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(19)

(54) VOLTAGE REGULATOR AND BRUSH ASSEMBLY

(71) We, LUCAS INDUSTRIES LIMITED, a British Company of Great King Street, Birmingham B19 2XF England, do hereby declare this invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:–

This invention relates to a voltage regulator and brush assembly and is more particularly concerned with a voltage regulator and brush assembly and also relates to an alternator including such an assembly.

According to one aspect of the present invention, there is provided a voltage regulator and brush assembly, comprising (1) a voltage regulator having an electrically conductive casing, and (2) an electrically insulating brush housing having brushes mounted in the housing and springs biassing the brushes, wherein (a) electrically conductive members mounted on the brush housing are electrically connected to the respective brushes and serve as abutments for the springs, (b) the casing has an electrically conductive apertured flange projecting therefrom, and (c) a fixing screw serves to secure the flange in electrical connection with one of the electrically conductive members, and to secure said one of the electrically conductive members to the brush housing.

Preferably, the fixing screw engages in a hole in the brush housing.

Preferably also, the electrically insulating housing has a recessed surface against which the apertured flange abuts, said recessed surface having therein the hole in which the fixing screw is engaged, so that the apertured flange is disposed between the conductive member and the recessed surface.

According to another aspect of the present invention, there is provided an alternator including a voltage regulator and brush assembly as defined in any one of the last preceding three paragraphs.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:–

Figure 1 is a plan view of one example of a voltage regulator and brush assembly according to the present invention;

Figure 2 is a longitudinal sectional view of a brush housing and brushes of the assembly of Figure 1;

Figure 3 is an end view of the assembly of Figure 1;

Figure 4 is a side view of the brush housing of the assembly; and

Figure 5 is a longitudinal sectional view of an alternator including the voltage regulator and brush assembly of Figures 1 to 4.

Referring to the drawings, the assembly comprises a glass-filled nylon brush housing 10 upon which is supported a voltage regulator body 11. The brush housing 10 houses a pair of brushes 12 and 13 which are electrically connected with relatively rigid electrically conductive plates 14 and 15, respectively, via respective flexible conductors 16 and 17. As is usual with electrical brushes, the brushes 12 and 13 are biased by respective compression springs 18 and 19. The conductor plates 14 and 15 serve as fixed abutments for the springs 18 and 19 and a seal 20 prevents ingress of dirt and moisture past the plates 14 and 15 and into the housing 10. The conductor plate 14 is secured to the housing 10 by means of a fixing screw 21 and also includes a further conductor plate portion 22. The further conductor plate portion 22 includes an integral terminal 23. The conductor plate 15 is secured to the housing 10 by means of a self-tapping fixing screw 24 and is disposed in a recess 29 formed in the housing 10 so as to be firmly located by the sides of the recess 29. The fixing screw 24 passes through an aperture (not shown) in the conductor plate 15 to engage in a blind hole 25 formed in the housing 10. The housing 10 further includes a cup-shaped portion 26 into which the free ends of the brushes 12 and 13 project. The brush housing 10 further includes an integral hooked portion 27 which is disposed at the opposite end of the housing 10 to the plate 15 and fixing screw 24. The hooked portion 27 defines therein a recess 28 which opens in the direction of the fixing

screw 24.

The cup-shaped portion 26 has a pair of blind holes 32 therein. Lastly, the housing 10 is further provided with a pair of integral apertured flanges 33. The purpose of the blind holes 32 and apertured flanges 33 will be described hereinafter.

The voltage regulator body 11 is basically in the form of an electrically conductive metal cup having an apertured flange 34 extending from one end thereof and a cranked tongue 35 extending from the opposite end thereof. The regulator body 11 houses voltage regulation circuitry which is of a *per se* known type and which will not be described herein in any detail except to state that a part of the circuitry which is to be connected with brush 13 is electrically connected to the body 11. The tongue 35 of the regulator body 11 is engaged in the recess 28 and the apertured flanges 34 of the regulator body 11 overlies a recessed surface 39 on the housing 10, the surface 39 surrounding the blind hole 25. The recessed surface 39 corresponds in outline to the free end of the apertured flange 34. As will be appreciated from the above description the apertured flange 34 of the regulator body 11 is disposed between the recessed surface 39 and the conductor plate 15. The fixing screw 24 thus serves to urge the plate 15 and apertured flanges 34 into close electrical contact with one another and also mounts one end of the regulator body 11 on the housing 10 as well as serving to secure the plate 15 to the housing 10.

Thus, a much better electrical connection is provided between the regulator body 11 and the plate 15 than would be the case if a separate connection, e.g. a lead, were used to effect the electrical connection. Also a fewer number of parts are required, leading to a voltage regulator and brush assembly which is economical to produce.

Most advantageously, the tongue 35 and recess 28 engage each other in the manner described in our co-pending British Patent Application No. 44042/76 (Serial No. 1 589 718) entitled "Voltage Regulator and Brush Assembly" filed on 22nd October 1976.

Referring now to Figure 5 of the drawings, the alternator illustrated therein comprises generally a stator assembly 40, a rotor assembly 41, a rectifier assembly 42 and the voltage regulator and brush assembly described hereinabove. A rotor shaft 43 of the rotor assembly 41 projects through an end bracket 44 of a housing 45 of the alternator and is rotatably mounted in bearings 46. A slip ring assembly 47 is mounted on that end of the rotor shaft 43 which projects externally of the housing 45. The brush housing 10 is bolted to the end bracket 34 by means of bolts 48 (only one shown) passing through the aforementioned apertured flanges 33. In this position, the slip ring assembly 47 lies within the cup-shaped portion 26, and the brushes 12 and 13 engage against respective slip rings of the assembly 47. A cap 49 overlies the regulator and brush assembly, and the rectifier assembly and is secured in position by bolts 50 which engage in screw threaded fashion in the blind holes 32 in the cup-shaped portion 26. Leads 51 from the stator assembly 40 are connected with the rectifier 42 which is also connected with brush 12 by way of the conductor plate portion 22. The terminal 23 is connected with a surge protection diode (not shown). The plate portion 22 is also connected with a lead 52 leading from the voltage regulator. Another lead 53 from the voltage regulator is connected with a terminal 54 for external connection into the wiring circuitry of a motor vehicle fitted with the alternator. Another lead 55 of the voltage regulator is connected with the rectifier 42. The precise construction of the rectifier 42 will not be described in any detail herein since it forms no part of the present invention. Its construction, however, together with its inter-relationship with the voltage regulator and brush assembly will be readily apparent to any person skilled in the art.

WHAT WE CLAIM IS:–

1. A voltage regulator and brush assembly, comprising (1) a voltage regulator having an electrically conductive casing, and (2) an electrically insulating brush housing having brushes mounted in the housing and springs biassing the brushes, wherein (a) electrically conductive members mounted on the brush housing are electrically connected to the respective brushes and serve as abutments for the springs (b) the casing has an electrically conductive apertured flange projecting therefrom, and (c) a fixing screw serves to secure the flange in electrical connection with one of the electrically conductive members, and to secure said one of the electrically conductive members to the brush housing.

2. An assembly as claimed in claim 1, wherein the fixing screw engages in a hole in the brush housing.

3. An assembly as claimed in claim 2, wherein the electrically insulating housing has a recessed surface against which the apertured flange abuts, said recessed surface having therein the hole in which the fixing screw is engaged, so that the apertured flange is disposed between the conductive member and the recessed surface.

4. An alternator including a voltage regulator and brush assembly as claimed in any preceding claim.

5. A voltage regulator and brush assembly substantially as hereinbefore described with reference to Figures 1 to 4 of the

screw 24.

The cup-shaped portion 26 has a pair of blind holes 32 therein. Lastly, the housing 10 is further provided with a pair of integral apertured flanges 33. The purpose of the blind holes 32 and apertured flanges 33 will be described hereinafter.

The voltage regulator body 11 is basically in the form of an electrically conductive metal cup having an apertured flange 34 extending from one end thereof and a cranked tongue 35 extending from the opposite end thereof. The regulator body 11 houses voltage regulation circuitry which is of a *per se* known type and which will not be described herein in any detail except to state that a part of the circuitry which is to be connected with brush 13 is electrically connected to the body 11. The tongue 35 of the regulator body 11 is engaged in the recess 28 and the apertured flanges 34 of the regulator body 11 overlies a recessed surface 39 on the housing 10, the surface 39 surrounding the blind hole 25. The recessed surface 39 corresponds in outline to the free end of the apertured flange 34. As will be appreciated from the above description the apertured flange 34 of the regulator body 11 is disposed between the recessed surface 39 and the conductor plate 15. The fixing screw 24 thus serves to urge the plate 15 and apertured flanges 34 into close electrical contact with one another and also mounts one end of the regulator body 11 on the housing 10 as well as serving to secure the plate 15 to the housing 10.

Thus, a much better electrical connection is provided between the regulator body 11 and the plate 15 than would be the case if a separate connection, e.g. a lead, were used to effect the electrical connection. Also a fewer number of parts are required, leading to a voltage regulator and brush assembly which is economical to produce.

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2. An assembly as claimed in claim 1, wherein the fixing screw engages in a hole in the brush housing.

3. An assembly as claimed in claim 2, wherein the electrically insulating housing has a recessed surface against which the apertured flange abuts, said recessed surface having therein the hole in which the fixing screw is engaged, so that the apertured flange is disposed between the conductive member and the recessed surface.

4. An alternator including a voltage regulator and brush assembly as claimed in any preceding claim.

5. A voltage regulator and brush assembly substantially as hereinbefore described with reference to Figures 1 to 4 of the

accompanying drawings.

6. An alternator substantially as hereinbefore described with reference to Figure 5 of the accompanying drawings.

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