Dec. 22, 1959 W. R. ANDERSON ET AL 2,917,863

INSECT ELECTROCUTION APPARATUS CONSTRUCTION

Filed Feb. 3, 1958 2 Sheets-Sheet 1

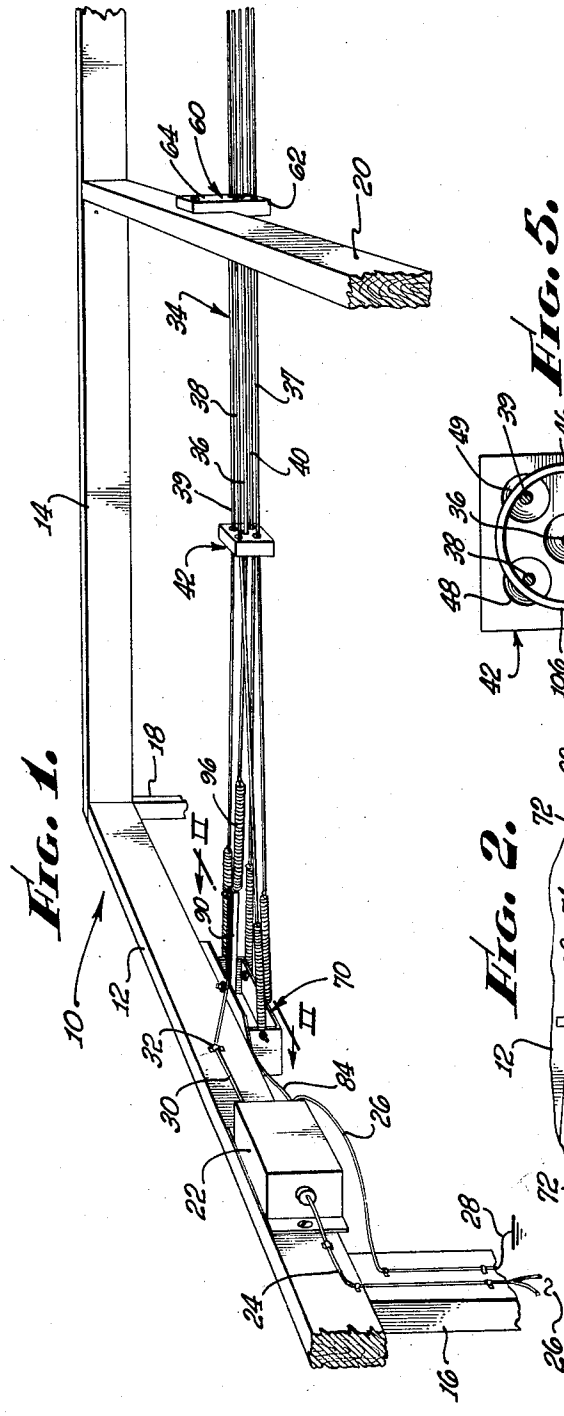


FIG. 1.

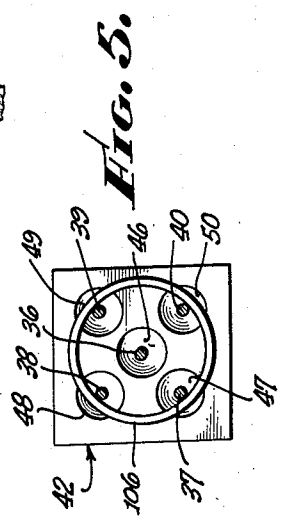


FIG. 5.

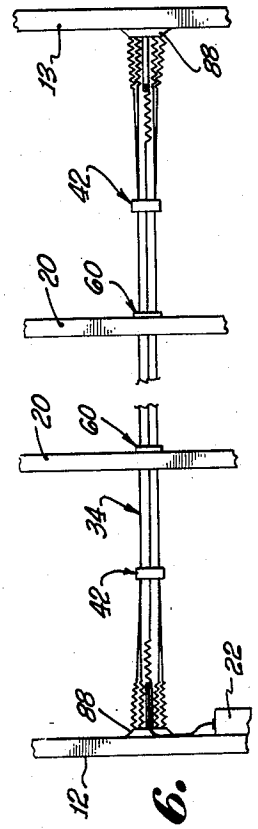


FIG. 6.

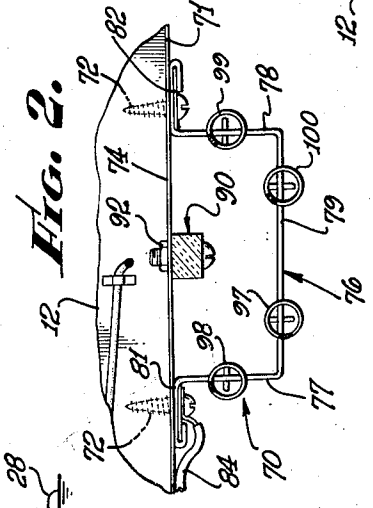


FIG. 2.

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INSECT ELECTROCUTION APPARATUS CONSTRUCTION

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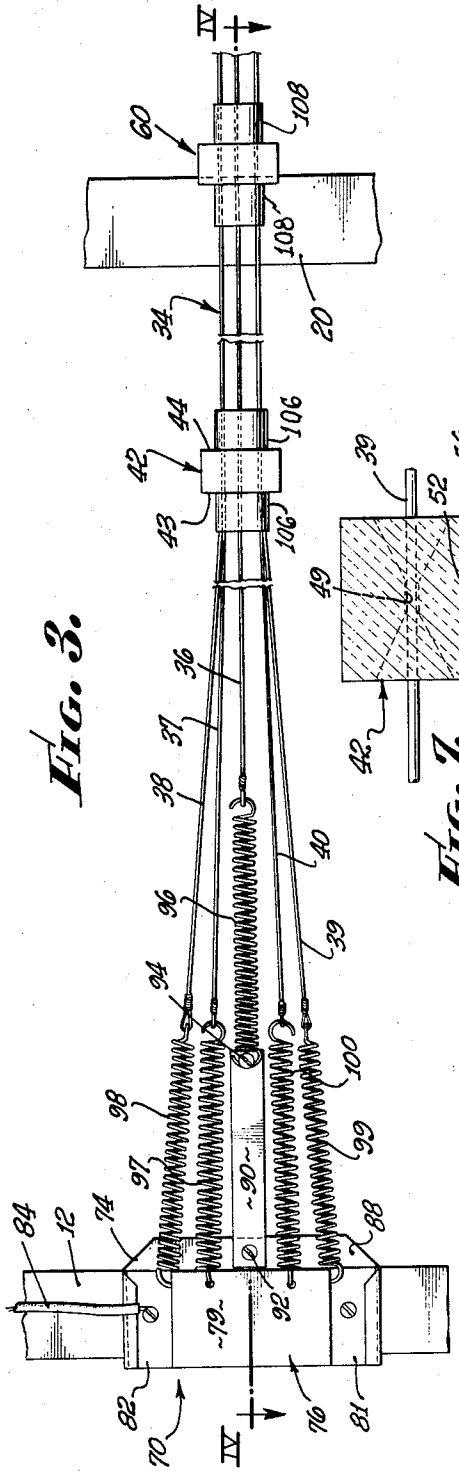


FIG. 3.

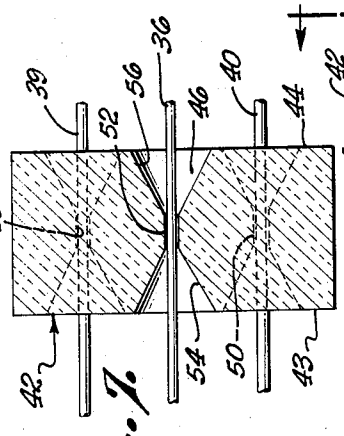


FIG. 7.

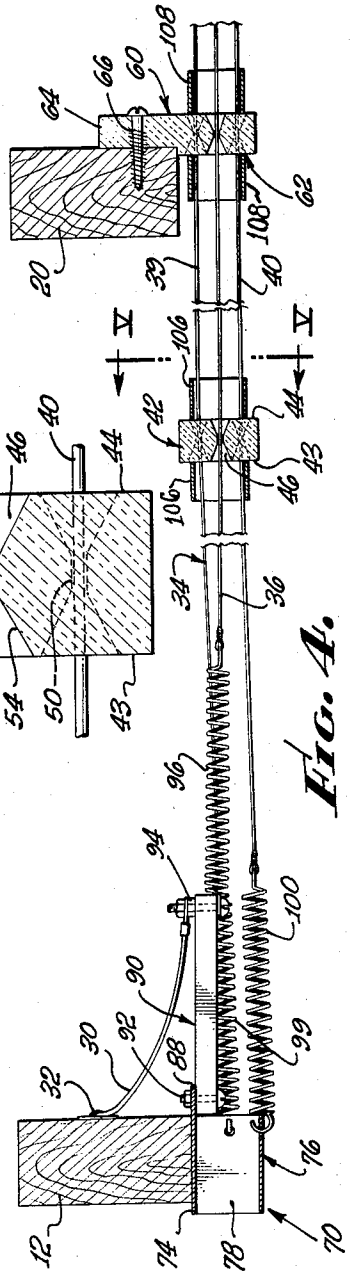


FIG. 4.

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# INSECT ELECTROCUTION APPARATUS CONSTRUCTION

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Application February 3, 1958, Serial No. 712,779

15 Claims. (Cl. 43—112)

The present invention relates generally to improvements in construction of apparatus for the electrocution of insects, and is a continuation-in-part of the application entitled "Insect Electrocution Apparatus," Serial No. 501,642, filed April 15, 1955, now United States Letters Patent No. 2,821,806, issued February 4, 1958.

The structure disclosed in the patent above referred to contemplates generally the provision of a group of conductors extending in parallel relation longitudinally of a building such as a hen house or the like where the insect problem, particularly of flies, is especially acute. At least one of the conductors is electrically charged at a high voltage, and the remaining conductors are spaced from the charged conductor or conductors by a sufficient distance to prevent electrical breakdown for the voltage used. The conductors are maintained in their correct relative position by a series of mounting or spacer insulator blocks having holes therethrough for receiving the conductors in spaced relation. The conductors are connected at their ends to an insulator mounting block, desirably including resilient springs in order to maintain the conductors under tension.

It is essential for the operation of the apparatus that no short circuit be permitted between the charged conductor and remaining conductors. Accordingly, in order to prevent the possibility that the body of an electrocuted insect might be effectively fried upon the insulator block surface and thus substantially decrease the resistance between conductors, the present invention provides an improved design of the insulator blocks and also ring or sleeve members carried by the conductors by which to insure that insects walking on the conductors will be electrocuted at a distance from the blocks rather than immediately adjacent thereto.

Furthermore, in accordance with a preferred construction of the present invention, there is provided at either end of a building, immediately beneath the roof thereof, a generally U-shaped metallic bracket, open upwardly, to which a number of grounded conductors may be attached, desirably by means of resilient spring members in order to maintain the desired tension upon the conductors. Additionally, the bracket is provided with means such as a flat member extending across the upper open portion thereof serving as an anchoring means for an insulator to which is attached an electrified conductor which, in accordance with the present invention, is adapted to be virtually surrounded by the grounded conductors throughout the extent of the apparatus.

Accordingly, it is a principal object of the present invention to disclose a novel electrocution apparatus construction. Further objects and purposes of the invention are to disclose insect electrocution apparatus of the character described wherein a group of conductors extend in parallel relation longitudinally of a building, such conductors being grounded and generally surrounding a parallel conductor adapted to be electrically energized



with high voltage; to disclose apparatus of the character referred to having end bracket support members of novel construction particularly adapted to economically and rigidly support the ends of conductors under tension, and to facilitate retaining the end portions of the conductors in assembled relation with the rafters or similar structural members of a building; to provide in apparatus of the character referred to cylindrical sleeve members adapted to minimize the possibility of an insect's being electrocuted on the surface of insulator members; to disclose, in insect electrocution apparatus, spacer insulator members having surfaces particularly configured to minimize the deposit of short-circuiting material thereon; and for other and additional purposes and objects as will become clear from a study of the following description of a preferred embodiment of the invention taken in connection with the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of portions of the roof rafters and ridge board of a building showing apparatus according to one form of the present invention installed thereon.

Fig. 2 is a view taken along the line II—II of Fig. 1.

Fig. 3 is a plan view on an enlarged scale, looking upwardly of the structure of Fig. 1, modified by the addition of cylindrical sleeve members carried on the conductors.

Fig. 4 is a sectional view taken along the line IV—IV of Fig. 3.

Fig. 5 is a view taken on line V—V of Fig. 4.

Fig. 6 is a fragmentary top plan view, on a small scale and with a central longitudinal portion omitted, of roof and end rafters having the apparatus of the present invention mounted thereon.

Fig. 7 is a sectional view, on an enlarged scale, of the insulating spacer as seen in Fig. 4.

Referring now in detail to Fig. 1 of the drawings there is indicated generally at **10** an upper corner portion of a building structure, the roof proper being omitted for clarity of illustration. Thus the portion of the structure shown includes an end rafter **12**, a ridge board **14** and vertically extending upright support members **16** and **18**. It will be understood that the structural members referred to are illustrative only of one form of conventional building design and in no way are to be taken as limiting the scope of the present invention. The ridge board **14** may extend centrally longitudinally of the building and have fixed thereto a number of roof rafters in accordance with known construction, one of such rafters being indicated at **20**.

Affixed to the end rafter **12** is a conventional transformer **22** adapted to be energized by input leads **24** connected to a suitable source of alternating current **26**. The output of transformer **22** is a relatively high voltage, desirably from about 4,000 to about 5,000 volts, one output lead **26** being grounded at **28**, the other output lead **30** being fastened to the inner surface of the end rafter **12** as by a suitable fastening means **32** and connected electrically as will be described hereinafter.

The group of conductors constituting the electrocution apparatus proper in accordance with the present invention is indicated generally at **34** and includes (see Figs. 5 and 6) a central conductor **36** and a plurality of conductors parallel thereto and angularly spaced thereabout extending from end rafter **12** at one end of the building to end rafter **13** at the opposite end. In the present illustration the group **34** includes four angularly spaced conductors identified as **37**, **38**, **39** and **40**, the latter conductors being desirably evenly spaced about the central conductor **36** at the vertices of a regular polygon, in the present instance a square. Desirably, the sides of the

square are between about ½ inch and ⅝ inch, with each of the outer conductors **37**, **38**, **39** and **40** being spaced from the inner or central conductor **36** by approximately ⅜ inch, although the precise dimensions may be varied somewhat from these figures depending upon the voltage desired to be used.

Throughout the major portion of the length of the conductor group **34** the conductors are maintained in parallel relation as shown in Fig. 6 by a number of spacer members disposed at intervals longitudinally of the conductor group. Two of the spacer members are indicated generally at **42** in Fig. 6 and each consists generally of rigid block of insulating dielectric material such as ceramic or the like having a plurality of openings extending therethrough for receiving the various conductors supported by the block.

As best appears in Figs. 3, 4 and 7, the spacer member **42** includes a pair of parallel faces **43** and **44** and openings for slidably receiving and supporting the conductors extending through the block from one of the faces to the other. Thus there is a central opening **46** and (see Fig. 5) additional openings spaced from the central opening **46** and identified as **47**, **48**, **49** and **50** which receive the respective conductors **37**, **38**, **39** and **40**.

A preferred construction of the openings extending through the block **42** is shown in Fig. 4 and will be best seen in the enlarged view of Fig. 7. As there appears, the opening **46** includes a central cylindrical portion **52** having a diameter only slightly larger than that of the conductor **36** passing therethrough. From either end of the cylindrical portion **52** and extending outwardly to the respective faces **43** and **44** the walls defining the opening **46** diverge outwardly as seen at **54** and **56**, the divergent portions being desirably substantially frusto-conical in configuration. The other openings extending through the spacer block **42** are desirably similarly configured as seen in dotted outline in the case of openings **49** and **50** slidably housing conductors **39** and **40** respectively as seen in Fig. 7.

The configuration of the openings as just described is desirable in minimizing the possibility that the body of a dead insect electrocuted by the present apparatus might become effectively fried on the surface of the spacer **42**, thereby tending to short-circuit the voltage appearing between the central conductor **36** and any of the exterior conductors **37**, **38**, **39** or **40**. Thus, with the construction just described in connection with the spacer block **42**, it is virtually impossible for an insect to be so electrocuted by the apparatus of the present invention that its body would be deposited upon the frusto-conical portions of any of the openings extending through the block **42**, since electrocution would have occurred before the insect could crawl into the opening. Moreover, even if it were possible for an insect to be electrocuted within an opening, it is unlikely, by reason of the relatively large size of the outer openings, that the body of such an insect would be deposited upon the flat surfaces **43** or **44** so as to sufficiently shorten the air gap existing between the charged conductor and the grounded conductors.

In order to mount the group of conductors **34** in a desired relationship immediately beneath the roof of a building or the like, mounting members may be provided having lower portions similar to the blocks **42** just described and including an upwardly projecting leg by which to provide attachment to a roof structural member. Thus in Figs. 1, 3 and 4, the group of conductors **34** is supported from transverse rafter **20** by means of a mounting member indicated generally at **60** having a lower portion indicated generally at **62** corresponding in construction to spacer block **42** previously described, the mounting member including also an upwardly projecting leg **64** which may be provided with an opening for receiving a mounting screw or the like **66** engaging the rafter **20**.

For optimum performance of the structure of the present invention it is desirable that the various conductors be maintained throughout their length in substantially the same relationship as is established by the various mounting or spacer blocks such as **42** and **62** at spaced intervals throughout the length of a building. Thus it becomes necessary to maintain the several conductors under a substantial degree of tension in order to minimize the movement of the conductors which might give rise to a short circuit at points between the spacer and mounting blocks. A preferred form of tension members and mounting means therefor in accordance with the present invention is shown in Figs. 1, 2, 3 and 4. As best appears in Fig. 2, a mounting bracket indicated generally at **70** is attached to the lower surface **71** of structural member **12** by a pair of fastening members **72**. The mounting bracket itself **70** desirably includes a flat portion **74** adapted to extend immediately beneath the rafter **12** and a lower portion indicated generally at **76** formed in generally U-shaped configuration having side walls **77** and **78** connected by a yoke **79**, each of the side walls **77** and **78** including at their upper ends an outwardly turned flange portion **81** and **82** respectively. Openings are formed in the flange portion **81** and **82** to register with similar openings in the flat portion **74** for receiving the fastening elements **72**. The entire bracket **70**, being made of metal, is electrically conductive and is grounded through a lead **84** which is connected at one end to the fastening element **72** and at its other end is connected to the end of the high voltage side of the tranformer which is grounded through the conductor **26**. Thus the entire metal framework constituting the mounting bracket **70** is maintained at ground potential. The base portion **74** of the bracket **70** includes a lip **88** projecting from beneath the rafter **12** and an elongated insulator member indicated generally at **90** and made of dielectric material is attached at one end to the lip **88**, desirably by a fastening element **92** passing through openings or apertures formed in the end portion of the insulator **90** and in the lip **88**. The other end of the insulator member **90** is similarly provided with an aperture extending therethrough and a fastening element **94** serves to attach one end of a tension spring **96** to the end of the insulator member **90**. Desirably, the fastening bolt **94** is long enough to permit the attachment thereto of the end of electrical lead **30** carrying the high voltage electricity from transformer **22**. The other end of spring **96** is connected to the central conductor **36** and thus that conductor is energized electrically by voltage in lead **30**.

The bracket **70** is provided with means for fastening thereto by resilient tension members the grounded conductors among the group of conductors **34**. In accordance with the preferred construction of the present invention the tension members connecting each of the grounded conductors to the frame of the bracket **70** are of metallic construction and hence are themselves electrically conductive. Thus, with particular reference to Fig. 3, metal coil springs **97**, **98**, **99** and **100** are connected to conductors **37**, **38**, **39** and **40** respectively, and are fastened at their other ends to the U-shaped portion **76** of the bracket **70**. Each of the springs includes rounded hook end portions which can either directly engage openings formed in the bracket portion **76**, or can be fastened by metallic fastening elements passing through such openings. It is to be noted that the springs **98** and **99** are fastened at their ends to the side walls **78** and **77** respectively, while springs **97** and **100** are fastened to the yoke portion **79** of the U-shaped bracket. By this configuration the grounded metallic springs are maintained at a sufficiently great distance from the charged conductor **36** and the metallic spring **96** connected thereto to prevent any sparking or arcing over between the charged conductor and spring and any of the grounded conductors and springs.

There may be provided in accordance with the present invention means additional to or in place of the preferred configuration of the openings in the dielectric spacer members for minimizing the possibility that the electrocuted body of an insect might become affixed to the dielectric surface of one of the spacers. Thus, with particular reference to Figs. 4 and 5, cylindrical sleeves **106** and **108** are mounted upon the conductor group **34** adjacent spacer block **42** and mounting block **60** respectively. The sleeves are desirably made of material sufficiently rigid to maintain their cylindrical shapes shown, and may be made of metal since they contact only the grounded conductors **37, 38, 39** and **40**. The sleeves have an inside diameter such that they frictionally contact the grounded conductors, and the sleeves may be easily slid along the conductors when desired. It will be seen that, with the sleeves in place as shown in Figs. 3 and 4, any insect such as a fly attempting to crawl along a conductor into a sleeve will be electrocuted long before arrival at the surface of the blocks **42** or **60**. Since the frictional engagement of the sleeves with the conductors permits them to be easily slid, cleaning of the conductors, sleeves and spacer and mounting blocks is facilitated.

It will thus be seen that the present invention constitutes improvements in electrocution apparatus, particularly in making such apparatus more economical in construction and more foolproof in operation and maintenance. It is to be understood that the specific forms of the invention herein disclosed are illustrative only, and that minor departures therefrom do not avoid the scope of the appended claims.

We claim:

1. In insect electrocution apparatus for mounting beneath and adjacent the roof of a building, in combination: a mounting bracket of rigid, electrically conductive material including a flat base connected to the lower surface of a roof support member and a downwardly offset portion fixed to the base, a plurality of openings being formed in the offset portion adjacent one edge thereof; an elongated rod of dielectric material having one end fastened to said base and projecting parallel thereto; an elongated resilient member connected to the other end of the rod and extending in prolongation thereof; a plurality of elongated resilient, electrically conductive members attached to the bracket by said openings and projecting outwardly from the bracket in approximate parallel relation with the rod and first named resilient member; a mounting block of dielectric material spaced from said bracket and adapted to be fastened to a roof support structure and project downwardly therefrom, the block having a plurality of horizontal openings therethrough disposed at apexes of a regular polygon and an additional opening centrally of the polygon; wires extending through said plurality of openings and connected to the outer ends of said plurality of resilient members; a conductor extending through said additional opening and connected to the first named resilient member; means for electrically grounding said bracket; means for connecting said conductor to a source of high voltage lower than the breakdown voltage between the conductor and wires; and means for maintaining the wires and conductor under tension.

2. The invention as stated in claim 1 wherein said block is provided with a pair of spaced parallel faces.

3. The invention as stated in claim 2 including cylindrical sleeves carried on said wires in circumscribed relation with said polygon, an annular end of each sleeve contacting one of said faces.

4. The invention as stated in claim 1 wherein said openings include substantially cylindrical central portions and outwardly diverging frusto-conical end portions communicating therewith.

5. The invention as stated in claim 4 wherein the portions of the openings are coaxially aligned.

6. Insect electrocution apparatus comprising: a longitudinally extending electrical conductor and plurality of wires; means supporting the wires and conductor in spaced parallel relation with the wires at apexes of a regular polygon and the conductor disposed centrally of the polygon approximately ⅜ of an inch from the wires; means for electrically grounding said wires; and means for electrically charging said conductor with a voltage slightly below the breakdown voltage for the distance between the conductor and wires.

7. The invention as stated in claim 6 wherein said supporting means includes a rigid member of dielectric material provided with a plurality of openings extending therethrough for receiving said conductor and wires.

8. The invention as stated in claim 7 wherein said openings include substantially cylindrical central portions and outwardly diverging frusto-conical end portions communicating therewith.

9. The invention as stated in claim 7 wherein said openings include central portions of diameters slightly larger than the respective wires and conductor received therein, and outer portions having cross-sectional dimensions substantially greater than said diameters.

10. The invention as stated in claim 9 wherein said rigid member is provided with a pair of spaced parallel faces and including cylindrical sleeves carried on said wires in circumscribed relation with said polygon, an annular end of each sleeve contacting one of said faces.

11. The invention as stated in claim 7 wherein said rigid member is provided with a pair of spaced parallel faces and including cylindrical sleeves carried on said wires in circumscribed relation with said polygon, an annular end of each sleeve contacting one of said faces.

12. In an insect electrocution apparatus including a conductor adapted to be connected to a high voltage source and a plurality of grounded wires parallel to the conductor and equally spaced therefrom and disposed around the conductor at substantially equal angular intervals and an insulator block of dielectric material having openings therethrough for receiving and so supporting the conductor and wires, the provision of a hollow cylindrical sleeve supported by said wires in circumscribed relation, one end of the sleeve being juxtaposed with a face of the insulator block.

13. In an insect eelctrocution apparatus including an insulator support block of dielectric material provided with parallel faces and a plurality of openings formed therethrough substantially defining apexes of a regular polygon and an opening disposed centrally of the polygon, a conductor connectable to a high voltage source extending through the central opening and supported therein and grounded wires extending through said plurality of openings and supported therein, the provision of a hollow cylindrical sleeve supported by said wires and abuttable against a face of said block.

14. In insect electrocution apparatus for mounting beneath and adjacent the roof of a building, in combination: a mounting bracket of rigid, electrically conductive material including a U-shaped portion attached to a roof support member and projecting downwardly therefrom; a plurality of wires connected to spaced points along an edge of said U-shaped portion; means spaced from said bracket for maintaining said wires substantially at apexes of a regular polygon; means for electrically grounding said bracket; and an electrically charged conductor disposed virtually at the center of said polygon, the polygon being of such size that the conductor is spaced from said wires by not more than about ½ inch, and the voltage charging the conductor being slightly below the breakdown value for the spacing between conductor and wires.

15. Insect electrocution apparatus comprising: a longitudinally extending electrical conductor and plurality of wires; means supporting the wires and conductor in spaced parallel relation with the wires at apexes of a regular polygon and the conductor disposed centrally of

the polygon and spaced from the wires by a distance greater than the breakdown distance for the voltage used, but close enough that an insect such as a fly on a wire or the conductor will effectively shorten the gap between a wire and the conductor to permit a flow of electrocution current for a short period; means for electrically grounding said wires; and means for electrically charging said conductor with a voltage slightly below the breakdown voltage for the distance between the conductor and wires.



No references cited.