Jan. 12, 1960 E. A. ERICSON 2,921,146

PLUG-IN TYPE POWER TAKE-OFF DEVICE WITH BIMETALLIC CONTACTS

Filed Dec. 2, 1957 2 Sheets-Sheet 1

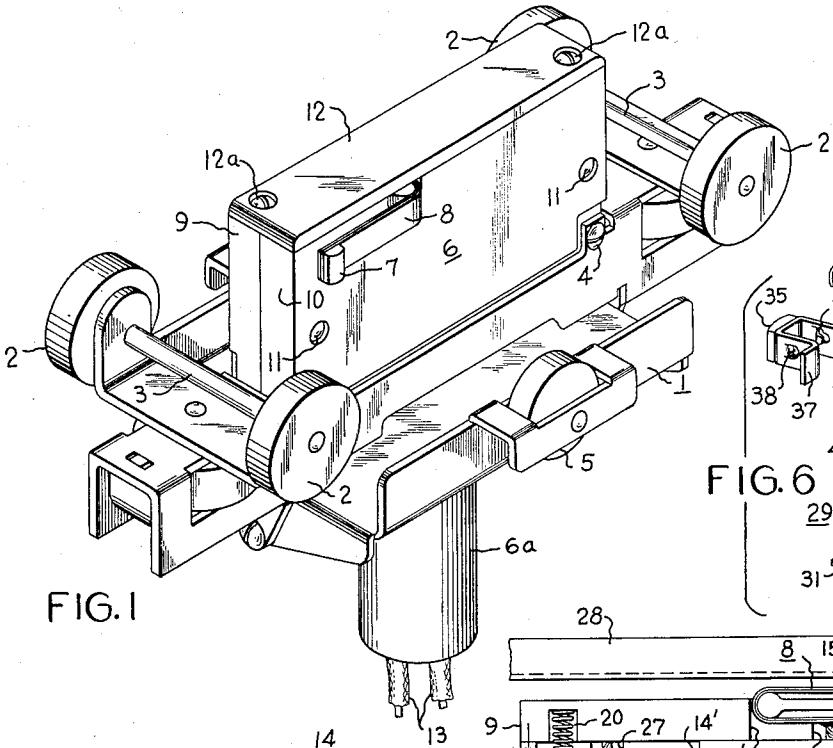

FIG. 1

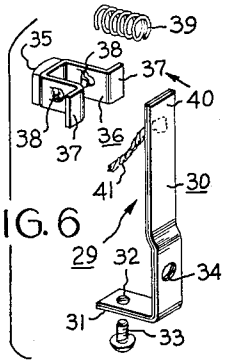

FIG. 6

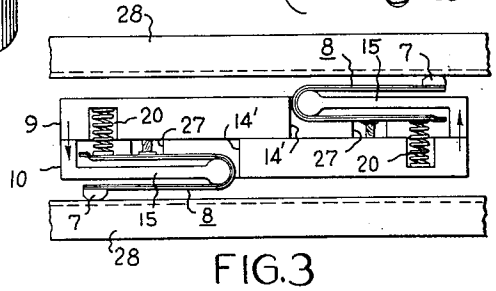

FIG. 3

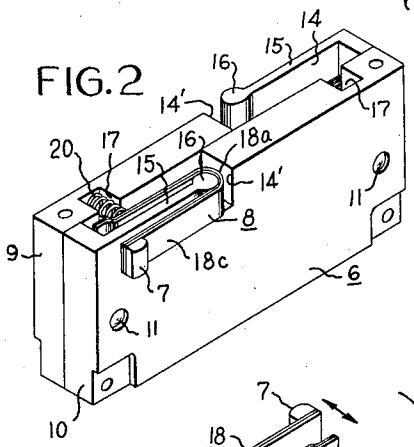

FIG. 2

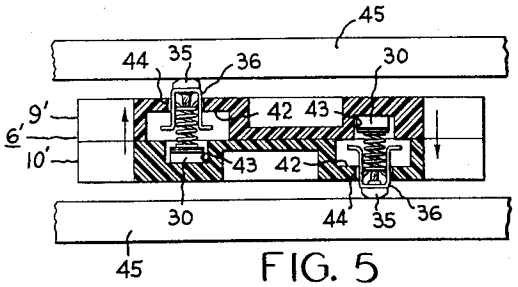

FIG. 5

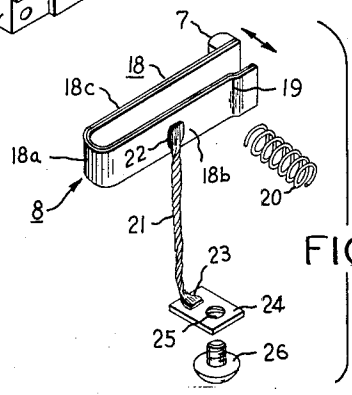

FIG. 4

INVENTOR.
ERIC A. ERICSON
BY Robert T. Casey
ATTORNEY

Jan. 12, 1960 E. A. ERICSON 2,921,146

PLUG-IN TYPE POWER TAKE-OFF DEVICE WITH BIMETALLIC CONTACTS

Filed Dec. 2, 1957 2 Sheets-Sheet 2

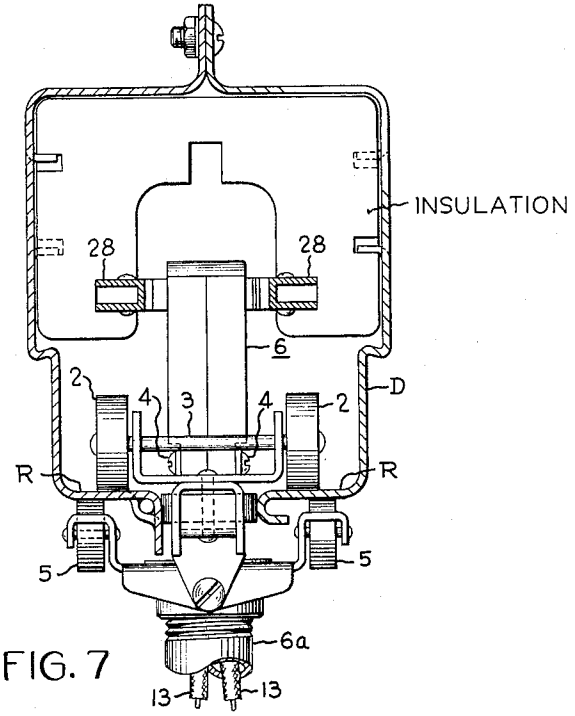

FIG. 7

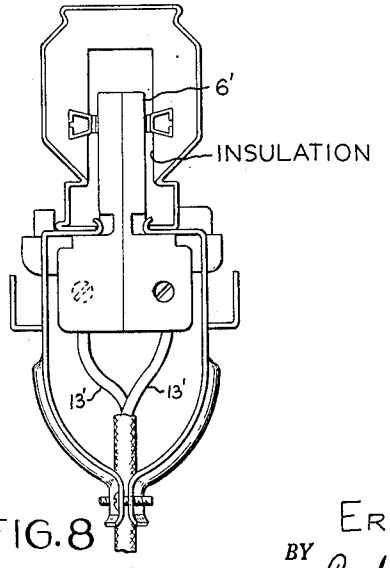

FIG. 8

INVENTOR.
ERIC A. ERICSON
BY Robert H. Casey
ATTORNEY

United States Patent Office 2,921,146
Patented Jan. 12, 1960

2,921,146

PLUG-IN TYPE POWER TAKE-OFF DEVICE WITH BIMETALLIC CONTACTS

Eric A. Ericson, Plainville, Conn., assignor to General Electric Company, a corporation of New York

Application December 2, 1957, Serial No. 700,038

4 Claims. (Cl. 191—45)

My invention relates to electric power take-off devices and more particularly to electric power take-off devices of the plug-in type such as are adapted to be used with bus bar type distribution systems or busways, and including stationary take-off devices and movable or trolley type take-off devices.

In order to secure good electrical contact and to avoid heating, excessive voltage-drop, etc., in such power take-off devices, it is necessary that adequate pressure of the contacts upon the bus bars be provided. In general, such pressure should be proportional to the amount of current being drawn. Thus, when larger currents are to be drawn, the pressure should be of greater magnitude than when only smaller currents are involved. Very great pressure, however, makes it very difficult to insert and remove such plug-in devices, and, in trolley type devices, tends to increase contact wear as the trolley is moved along the duct from one position to another.

Accordingly, it is an object of this invention to provide an improved power take-off device which provides high contact pressure when needed without causing difficulty in inserting or removing such device. It is another object of the invention to provide an improved trolley type take-off device in which high contact pressure is provided only when needed, thus reducing friction and wear during ordinary movement of the device.

In accordance with the invention, there is provided an electric power take-off device including a main supporting body and a contact movable relative thereto for engagement with a busway conductor. A current responsive member is provided on the main support, connected electrically in series with the contact and adapted to exert supplementary force on the contact in a contact making direction in response to current flow therethrough. Since the magnitude of such force depends upon current flow, it is reduced in the absence of such current. This permits ready insertion or removal of the device on a busway. The invention is especially adapted for trolley type power take-off devices, where it minimizes friction and wear of contacts by providing high contact pressure only at times when it is needed. While this is of value in any application of a trolley type device, it is especially useful in those frequent applications where power is drawn only when the device is stationary.

The invention will be more clearly understood from the following detailed description, reference being had to the accompanying drawing, and the features of novelty will be particularly pointed out in the appended claims.

Figure 1 is a perspective view of an electric power take-off device of the trolley type incorporating the invention;

Figure 2 is a perspective view of the contact supporting structure of the collector of Figure 1, with a portion of the insulating body thereof and one contact assembly removed;

Figure 3 is a plan view of a portion of the collector of Figure 1 shown in operative relation with associated

bus bars of a busway system, a portion of the insulating body being omitted to show the contact arrangement;

Figure 4 is an exploded perspective view of a contact assembly of the collector of Figure 3;

Figure 5 is a plan view in section of a stationary power tape-off device embodying the invention;

Figure 6 is an exploded perspective view of the contact assembly of the collector of Figure 5;

Figure 7 is an elevation view, partly in section, of the trolley type power collector of Figure 1 in place on a power distribution duct or busway; and

Figure 8 is a view similar to Figure 7, but showing the stationary power take-off device of Figure 5 in place on a power distribution duct or busway.

Referring to Figure 1, there is shown a power distribution duct or busway power take-off device of the trolley type incorporating the invention and comprising a carriage or main support **1**, adapted to be supported in rolling engagement with rail surfaces R of a distribution duct D (Figure 7) by means of wheels **2** affixed to axles **3**, wheels **5** are also provided which are adapted to engage the under side of the duct D to restrict tipping.

An insulating carrier or casing, generally designated at **6**, is affixed by suitable means such as by screws **4** to the support **1**, and carries a pair of contact assemblies including contacts **7** adapted to slidably engage bus bars **28**. Casing **6** includes two halves **9**, **10** enclosing the contact assemblies **8**. The two halves **9**, **10** are joined by suitable fasteners such as by screws or rivets **11**. An insulating cover member **12** is secured to the casing by suitable fasteners such as by screws or rivets **12***a*.

The casing **6** includes a depending portion **6***a* adapted to house conductors **13** which lead to a power consuming device (not shown). The halves **9**, **10** of the casing **6** are each formed with a recess **14** partially enclosed by a wall **15** terminating in a generally cylindrical enlargement **16** leaving a restricted passageway between the enlargement **16** and the wall **14'** of the casing **6**. A recess **17** is also provided in the meeting face of each casing half and arranged to communicate with the recess **14** of the opposite casing half when the casing **6** is assembled.

Each contact assembly includes a thermally responsive bimetallic member or strip **18**, bent into a generally U-shaped form, with an arcuate bight portion **18***a* and opposed leg portions **18***b*, **18***c*. The bimetallic strip **18** is arranged so that the side thereof having the greater coefficient of thermal expansion is inside the U, so that the U will expand and the free ends move away from each other upon increase in the temperature of the bimetallic strip, as shown by the double arrow in Figure 4. An offset or shoulder **19** is formed in leg **18***b* of the bimetallic strip **18**, for cooperation with a compression spring member **20** which abuts leg **18***b* of the bimetallic strip when assembled in the contact structure. Shoulder **19** serves to prevent outward sliding of spring member **20** on the leg **18***b* toward the end thereof. A contact **7** is conductively affixed to leg **18***c* of bimetallic strip **18** by suitable means such as by welding. A flexible pigtail lead **21** is soldered or otherwise conductively affixed to bimetallic strip **18** at **22**, and to a terminal **24**, carried by the casing **6**, at **23**. Terminal **24** is provided with a threaded opening **25** receiving a terminal screw **26** to secure one of the conductors **13** thereto.

The contact assembly **8** is assembled in casing **6** by placing spring **20** loosely in recess **17**, and disposing the arcuate portion **18***a* of bimetallic strip **18** about cylindrical enlargement **16**, with leg **18***c* lying outside and parallel to the casing and the leg **18***b* lying within recess **14**. Bimetallic strip **18** is thus pivotally supported in the casing **6** by sliding engagement with cylindrical enlargement **16** and wall **14'**. The free end of spring

member 20 is disposed to abut leg 18b of bimetallic strip 18 adjacent shoulder 19.

A recess 27 is also provided in each of the casing halves 9 and 10 to receive flexible pigtail lead 21.

Compression spring members 20 are provided, positioned in each recess 17, which bias bimetallic strips 18 and contacts 7 respectively outwardly into engagement with electric current supply conductors or bus bars 28, about circular enlargements 16 as pivots.

The bimetallic strips 18 are connected electrically in series with the contacts 7, a circuit being established from bus bars 28, to contacts 7, to bimetallic strips 18, to pigtail leads 21, terminal strips 24, and conductors 13.

Spring members 20 are so dimensioned, and bus bars 28 so spaced that when no current is flowing in the circuit and bimetallic strips 18 are therefore subject to ambient atmospheric temperature only, the bias produced by bimetallic strips 18 and spring members 20 is sufficient to maintain contacts 7 in engagement with bus bars 28, and to sufficiently compress spring members 20 to insure the maintenance of their proper alignment relative to bimetallic strips 18. Thus, when no current is flowing in the circuit, the current collector may be moved along the rails or duct on rollers 2 easily and without causing substantial frictional wear of the contacts.

When current is drawn, however, it heats bimetallic strips 18 and causes them to deflect as previously described so that their free ends move apart, thus increasing the pressure of the cumulative bias of bimetallic strips 18 and spring members 20 urging contacts 7 against the bus bars 28.

In Figures 5, 6 and 8, there is shown a stationary type power take-off device embodying the invention. This embodiment comprises a contact structure generally indicated at 29 in Figure 6. A bimetallic strip or member 30 of L-shaped form is provided, in which the metal strip having the greater co-efficient of thermal expansion is placed on the outside of the L, so that distortion caused by thermal expansion will cause movement of the free end in the direction of the arrow in Figure 5. Leg 31 is provided with a threaded hole 32 cooperating with a screw 33 for connection to incoming leads 13'. An opening 34 is formed in the bimetallic strip for attaching the strip 30 to a wall of the casing 6' in recess 43 by suitable means such as a screw or rivet (not shown).

A contact 35 is secured to a contact bearing bracket 36, which is provided with flanges 37 and inwardly bent tongues 38. A compression spring member 39 is interposed between contact carrying element 36 and the free end 40 of bimetallic strip 30 as best seen in Figure 6, and is engaged by bent-up tongues 38 to secure it at one end to element 36. A flexible pigtail lead 41 is soldered or otherwise conductively affixed to free end 40 of bimetallic strip 30 and to element 36. A casing 6', comprising halves 9', 10' is provided for mounting the contact assembly 29. Casing halves 9', 10' are each provided with suitable mating recesses 42, 43 and opening 44. Opening 44 is made of a size to permit relative sliding motion of element 36 therethrough but to limit movement of element 36 outwardly out of casing 6' by means of the engagement of flanges 37 with the interior surface of recess 42. Spring member 39 thus biases contact carrying bracket 36 outwardly to urge the contact 35 into engagement with electric current supply conductors or bus bars 45, reacting against the free end 40 of bimetallic strip 30.

As in the previous embodiment, the bias urging the contacts 35 against corresponding bus bars 45 is increased by the deflecting action of the bimetallic strip 30. When the bimetallic strips are subject only to ambient temperatures and are in an undistorted position, i.e., when no current is flowing through the circuit, the bias, represented solely by the pressure of spring members 39, is just sufficient to maintain surface contact of contacts 35 with bus bars 45. The current collector may be moved along the rails or duct on rollers 2 without incurring substantial frictional wear of contacts 35 upon bus bars 45. When current is drawn, however, the strip 30 deflects and increases the contact pressure.

It will be observed that although the invention is especially suited for use in applications where power is drawn only when the collector is stationary, it is also beneficial in any application where power is drawn in varying amounts or in an intermittent fashion from a movable collector, since the contact pressure, and hence the wear on the contacts is reduced whenever the current drawn from the collector is reduced.

It should be understood that the invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may readily be made and I therefore intend by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. For use with a trolley type power distribution system having an elongated housing and at least one conductor carried by said housing, a trolley type power take-off device comprising a support, means for mounting said support to provide relative movement between said support and the housing when the support is used in combination therewith, at least one electrical contact member movably supported on said support and disposed and arranged to contact said conductor when said device is supported on said housing, an elongated bimetallic strip having a first portion mounted on said support and a second portion movable with respect to said support, means connecting said contact and said bimetallic strip electrically in series, and means connecting said second portion of said bimetallic strip to said contact in force-transmitting relation, said bimetallic strip being constructed to deflect when heated by current passing therethrough in a direction to exert a force on said contact through said force-transmitting means.

2. A trolley type power take-off device as set forth in claim 1, said device also comprising a compression spring having one end thereof in engagement with said bimetallic strip and having the other end thereof disposed and arranged so that said spring when compressed exerts a force upon said contact in the same direction as said force exerted thereon by said bimetallic strip.

3. For use with a trolley type distribution system having an elongated housing and at least one conductor carried by said housing, a trolley type power take-off device comprising a support, means for mounting said support to provide relative movement between said support and the housing when the support is used in combination therewith, at least one elongated generally U-shaped bimetallic strip member pivotally mounted on said support adjacent the bight of said U, an electrical contact mounted on one end of said bimetallic strip member and adapted to be moved thereby outwardly of said support for engagement with said conductor when said device is supported on said housing, a compression spring between the other end of said bimetallic strip member and said support, an electrical terminal member mounted on said support, means connecting said terminal member electrically to said other end of said bimetallic strip member, said bimetallic strip member having its high expansion side on the inside of said U whereby said bimetallic strip member deforms when heated by current flowing therethrough in a direction to open said U and to increase the bias of said compression spring on said contact.

4. For use with a trolley type power distribution system having an elongated housing and at least one conductor carried by said housing, a trolley type power take-off device comprising a support, roller means mounted on said support for supporting said device on said hous-

ing and permitting rolling movement of said device along said housing, at least one electrical contact member movably supported on said support and disposed and arranged to contact said conductor when said device is supported on said housing, an elongated bimetallic strip member having one end thereof movable with respect to said support, an electric terminal member mounted on said support and electrically connected to said first end of said bimetallic strip member, flexible electrical conductor means connecting said other end of said bimetallic strip to said contact member, and a compression spring having one end thereof in engagement with said contact member and having the other end thereof in engagement with said bimetallic strip member, said bimetallic strip member being constructed and arranged to deform when

heated by current passing therethrough so as to move said other end toward said compression spring to transmit contact pressure therethrough to said contact member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,943,958	Grant	Jan. 16, 1934
2,077,587	Rowe	Apr. 20, 1937
2,128,135	Glasgow	Aug. 23, 1938
2,170,298	Frank	Aug. 22, 1939
2,361,536	Frank	Oct. 31, 1944
2,537,866	Tanner	Jan. 9, 1951
2,740,942	Sprigg	Apr. 3, 1956