

[54] **GROUNDING DEVICE FOR BUNDLE CONDUCTOR STRINGING BLOCKS**

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[22] Filed: Oct. 27, 1970

[21] Appl. No.: 84,372

[52] U.S. Cl. 254/134.3 PA, 254/192, 242/157, 254/DIG. 11, 198/192

[51] Int. Cl. B24b 5/00

[58] Field of Search 254/192, 193, DIG. 11, 134.3 PA; 242/157; 174/5 SG, 6; 198/192; 193/37, 35 B, 35 F

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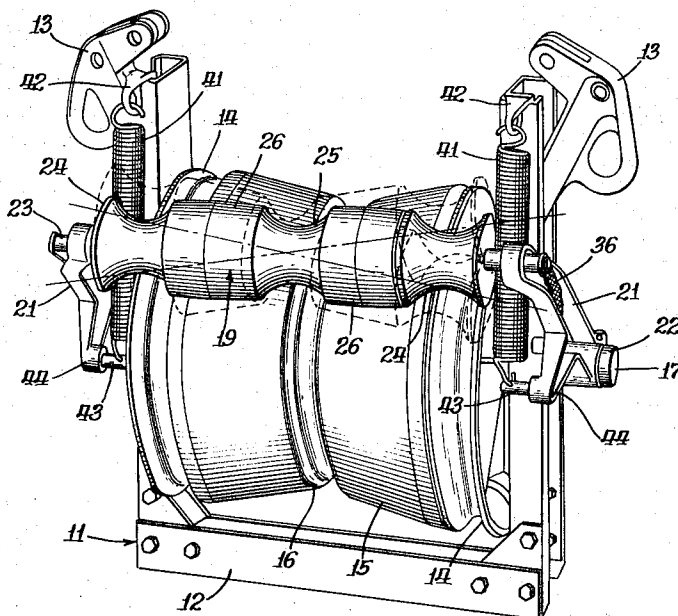
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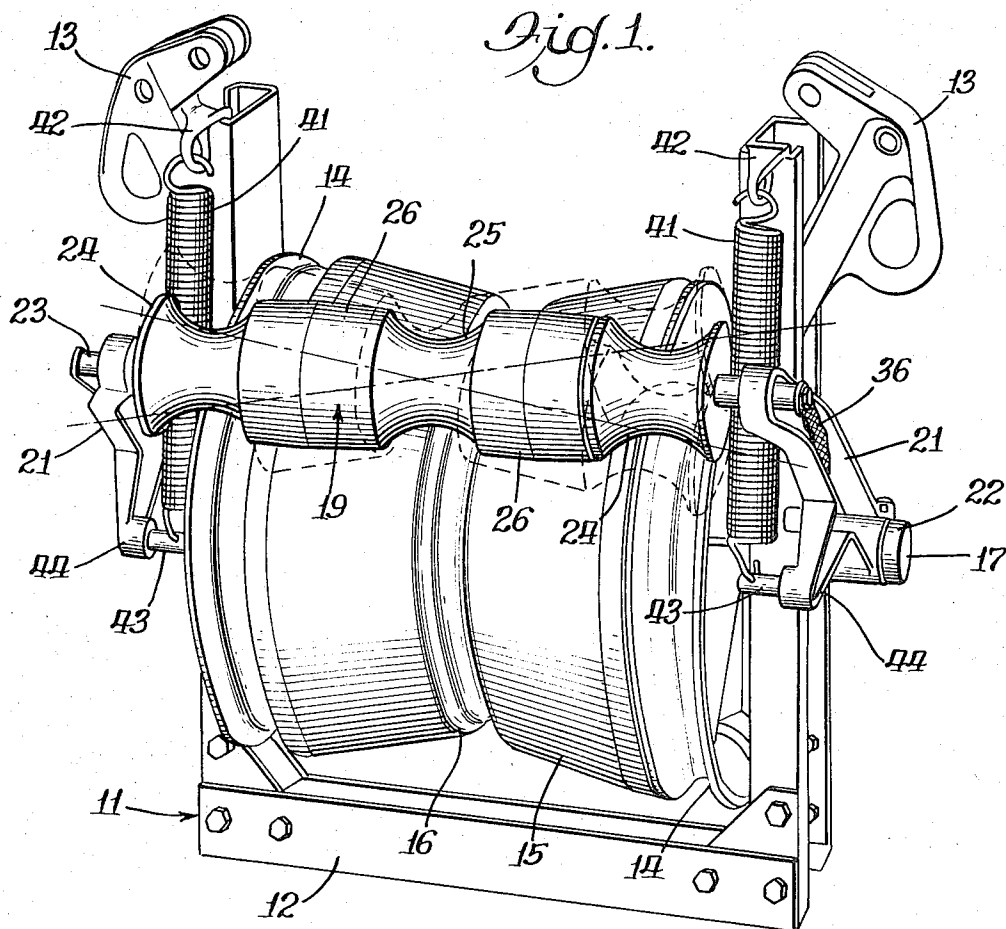
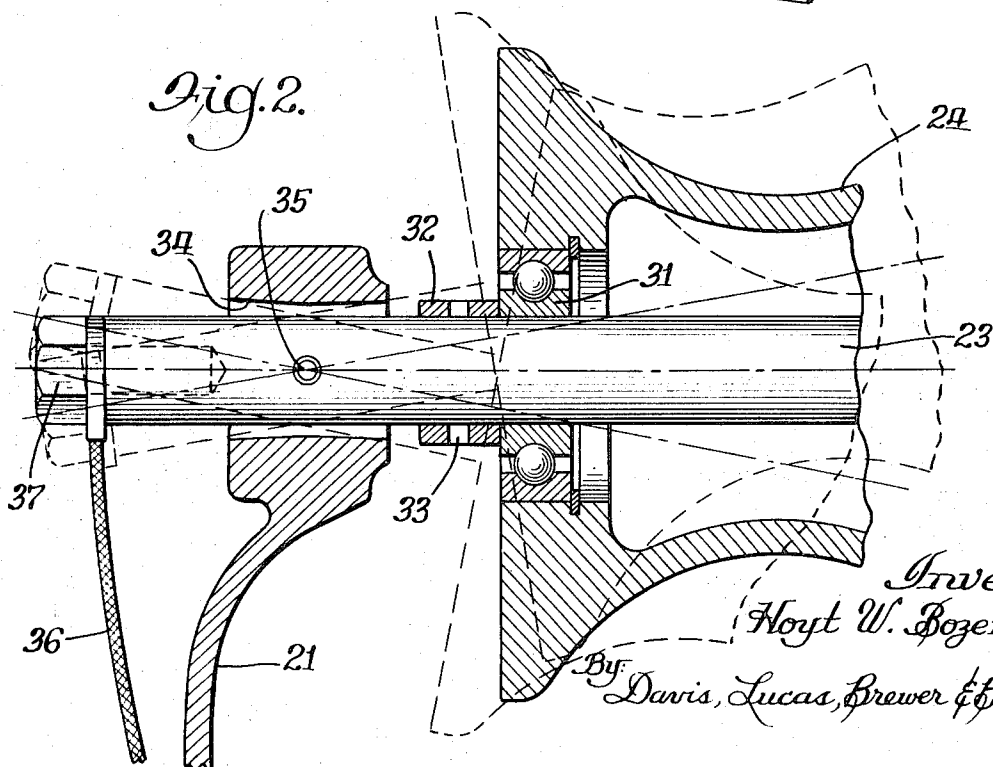
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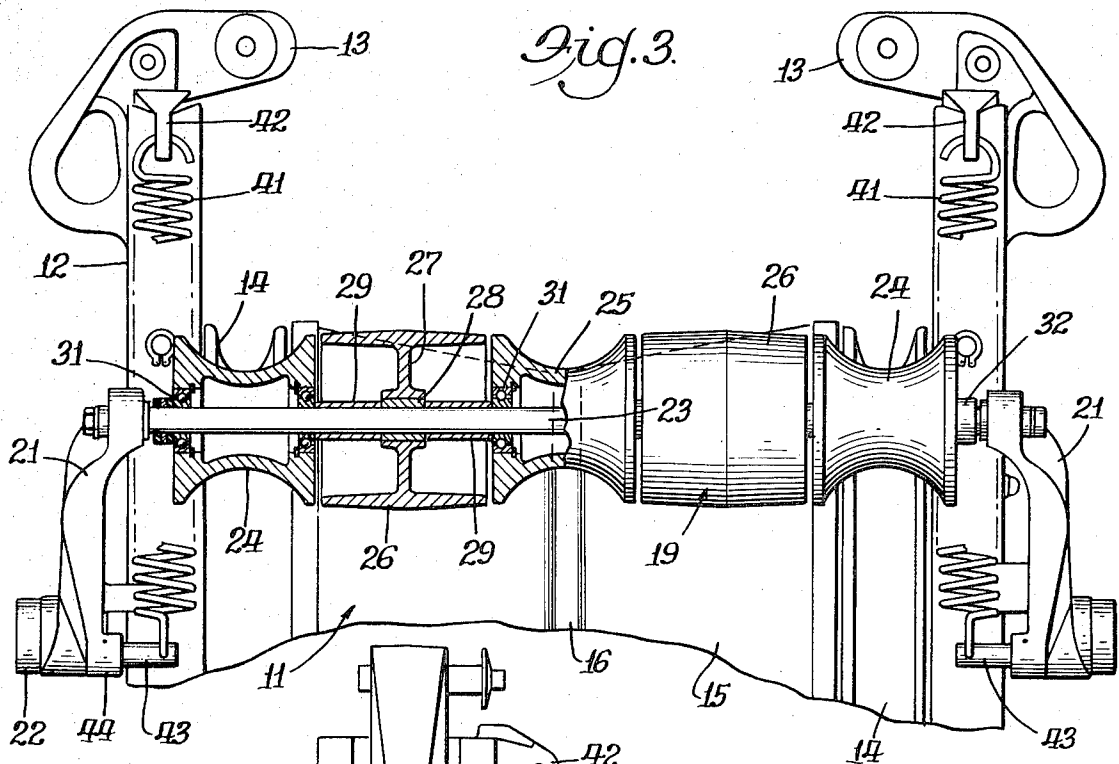
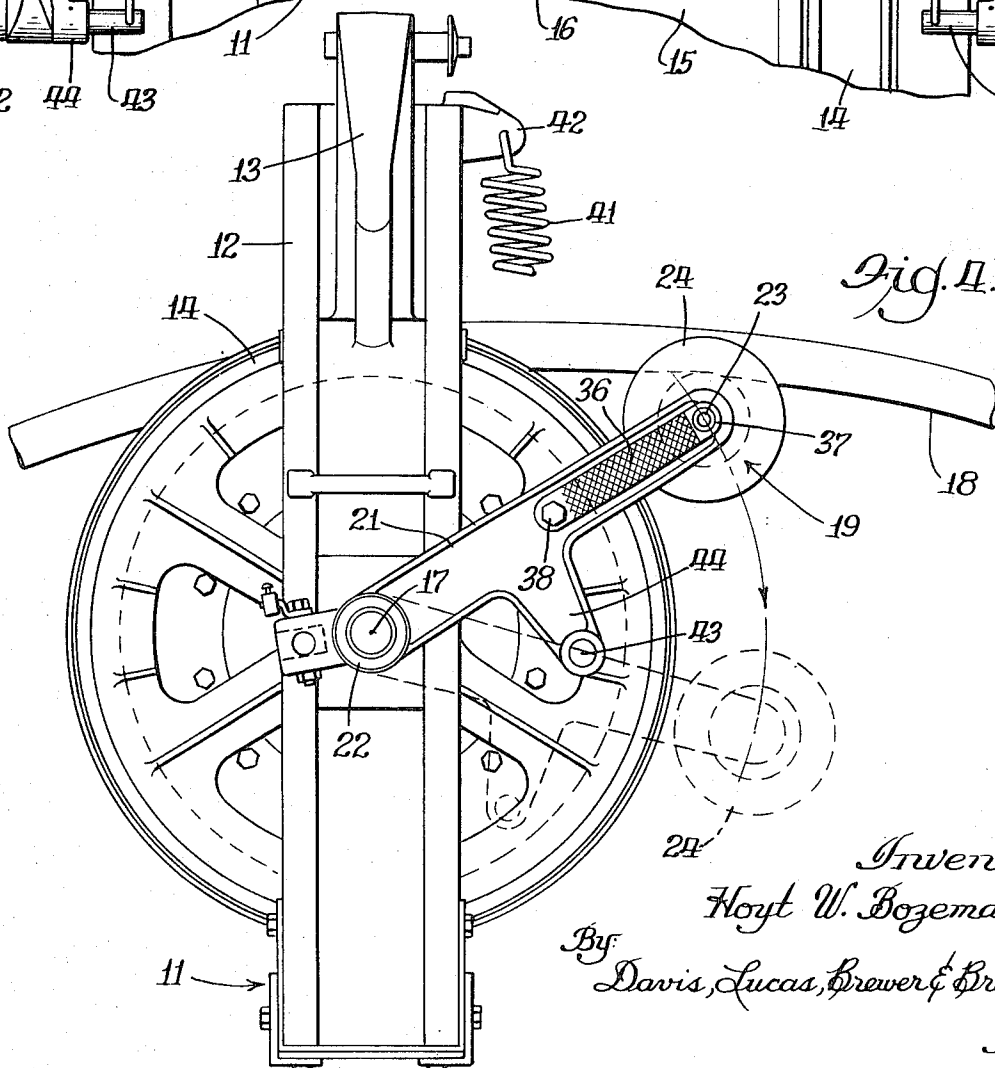
[57] **ABSTRACT**

Grounding device for a bundle stringing block having a plurality of coaxial sheaves rotatably supported by a frame which comprises a metal grounding roller spaced from the periphery and aligned with each sheave, a laterally extending shaft rotatably supporting the grounding rollers, an arm articulately connected with each end of the roller shaft and pivoted on the frame coaxially with the sheaves, springs connected at their upper ends to the frame and at their lower ends to each arm at a point between its pivot and the roller shaft and offset downwardly to provide a moment arm about the roller arm pivot variable in length in response to roller arm movement to maintain substantially constant the lifting force on each grounding roller despite relative variations in conductor tensions, and means for electrically connecting a roller arm with the roller shaft.

5 Claims, 4 Drawing Figures







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GROUNDING DEVICE FOR BUNDLE CONDUCTOR STRINGING BLOCKS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to stringing equipment for electrical conductors, and more particularly to a device for grounding a bundle conductor stringing block.

2. Description of the Prior Art

Heretofore, it has been the practice to ground the frames of blocks employed in stringing electrical conductors. This was satisfactory with respect to draining off static voltage, but is not effective with respect to the very much higher voltages which are induced in the conductors being strung in relatively close proximity to existing high voltage lines. The problem of getting rid of these high induced voltages was compounded by the very desirable practice, from the standpoint of preventing conductor surface damage, of using protective linings on the conductor sheaves. Even where such linings are of neoprene, which is sufficiently conductive to pass static voltages from a conductor to the sheave, they will not transmit the higher induced voltages and are burned thereby, which renders the blocks unsuitable for conductor stringing. And of much more importance, if the high induced voltages are not effectively conducted to ground from the new lines being erected, other and more expensive equipment may be damaged and injury to persons and even death may result and have occurred.

To meet these problems, a grounding roller has been employed with a single conductor stringing block which has metal-to-metal contact with the conductor being strung and may be grounded so that reliance will not have to be placed on conducting contact between the stringing sheave or pulley and the conductor. However, such arrangement is not practical with bundle blocks for stringing a plurality of conductors, and will be inoperative even if a plurality of grounding rollers are mounted upon a single shaft, instead of using a single or common roller across all the conductors, and different tensioning of the individual conductors results in poor contact or disconnection of any one of them from its grounding roller.

SUMMARY OF THE INVENTION

These problems have been overcome by the instant invention by insuring a metal-to-metal contact at all times between the conductors being strung and metal rollers individual to the conductors, but mounted on a common shaft, with the shaft supported for swinging movements peripherally of the coaxial sheaves in a bundle stringing block by means of a pair of arms rotatably supported by the block frame, and resilient means interconnecting the frame and each of the arms to impose a predetermined lifting force on the latter. Further, articulated connections between the arms and the roller shaft automatically compensate for varying forces applied to different ones of the grounding rollers, and the interconnection of the resilient means between the frame and each of the arms is such as to maintain the predetermined lifting force on the arms substantially constant regardless of the peripheral positions of the grounding rollers relative to the sheaves within the normal range of movement of the arms.

In the Drawings:

FIG. 1 is a perspective view of a bundle conductor stringing block with a grounding device embodying the features of this invention mounted thereon and shown in normal position in full lines and in other operable positions in broken lines;

FIG. 2 is a detail vertical section through one end of the grounding roller shaft, with the latter shown in broken lines in two extreme positions relative to the supporting arms;

FIG. 3 is a rear elevational view of the device of FIG. 1, with parts thereof in vertical section; and

FIG. 4 is an end elevation as seen from the left side of FIGS. 1 and 3, with the grounding device shown in broken lines in an extreme lower position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to FIG. 1, a bundle conductor stringing block of well-known construction is illustrated and designated generally by reference numeral 11. This block 11 comprises a rigid frame structure 12 adapted to be suspended in a manner well understood in the art, as by means of suspension fittings 13, by or from the lower end of an insulator string. Supported by and within the lateral members of the frame 12 are a plurality of coaxial conductor sheaves or pulleys 14 and a center roller 15 having the usual pulling line groove 16. The sheaves 14 and roller 15 are rotatably supported by a shaft or shaft means 17 which extends through and is carried by the lateral vertical members of the frame 12. This bundle conductor stringing block 11 as herein illustrated comprises two of the sheaves 14, which preferably are protectively line in well-known manner, and are adapted in use each to receive a conductor being strung, such as that shown at 18 in FIG. 4. As is fully understood in the art, to effect such stringing of the two conductors 18, a pulling line (not shown) first is drawn through the block 11 over the roller 15 and in the groove 16 in a direction from right to left in FIG. 4. A runningboard (also not shown) is attached to the trailing end of the pulling line and is drawn thereby through the block 11, the conductors 18 being attached to the trailing end of that runningboard thereby to be laid in the sheaves 14. Thereafter, and until the conductors subsequently are connected permanently to the temporarily block-supporting insulator string, those conductors 18 are engaged and supported by the peripheral grooved portions of their associated sheaves 14.

As previously noted, the mechanism so far described in detail in well known and may be of any desired form or design of bundle block construction other than that herein illustrated. The present invention comprises a grounding device for such a bundle block and is designated generally by reference numeral 19.

This grounding device 19 comprises a pair of arms 21 which are disposed laterally adjacent and outside of the frame 12 and are pivotally supported at their lower end portions by the frame. This preferably is accomplished by rotatably mounting the arms 21 on lateral extensions of the shaft 17 and retaining the arms on the shaft in any suitable manner, as by means of collars 22 secured to the shaft. Adjacent its outer end, each of these arms 21 is articulately connected in a manner later to be described in detail to a laterally extending shaft 23. This shaft 23 rotatably supports a metal grounding

roller 24 aligned with each of the conductor sheaves 14, a central metal grounding roller 25 aligned with the pulling line groove 16, and two spacer drums 26 disposed between the rollers 24 and 25. As shown in FIG. 3, each spacer drum 26 is provided with a central web 27 having a bore receiving a bushing 28, and spacer sleeves 29 are slidably mounted on the shaft 23 at both sides of the bushing 28. Each of the grounding rollers 24 and 25 are provided in the ends of suitable bores therethrough with bearings 31 engaging shaft 23, and the assemblage of these several rollers 24 and 25 and spacer drums 26 is retained against lateral movements longitudinally of shaft 23, as by means of collars 32 secured to the shaft by pins 33.

Referring more particularly to FIG. 2, the articulated connections between the roller shaft 23 and its supporting arms 21 are shown as comprising a bore 34 in the outer end portions of each of the arms 21 for relatively loosely receiving the shaft 23 and a pin 35 extending through the shaft and the associated arm 21 at right angles to the longitudinal axes of the shaft and the arm. The outer ends of each of these bores 34 are enlarged to facilitate pivotal movements of the shaft 23 relative to the associated arm 21 about the axis of the pin 35. This arrangement enables such movement of the shaft relative to the arms between the extreme positions illustrated in broken lines in FIG. 2.

At least one of the ends of the roller shaft 23 is electrically connected to its associated arm 21 by a cable 36 secured at one end to the shaft by a bolt 37 and similarly connected by a bolt 38, as shown in FIG. 4, to the associated arm 21. At its lower end, the arm 21 is provided with a suitable grounding lug 39 for connection to a grounding wire in well-known manner.

Means are provided for resiliently interconnecting the frame 12 and each of the arms 21 to impose a predetermined lifting force on the latter which comprises, in the present embodiment, a pair of springs 41. Each spring 41 is connected at its upper end to the frame by a bracket or hanger 42 mounted on the frame and at its lower end to a pin 43 which is suitably secured to, and extends laterally inwardly from, an arm extension 44. This extension 44 comprises an integral portion of the arm 21 and, as best seen in FIG. 4, is so disposed as to locate the point of connection of the lower end of the associated spring 41 at a point spaced from the shaft means 17 on which the arm 21 is pivoted toward the roller shaft 23 and offset downwardly from the longitudinal axis of the arm 21 to provide a moment arm about the axis of the shaft 17 as applied to or by the spring which is variable in length in response to rotation of the arm 21. In other words, as the arm 21 is swung downwardly from its full line position of FIG. 4, the effective moment arm or horizontal distance between the centers of the shaft 17 and the pin 43 decreases. Such downward movement is accompanied by an increasing lifting force effected by the spring 41 on the arm 21 by virtue of tensioning of the spring. The arrangement of these parts is such that depression of the roller shaft 23 to increase the lifting force of the springs 41 is compensated for by the automatically corresponding reduction in the effective length of the moment arm of the spring on the arm 21, so that the predetermined lifting force of the springs is substantially constant regardless of the peripheral positions of

the grounding rollers 24, 25 relative to the sheaves 17 and roller 15 within the normal range of movement of the arms 21.

Consequently, the grounding device 19 is effective to maintain metal-to-metal contact between the pulling line and the central grounding roller 25 before the runningboard reaches the bundle block 11 and, thereafter, between the conductors 18 being strung and the grounding rollers 24. This will be effected regardless of the tensions in the conductors 18 and any variations of tensions of the conductors relative to each other. This is of extreme importance because even though perfect metal-to-metal contact is maintained between one of the conductors 18 and its roller 24, failure to maintain similar contact between the other conductor or conductors being strung and the associated grounding roller or rollers will fail to drain the high induced voltage from such conductor or conductors. Differences in tensioning of the conductors during stringing could have the effect in a device of the type herein illustrated of swinging the roller shaft 23 downwardly peripherally of the sheaves 14 in response to slacking of one of the conductors 18 being strung. Such slacking of a conductor would depress the associated grounding roller 24 against the upward constraining forces of the spring or resilient means 41. If the shaft 23 were rigidly connected to the arms 21, this would result in similar lowering of the other conductor roller or rollers 24 to impair or terminate their conductive contact with the associated conductors.

However, the articulated connections 34, 35 between the arms 21 and the shaft 23 prevent any such contact-impairing result because they permit tilting of the shaft 23 relative to the arms 21 in the manner illustrated in broken lines in FIGS. 1 and 2, whereby depression of one of the grounding rollers 24 will not automatically be accompanied by a similar depression of the other roller or rollers 24, and the latter will continue to be maintained in effective metal-to-metal contact with their associated conductors.

The grounding device of this invention thus effectively functions to drain off static and induced voltages from all of the conductors being strung in a bundle operation. The use of the cable 36 at either or both ends of the shaft 23 insures adequate capacity for draining any voltages encountered in all of the conductors being strung without having to rely upon only the pins 35 and line contacts between the shaft 23 and the arms 21.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A grounding device for a bundle stringing block having a supporting frame, a plurality of coaxial sheaves and laterally extending shaft means for rotatably supporting said sheaves on said frame; comprising a pair of roller arms rotatably supported by said frame laterally outwardly of said sheaves, a metal grounding roller aligned with each of said sheaves, a

roller shaft for rotatably supporting and electrically connected to said rollers, means interconnecting said roller shaft and said arms to support said shaft for swinging movements peripherally of said sheaves, resilient means interconnecting said frame and each of said arms to impose a predetermined lifting force on the latter, and means for electrically connecting said roller shaft with a said arm.

2. A grounding device according to claim 1, wherein said interconnecting means comprises an articulated connection between said roller shaft and each of said arms to automatically compensate for varying forces applied to different ones of said grounding rollers.

3. A grounding device according to claim 2, wherein the interconnection of said resilient means between said frame and each of said arms maintains said predetermined lifting force substantially constant regardless of the peripheral positions of said grounding rollers relative to said sheaves within the normal range of movement of said arms.

4. A grounding device according to claim 2, wherein

each said articulated connection comprises a laterally extending bore through one end portion of a said arm for loosely receiving said roller shaft, and a pin extending through said shaft and said arm at right angles to the longitudinal axes thereof, the outer ends of said bore being enlarged to facilitate pivotal movements of said shaft relative to said arm about the axis of said pin.

5. A grounding device according to claim 2, wherein said arms are rotatably mounted on said shaft means, and said resilient means comprises springs connected at one end to said frame and at their other ends, respectively, to a said arm at a point spaced from said shaft means toward said roller shaft and offset downwardly from the longitudinal axis of said arm to provide a moment arm about the axis of said shaft means variable in length in response to rotation of said arm, whereby depression of said roller shaft to increase the lifting force of said springs is compensated for by an automatic corresponding reduction in the effective length of the associated said moment arm.

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