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1,684,491

R. H. HOYT
ELECTROSTATIC CONDENSER

Filed June 14, 1926

Fig. 1.

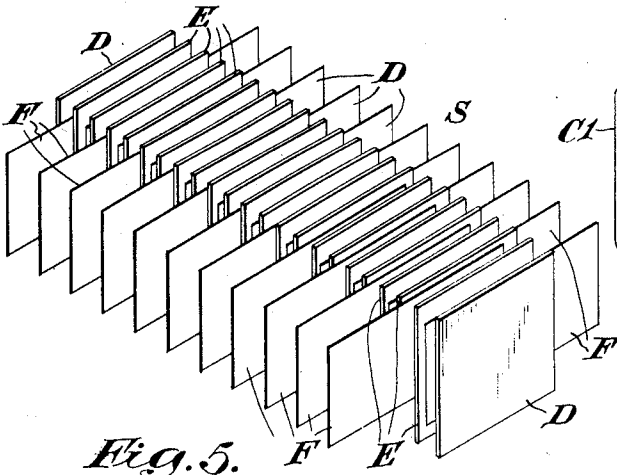


Fig. 2.

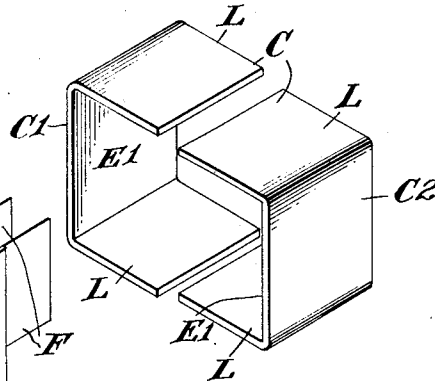


Fig. 5.

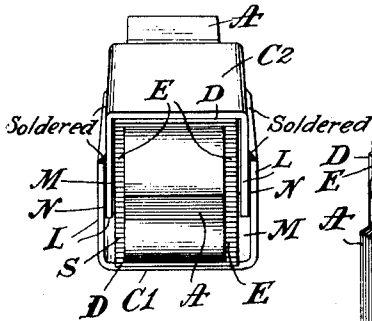


Fig. 3.

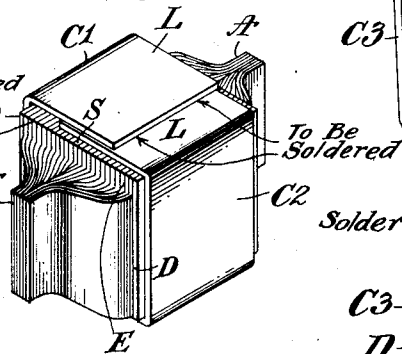


Fig. 6.

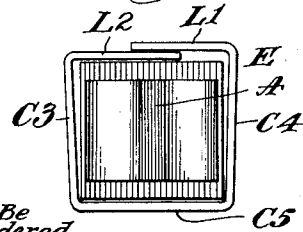


Fig. 7.

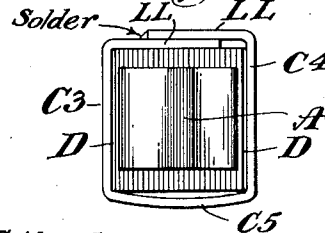
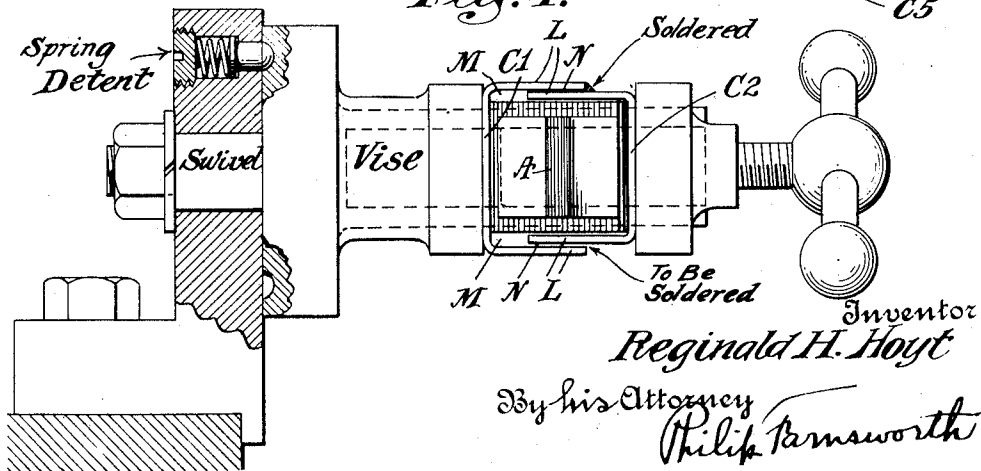


Fig. 4.



By his Attorney
Philip Barnsworth

UNITED STATES PATENT OFFICE.

REGINALD HUNTER HOYT, OF ROSLINDALE, MASSACHUSETTS, ASSIGNOR TO WIRELESS SPECIALTY APPARATUS COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF NEW YORK.

ELECTROSTATIC CONDENSER.

Application filed June 14, 1926. Serial No. 115,863.

This invention relates to electrostatic condensers.

Its object is to improve the construction at low cost.

The invention consists of the process and product hereafter described in connection with the drawings, of which

Fig. 1 is an exploded perspective view of the condenser stack showing the stacked foils, and micas and the foil bunches projecting from opposite sides of the stack;

Fig. 2 is a perspective of a pair of telescoping open-sided U-shaped clamps;

Fig. 3 is a perspective view of the stack of Fig. 1 with the clamps of Fig. 2 telescoped in place;

Fig. 4 illustrates the process of initially putting the condenser stack under desired compression and in maintaining such compression permanently by fusing together the pair of clamping-members of Fig. 1 in their telescoping relation of desired stack compression;

Fig. 5 is a perspective view of the completed permanently clamped condenser removed from the processing apparatus of Fig. 1; and

Figs. 6 and 7 are side elevations as in Fig. 4 of the condenser of Fig. 1, but showing a modified form of telescoping clamp fused in permanent stack-compressing condition.

The nature of the condenser, in the form at present preferred, is shown in exploded perspective in Fig. 1, wherein there are alternating dielectric sheets E and armature sheets F together constituting a stack S. Preferably sheets E are of micas and sheets F of metal foil as lead or tin. Successive foils F are of opposite polarity and are separated from one another by a mica sheet E, and they project from opposite sides of stack S. At the ends of the stack are insulating end plates D of somewhat thicker mica dielectric than sheets E.

The two simple members of the clamping system C of stack S are shown in Fig. 2, each (C^1 and C^2) being a U-shaped sheet of soft brass. These are almost duplicates but the main portion of C^1 is longer than the main portion of C^2 so that the legs of C^2 can telescope (as hereinafter described in detail) inside of the legs of C^1 as shown in Fig. 3.

In Fig. 3 the elements (foil-bunches) A, D and E are shown as they actually exist after

being stacked together and the foils of each of the oppositely poled foil-bunches A are soldered together at their ends. As yet, however, the stack S is not under compression, altho the clamping members of Fig. 2 have been applied to the stack.

This invention is particularly adapted to be useful with the common little condensers comprising a comparatively short stack of a few sheets of foils and micas for service at low potential and low current altho permissively at high frequency as in radio. Such condensers usually are put in a cheap case, with suitable terminals connected with the foil-bunches of the stack, and projecting out of the casing for connection suitably in circuit as desired. Such condensers are of very low sales prices and it is especially desirable to keep down the cost; but it is important, even in such condensers, to clamp the stack effectively so as to maintain the capacity as constant as may be. This invention is valuable in its simplicity involving the necessary low production costs of material and labor while providing an effective permanent clamp.

All that is necessary is to apply the telescoping U-clamps as in Fig. 3 and then solder their joints on by the process of Fig. 4 resulting in the product of Fig. 5.

No particular casing means is required, but the ends of the stack S are left exposed from the two U-clamps C^1 , C^2 , and the unit consisting of stack and clamp is ready for use altho as suggested above it may be placed in any convenient or suitable casing with or without an insulating embedment.

In Fig. 3 the insulating end plates D of stack S are engaged by the inside faces of the main portions E^1 (Fig. 2) of the two U-clamps, which are open at their sides to permit free extension of foil-bunches A which project from the condenser stack.

As shown in Fig. 3 the legs of the two U-members overlap one another. This may be to a greater or less extent, depending on the length of the stack between its end plates D; thereby standard clamps, produced in large quantity by a given automatic stamping press, can be employed for stacks of varying length. In any case, however, the legs L of each of the pair of clamping members are long enough so that they overlap so as to permit useful results of the soldering operation of Fig. 4; also said legs L of inner clamping

member C^2 are short enough so that in the positions (Fig. 3) of their initial application to the stack, they do not extend to the main body of the outside clamping member C^1 ; thus such legs are free to move further when the stack with applied clamp of Fig. 3 is put under compression in the swiveled vise in Fig. 4.

In Figs. 4-5 is illustrated the fact that there may be a slight clearance N between the overlapping portions of the legs L of the pair of clamps; this indicating that there is no need of close working fits at these portions of the clamps, which lie on the sides of stack S , said sides not being under compression; the clamping being effective only at the stack-ends, and by the main bodies of the clamps C^1 , C^2 , and not by their legs.

Under the above conditions, and without any special care or pains involving expensive time, labor or materials, the little condenser with clamps applied as in Fig. 3, is placed under compression in the swivel vise of Fig. 4. All that is advisable, for convenient soldering, is that a pair of overlapping adjacent legs of the pair of clamps be located in the vise so that it will lie in a horizontal plane, as shown in Fig. 4. With the stack and its clamp in that portion in the vise and while they are under end compression in the vise, the soldering is effected as shown in Fig. 4, i. e., the end of one leg L of the outer telescoping U-member C^1 is soldered to the outer surface of the adjacent leg L of the inner telescoping U-member C^2 , such soldering extending (Fig. 5) from one edge of both legs clear across to the opposite edge.

While no particular form of apparatus for holding the product under compression during soldering is necessary, yet the process is best effected in some sort of swivel vise as that shown, because the process leads itself to successive solderings of both pairs of adjacent clamp-legs without releasing the product from the compression during the entire processing between Figs. 3 and 5. Thus, after the soldering shown in Fig. 4 has been completed (on one pair of adjacent legs), the vise is turned one hundred and eighty degrees, carrying with it the now partially clamped condenser, so that the as yet unsoldered joint at the bottom in Fig. 4 is moved to the top thereby permitting convenient soldering at the second and last joint, i. e., convenient in the sense of having the cooperation of gravity instead of the reverse. While no particular design of apparatus is necessary, therefore, it is a useful feature of the process, in addition to other features, to maintain the temporary compression of the stack until both joints are soldered, i. e., not to release the processing compression after only one of the two joints is soldered. While it might be possible to do the latter without injury, (because it is not necessary to apply any very high degree of

compression) yet the same would tend to injure the joint already soldered and might actually injure it in many instances, whereas an object of the invention is to produce a perfect condenser even altho the cost be low.

Any other of the various well-known forms of fusing may be employed; but I have found that simple, ordinary soldering is efficacious, and that no more expensive clamping means, clamping pressure or apparatus is needed to maintain permanent compression on the stack than the single, open-sided, telescoping U-clamps of soft brass, with the two joints soldered as shown completed in Fig. 5. It may seem surprising that such soldered joints are sufficient to maintain such compression against the expansive tendency of the compressed stack to break the soldered joint; but the result of actual commercial production in accordance with the invention as above are so good that the constructor is advised to do as above; these good results being due, apparently, to the design of the clamping members adapting them to be retained permanently in compressing relation with the stack by nothing but the soldering of the joints as above.

It is to be noted that in addition to the permissive clearance N between adjacent clamp legs, thereby avoiding accurate fitting, the same is the fact as between the inside of the legs of the inner telescoping clamp C^2 and the edges of micas E at those sides of the stack from which the foil-bunches do not project, as indicated by the clearance M , Figs. 4-5. That is, no special care is needed as to exact uniformity of dimensions of either clamp-member or of the widths of micas E . The six faces of the completed condenser are divided into three pairs, each pair having opposite faces; thus, the two opposite end stack-faces are engaged by the main bodies or intermediate portions C^1 , C^2 of the two clamps, the two opposite faces from which the foil-bunches A of opposite polarity project are left entirely free of the clamps owing to the open-sided character of the entire clamping system C , and the other two opposite faces of the stack of micas E are paralleled by the four legs L of the two clamps which exist solely for the purpose of permitting the two clamps to be held together by the soldering in their permanent compressing relation with the stack, the face-relation of the mica edges and the legs of each clamping member being immaterial (there may be spaces M between them) provided only that the legs can telescope on the stack so as to put it under compression and can be fused together while in compressing relation with the stack so as to maintain the desired compression permanently.

The above is the preferred form of the invention and possesses the advantages that the clamping system is the same shape as the mica stack and does not tend to bend over the outer

edges of the micas; also after the fusing is effected there is no reduction of the compression on the stack. But Figs. 6-7 show a modification having some advantages of the preferred form. There the telescoping clamp is in a single piece and only the two ends L^1 , L^2 telescope with one another. Fig. 6 shows such a clamp applied to a sheet stack like that of Fig. 1, in readiness to be put under compression in process as in Fig. 4, when the end of outer leg L^1 is to be soldered to the surface of the inner leg L^2 , as shown effected in Fig. 7. The sides C^3 , C^4 of this single-piece clamp correspond with the main bodies or bases C^1 , C^2 of the clamping members of Fig. 2, and it is their inner faces which engage stack end-plates D (Fig. 7) to put the stack under compression. In processing the device of Fig. 6 in the vise of Fig. 4, however, there is no telescoping of two members at the part C^5 of the one-piece clamp; yet the clamping system must yield somehow to the compression, and that is (Fig. 7) via outward bowing of clamp-portion C^5 which in some cases may not be too seriously disadvantageous. This modification does not permit such a weak clamp structure as the clamps (soft brass) of Fig. 2, and the single piece clamp should be such as to retain the bow in C^5 permanently so that when released from the vise, portion C^5 will not straighten out more or less and thereby release the stack from the desired compression to any material degree. To that end the one-piece clamp of Figs. 6-7 may be made of thicker material, or of any of the various well-known metals or metallic alloys having greater stiffness than the soft brass of the clamps of Fig. 2, or both thicker or stiffer. Or, if the inside dimension of clamp-portion C^5 were exactly the length of the stack when compressed as desired, and if legs C^3 , C^4 were in position sufficiently far apart initially to permit insertion of the uncompressed clamp, then soft brass might be used for the one-piece clamp and there might be no bowing of portion C^5 ; but these considerations illustrate the fact that the form of clamping system of Fig. 1, is greatly to be preferred.

The words fused and fusing are employed herein in their ordinary technical significance to include soldering, welding, brazing, etc.

I particularly point out and distinctly claim the part, improvement, or combination which I claim as may invention or discovery, as follows:—

1. A clamped sheet-stack condenser comprising a foil-stack and two U-shaped metal clamping members extending around the end faces and two side faces of the stack, the foil-sheets projecting beyond the stack and beyond the clamping members from the remaining two opposite side faces of the stack; the

intermediate portions of the U-shaped clamping members engaging the end faces of the stack; the end legs of the clamping members telescoping one another at those opposite side faces of the stack from which the foil-sheets do not project; and the ends of the outside end legs of the clamping members being soldered to the surfaces of the inside end legs; the intermediate portions of the U-shaped clamping members being spaced apart in positions holding the stack under end-to-end compression, and said soldering holding said intermediate portions in their clamping relations to the end faces of the stack.

2. A clamped sheet-stack condenser comprising a stack of dielectrics and armatures and a metal clamping means extending around the end faces and two side faces of the stack, the armatures projecting beyond the stack and beyond the clamping members from the remaining two opposite side faces of the stack; said clamping means having at a side face of the stack from which the armatures do not project, two overlapping ends and adjacent thereto two clamping portions engaging the end faces of the stack; and said overlapping ends being fused together; the clamp-portions which engage the end faces of the stack being spaced apart in positions holding the stack under end-to-end compression and said fusing holding said clamp-portions in their clamping relation to the end faces of the stack.

3. A clamped sheet-stack condenser comprising a stack of dielectrics and armatures and two U-shaped metal clamping members extending around the end faces and two side faces of the stack, the armatures projecting beyond the stack and beyond the clamping members from the remaining two opposite side faces of the stack; the intermediate portions of the U-shaped clamping members engaging the end faces of the stack; the end legs of the clamping members telescoping one another at those opposite side faces of the stack from which the foil-sheets do not project; and the telescoping end legs of the clamping members being fused together; the intermediate portions of the U-shaped clamping members being spaced apart in positions holding the stack under end-to-end compression, and said fusing holding said intermediate portions in their clamping relations to the end faces of the stack.

4. A clamped sheet-stack condenser comprising a stack and a metal clamping means extending around the end faces and two side faces thereof, the armatures projecting from the stack beyond the clamping means; and said clamping means having, at a side face of the stack from which the armatures do not project, two overlapping ends and adjacent thereto two clamping portions engag-

ing the end faces of the stack; said overlapping ends being fused together and holding said clamping portions in clamping relation with the stack.

- 5 5. Clamping means for a condenser stack which comprises two U-shaped metal clamping members the ends of which telescope one another at opposite side faces of the stack, the portions of each member which are intermediate their telescoping ends being adapted for clamping engagement with the end faces of the stack; the openings between the telescoping portions of said members being adapted to leave the corresponding side faces
10 of the stack exposed; and the telescoping ends at opposite side faces of the stack being fused together and thereby holding the intermedi-

ate clamping portions in clamping relation with the end faces of the stack.

6. In combination with a condenser stack, 20 a band-shaped metal clamp extending around the opposite end faces and two of the four side faces of the stack leaving the other two side stack-faces exposed; said clamp having at least two mutually overlapping ends located at one side face of the stack, said overlapping ends being fused together holding the two clamping faces of the clamp in clamping relation with the end faces of the stack to which said clamping faces are adjacent. 25 30

In testimony whereof I hereunto affix my signature.

REGINALD HUNTER HOYT.