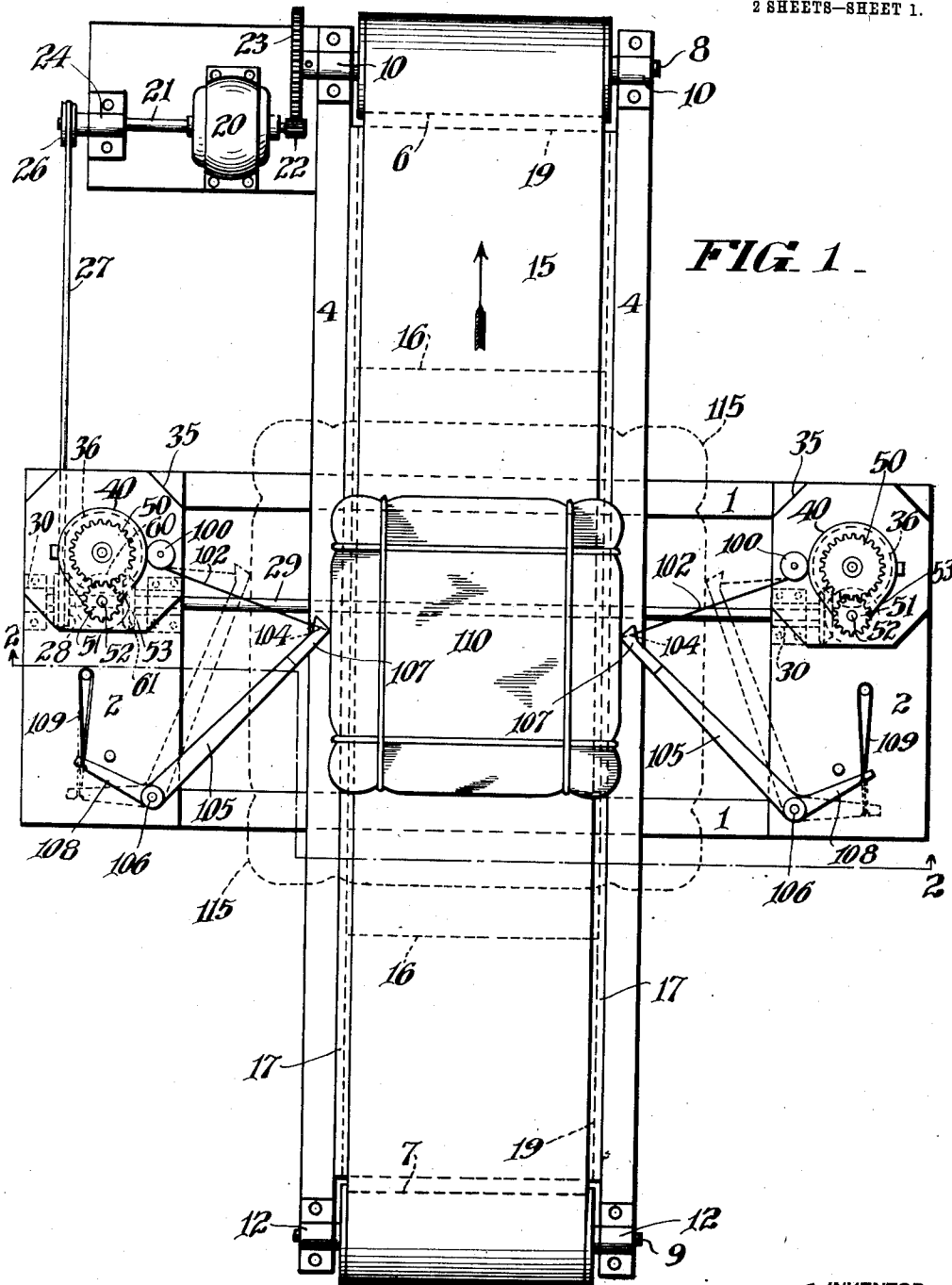


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ELECTRICAL APPARATUS FOR DESTROYING INSECTS.
APPLICATION FILED AUG. 22, 1911.

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ELECTRICAL APPARATUS FOR DESTROYING INSECTS.

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To all whom it may concern:

Be it known that I, FRANKLIN S. SMITH, a citizen of the United States, residing in Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Electrical Apparatus for Destroying Insects, of which the following is a specification.

My invention relates to improvements in apparatus for destroying insects, their eggs, larvæ or pupæ by the action thereon of electrical discharges and currents.

In practical application my invention is employed for the sterilization of various articles of commerce, such as clothing, tobacco, cereals and foods of various kinds; that is, for the destruction of such insects, their eggs, larvæ or pupæ as may infest such articles.

One of the objects of my invention is to provide a machine or apparatus which is capable of adapting itself to bales and packages of articles of different sizes and shapes whereby a single machine or apparatus may be employed for treating packages and bales of different shapes or configuration and sizes.

Other objects and advantages of my invention will be specifically referred to hereinafter or will be apparent from the description of my invention.

One form of a convenient embodiment of my invention is illustrated in the accompanying drawings forming a part of this specification but it will be understood that changes in the details of construction and the relative arrangement of the parts may be made within the scope of the claims, without departing from my said invention.

In the drawings,—Figure 1 is a top plan view of a machine embodying my invention; Fig. 2 is a transverse section thereof on the line 2—2 of Fig. 1; Fig. 3 is a longitudinal section of the distributing mechanism showing details of construction; Fig. 4 is a transverse section of the distributing mechanism taken on the line 4—4 of Fig. 3; and Fig. 5 is a horizontal section of a casing containing a coiled spring and showing the said spring and a conducting wire connected thereto.

Referring to the drawings, 1 designates portions of the frame consisting of wooden bars or members which are arranged in parallel relation to each other and the opposite ends of which are wider than the intermediate portions thereof as is shown in Fig. 2 of

the drawings. The opposite ends of the members 1 of the frames are connected together by means of cross members 2 of plank or other suitable material extending across the top edges thereof and the cross members 3 of similar material extending across the bottom edges thereof at their opposite ends.

4 designates side members of an additional part of the frame structure. The members 4 extend substantially at right angles across the members 1 and are seated in slots or notches 5 in the said members 1.

Preferably the members 1 and 4 of the frame structure are so secured together that they may be readily separated for the purpose of facilitating transportation thereof. The parts 1 and 4 of the frame structure should be of wood or any other suitable non-conducting material. It should be understood also that the construction of the frame of the machine may be varied to suit the convenience of the manufacturer, as my invention is not limited to any particular or specific construction of frame.

Rollers 6 and 7 are provided at the opposite ends of the frame members 4 and are supported upon shafts 8 and 9 which are journaled in bearings 10 and 12 secured upon the opposite ends of the said members 4. A conveyer 15 of non-conducting material is supported upon the rollers 6 and 7.

Although I have shown single rollers only at the opposite ends of the members 4 for supporting the conveyer 15 it will be understood that the construction of means for supporting and causing traveling movement of a conveyer 15 may be varied to suit the will and convenience of the manufacturer and for the purpose of meeting the different conditions which may be presented.

For the purpose of supporting the central portion of the upper part of the conveyer 15 I have provided a relatively thick plate of glass 16 which is supported at its opposite side edges upon the upper edges of the parts or members 17 which are of wood or of some other suitable non-conducting material. The parts 17 are secured to and supported upon the members 4 of the frame structure of the machine. The upper edges of the parts 17 are rabbeted as indicated at 18 to form shoulders on which the side edges of the glass plate 16 are supported. It will be apparent that a load upon the upper side of the conveyer 15 would cause sagging thereof at its central portion between the supporting

rollers 6 and 7 at its opposite ends were it not for the presence of the glass plate 16. I have also provided supports 19 of wood or any other suitable material which rest upon the upper edges of the parts 17 and which are located between the opposite ends of the glass plate 16 and the rollers 6 and 7 located at the opposite ends of the members 4. These supports 19 are preferable in order to prevent altogether the sagging of the conveyer 15 beyond the ends of the glass plate 16, yet such parts may be omitted and are not essential parts or elements of my invention.

Revolution of the rollers 6 and 7 to cause a traveling movement of the conveyer 15 may be effected by any suitable means. As a means for that purpose I have provided a motor 20 having a shaft 21. Upon one end of the said shaft I provide a pinion 22 which engages a gear 23 upon the shaft 8 upon which the roller 6 is supported. The shaft 21 on the side of the motor 20 opposite the pinion 22 is journaled in a bearing 24 and is provided with a driving wheel 26 upon which is located a driving belt 27. The said driving belt passes over a wheel 28 upon one end of a shaft 29 which extends across the machine or apparatus substantially at right angles to the members 4 of the frame structure and at right angles to the length of the conveyer 15. The belt 27 is driven by the driving wheel 26 and it in turn drives the wheel 28 and the shaft 29. The shaft 29 is journaled in bearings 30 secured to the cross members or planks 3 connected to the lower edges of the members 1 of the frame structure.

At the opposite ends of the shaft 29 I have provided certain mechanism for causing electrical discharges across a field located above the conveyer 15. This mechanism is duplicated at each end of the shaft, that is at each end of the frame members 1 of the structure. Referring to the said mechanism 35 designates relatively thick blocks of non-conducting material such as fiber which are secured to the cross members or planks 2 which are secured to the upper edges of the members 1 of the frame structure.

36 designates cylindrical members of suitable non-conducting material such as porcelain, the lower ends of which are seated in circular grooves 37 in the blocks 35. The upper ends of the said cylindrical members are closed by the closures or heads 40 consisting of suitable non-conducting material, such as fiber. These heads or closures are provided with circular depressions or grooves 41 in which the upper edges of the walls of the hollow cylindrical members 36 are secured.

Situated centrally and extending longitudinally of the respective cylinders 36 are

shafts 45 which are supported upon the base blocks 35. The lower ends of the said shafts are provided with reduced end portions 46 which are located in seats or sockets 47 formed in the said base blocks 35. The upper ends of the said shafts project through holes 48 formed in the closures or heads 40 of the said cylindrical members 36. Although the members 36 are shown as cylindrical, yet they may be of any other shape or contour in cross section.

50 designates gears secured to the upper ends of the shafts 48 which gears are meshed with pinions 51 secured upon the upper ends of shafts 52. The said shafts 52 are supported at their upper ends in bearings formed in projecting portions 53 of the closures or heads 40. The lower end portions of the shafts 52 project through holes 54 formed in the base blocks or members 35 and also holes formed through plugs 55 which are secured in the cross-members 2. The lower ends of the shafts 52 are provided with beveled gears 60 which are meshed with beveled pinions 61 upon the shaft 29. The said shafts 52 are supported against longitudinal movement by the sleeves of the gears 51 which rest against the top sides of the projecting portions 53 of the heads or closures 40. The said shafts are also supported against longitudinal movement by the engagement of the gears 60 with the pinions 61.

It is apparent that revolution of the shaft 29 causes revolution through the connecting gears 61, 60, 51 and 50 of the two shafts 45. I have secured upon the shafts 45 a series of disks 69 consisting of fiber or any other suitable non-conducting material. In the construction illustrated I have shown forty four disks upon each shaft divided into four groups, each of which contains eleven disks. The number of disks may be increased if desired either with or without an increase in the number of groups. For convenience of description I designate these groups from the top downwardly as 70, 71, 72 and 73.

Preferably the disks in each group are connected together by means of fiber pins or pins of other suitable non-conducting material and the said groups are forced tightly upon the shafts 45 and when in proper position are preferably secured in such position by means of fiber pins or pins of other suitable non-conducting material which extend transversely through the shafts 45 and through the respective groups of disks. As illustrated in Fig. 3, of the drawings the groups of disks are separated from each other by intervals of considerable length relatively considered, but it should be understood that this is merely for the purpose of illustration and description and that as a matter of fact the several groups are situated as near together as it is practicable to place them. The uppermost disk in each of

the groups is provided with a contact member 75, as illustrated in Figs. 3 and 4 of the drawings. Each alternate disk, counting from the uppermost or topmost disk, is also provided with a contact member 75 so that in the construction shown in which each group consists of eleven disks, six of them are provided with contact members 75. A disk having no contact member is interposed between the alternate disks having contacts thereon. As shown in Fig. 3 the right hand end of the first contact member is in alinement with the left hand end of the second contact member, while the right hand end of the second contact member is in alinement with the left hand end of the next succeeding contact member and so on for all of the said members until finally the right hand end of the last contact member (as indicated at 77) is in alinement with the left hand end of the first contact member of the topmost disk of each group. Circularly considered the combined length of the contact members of each group is equal to the circumference of the cylinder formed by the disks. It will be seen, therefore, that each contact member is of a length equal to one-sixth of the circumference of the said cylinder. Secured to the said shafts in proximity to or in contact with the respective groups of disks 70, 71, 72 and 73 are metallic contact rings 80. These rings are secured to the shaft 45 by means of screws 81. The contact rings 80 are connected respectively to the contacts 75 which are secured upon the group of disks with which the said contact rings are respectively associated. The connection between any ring and its associated group of contacts is made by a wire 84 which extends from the said ring to the several contacts as is indicated in dotted lines in Fig. 4, of the drawings.

85 designates conductors which extend from separate sources (not shown) of high tension electrical energy, the ends of which conductors are connected to terminals 86 by means of binding screws 87. The said terminals have screw threaded connection with and project through the cylindrical members 36, as is shown in the drawings. The inner end portions of the said plugs are provided with holes or recesses in which pins 89 are provided and which are pressed toward the axes of the cylindrical members 36 by means of spring 90. The inner ends of the said spring-pressed pins 89 are in contact with the contact rings 80.

The contact rings 80 may, of course, be changed to positions upon the opposite sides of the groups of disks from those shown.

It will be understood that the ends of the conductors at opposite sides of the machine are positive and negative respectively.

95 designates pins which are seated in thimbles 96 which are secured in the walls

of the cylindrical members 36. The said pins are pressed inwardly by means of springs 97 and are so located in the respective groups corresponding to the groups of disks 70, 71, 72 and 73 that they are in contact with the alternate disks upon which the contacts 75 are secured. This is clearly shown in Fig. 3 of the drawing. The said pins have electrical communication with coiled springs 99 which are located in revolvable boxes or cases 100, the sides of which are extended beyond the circular inclosing edges thereof so as to form flanges 101 between which conducting wires 102 are wound. The said conducting wires are connected, as indicated at 103, to the coiled spring 99. It will be seen, therefore, that there is electrical connection from the conductors 102 to the respective spring pressed pins 95 with which they are associated. The outer ends of the conductors 102 are connected to electrodes or terminals 104 which are secured in the outer ends of the levers 105 pivoted upon upright supports 106. These levers consist of a main or body portion of wood or fiber which is tipped with some suitable material 107, such as porcelain, in which the electrodes 104 are secured. It is necessary to form the ends of the levers 105 of some such non-conducting material as porcelain because of the fact that wood or fiber carbonizes and in a comparatively short time loses its qualities of non-conductivity.

The pivoted ends of the levers are provided with extensions or arms 108 which are engaged by elastic spring bands 109 of suitable material which hold the inner ends of the said levers 105 at all times in their innermost positions. In Figs. 1 and 2 of the drawings I have illustrated in full lines, a bale of tobacco, 110, against the opposite sides of which the inner ends of the levers 105 are in contact by reason of the fact that each of them is actuated by an independent actuating device 109. The inner end of each of the said levers follows closely the contour of the surface of the bale with which it contacts so that the electrode in such lever is at all times in substantially the same position with respect to the bale or package of tobacco or other object which is being treated. Also by reason of the fact that the levers 105 are pivoted and held inwardly by the action of springs, bales or packages of different sizes may be treated. This is illustrated in Fig. 1 in which bale 115 is shown in dotted lines which is very much larger than the bale 110 which is shown in full lines. The positions of the levers 105 when the larger bale is being treated are illustrated in dotted lines in said Fig. 1. It should be understood that the construction of means for holding the arms or levers 105 inwardly may be varied as desired. In other words,

I do not limit myself to any specific construction or form of spring or elastic means or other actuating device for holding the arms in yielding position toward the longitudinal center of the machine.

Each of the several groups of disks and the mechanism connected thereto and associated therewith operates independently of every other such group. Furthermore by reason of the fact that the ends of the pins 95 are of considerable width each succeeding contact 75 on the disks is in contact with a pin before the first preceding contact member passes out of contact with its co-operating and co-acting contact pin. By this means there are no intervals between the sparks or discharges between the terminals but on the contrary there are at all times electrical sparks or discharges passing through the space between the terminals and electrodes 104 so that no part of the article whatever can pass between the said terminals without being subjected to the action of such discharges. In a machine of this character a considerable proportion of the discharge takes place and is manifested in the form of an effluve and I depend upon this as well as the discharges of other characters for destroying the insects, their eggs, larvæ or pupæ which may infest the articles treated.

In the operation of my machine, electrical discharges are caused to take place between the terminals or electrodes 104 which are secured in the porcelain ends of the levers 105. The articles to be treated are placed upon the conveyer 15 and are conveyed between the said electrodes. The levers carrying the said electrodes yield to permit bales or packages of different sizes to pass between the said electrodes. As the articles, either in bales or packages or whatever other form in which they may be presented, are passed between the said electrodes the electrical discharges pass therethrough reaching and acting upon every part thereof whereby all the various insects, their eggs, larvæ or pupæ which may be present in such packages are destroyed.

The broad invention disclosed herein and not claimed is claimed in my co-pending application filed March 13th, 1911, Serial No. 614,183.

Having thus described my invention I claim:

1. In an electrical apparatus for destroying insects, their eggs, larvæ or pupæ, the combination of separate sources of electrical energy, a plurality of pairs of groups of electrodes, oppositely disposed with respect to each other and means for electrically connecting successively each pair of opposed electrodes in each pair of opposed groups with a pre-determined one of said sources of electrical energy.

2. In an electrical apparatus for destroying insects, their eggs, larvæ or pupæ, the combination of separate sources of high tension electrical energy, a plurality of groups of contacts oppositely disposed with respect to each other, means for connecting the said separate sources of electrical energy to said opposed groups of contacts, a plurality of groups of electrodes interposed between the said plurality of groups of oppositely disposed contacts, and means for successively electrically connecting the said electrodes of the several groups to the contacts in the groups with which the said groups of electrodes are respectively associated.

3. In an apparatus of the character described, the combination of a source of electrical energy, groups of oppositely disposed electrodes, means for supporting the said electrodes pivotally in yielding position, means for successively connecting the said terminals in the said groups with the said source of electrical energy and means for supporting articles between the said groups of electrodes whereby they may be subjected to the action of the electrical discharges between the said electrodes.

4. In an apparatus of the character described, the combination of a source of electrical energy, groups of oppositely disposed electrodes, means for yieldingly supporting the said electrodes, means for successively electrically connecting the said electrodes of the respective groups with the said source of electrical energy and means for supporting articles between the said groups of electrodes, the said electrodes yielding to permit articles of different and varying sizes and configurations to be placed between the same.

5. In an apparatus of the character described, a combination of a source of electrical energy, groups of oppositely disposed electrodes, pivoted arms upon which the said electrodes are carried, means for actuating the said arms about their pivots to hold their inner ends in position to contact with the article being treated, means for successively connecting the said electrodes in the said groups with the source of electrical energy, and means for conveying articles between the said groups of electrodes and in contact with the yielding arms upon which the said electrodes are supported.

6. In an apparatus of the character described, the combination of separate sources of electrical energy, a plurality of pairs of groups of oppositely disposed electrodes, the electrodes in each pair of groups and the source of electrical energy supplying the same being electrically independent of every other pair of groups and the source of electrical energy supplying the same, means for successively electrically connecting oppo-

sitely disposed pairs of electrodes in the respective pairs of groups with the respective sources of electrical energy associated therewith, the said means including a plurality of contacts spirally arranged, and the revoluble member upon which the said contacts are supported and contact pins for successively contacting with said contact members, and means for conveying articles between the said electrodes to be acted upon thereby.

7. In an apparatus of the character described, the combination of a plurality of groups of contact members, those in each group being spirally arranged and extending around a complete circle and the said members in each group being also electrically connected and having connection with

separate sources of electrical energy, oppositely disposed pairs of groups of electrodes, the said pairs of groups being respectively associated with oppositely disposed groups of said contact members, means for successively connecting pairs of electrodes to successive contact members in the said respective groups, and means for conveying articles between the said electrodes to be treated by the electrical discharges between the same.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 21st day of August, A. D. 1911.

FRANKLIN S. SMITH.

In the presence of—

CARRIE E. KLEINFELDER,
GEO. H. WEIDNER.