Sept. 10, 1963 M. T. PHELPS 3,103,398

DOOR HINGE FOR ELECTRICAL CONNECTION

Filed Aug. 16, 1960 2 Sheets-Sheet 1

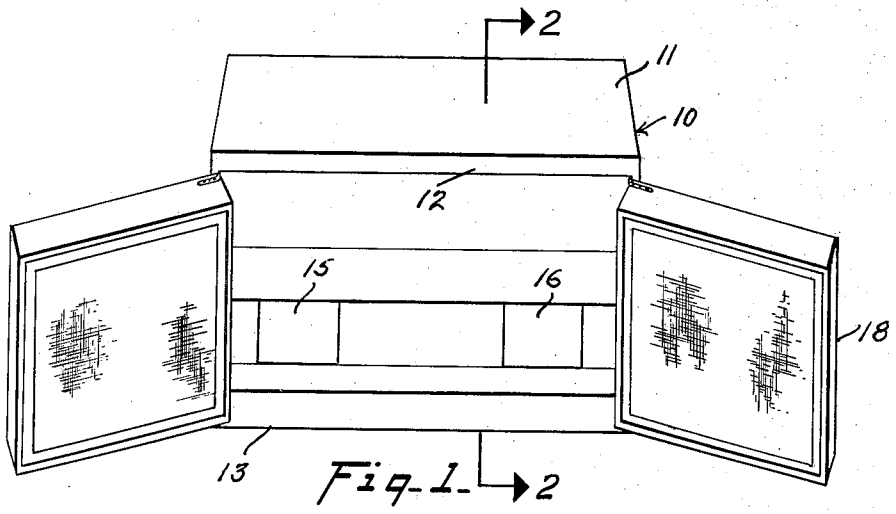


Fig. 1

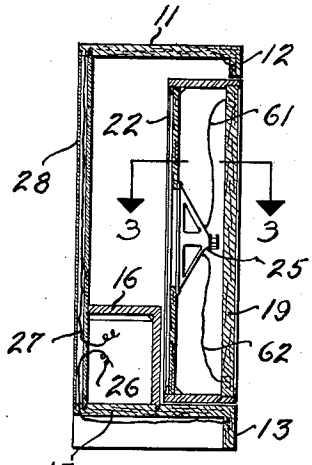


Fig. 2

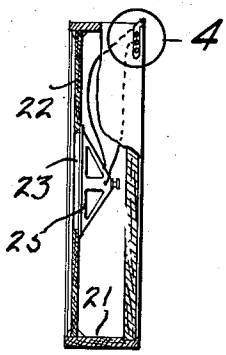


Fig. 3

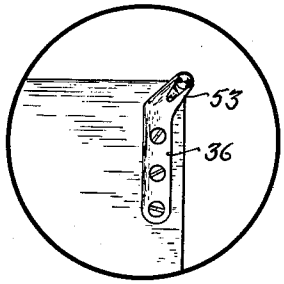


Fig. 4

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Sept. 10, 1963 M. T. PHELPS 3,103,398

DOOR HINGE FOR ELECTRICAL CONNECTION

Filed Aug. 16, 1960 2 Sheets-Sheet 2

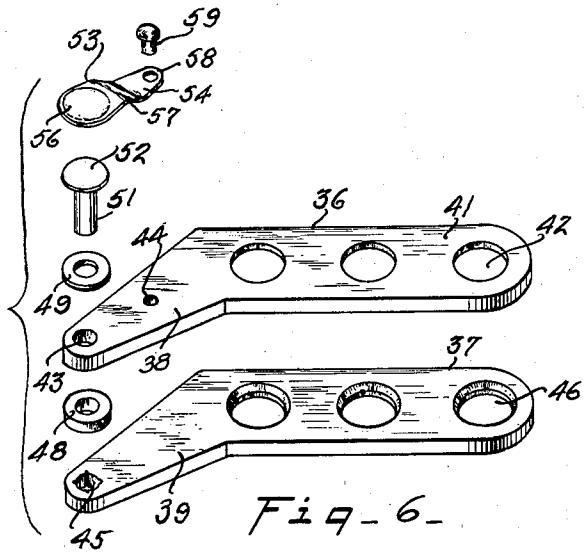


Fig-6-

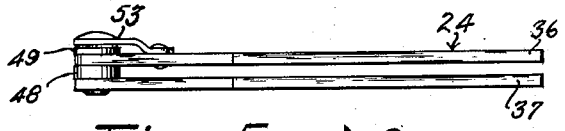


Fig-5-

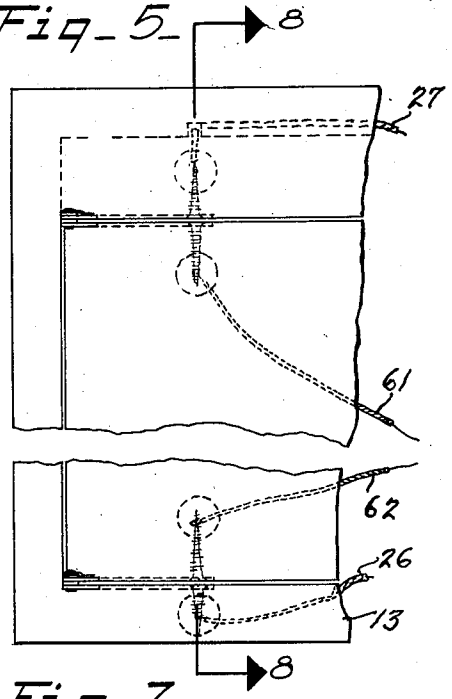
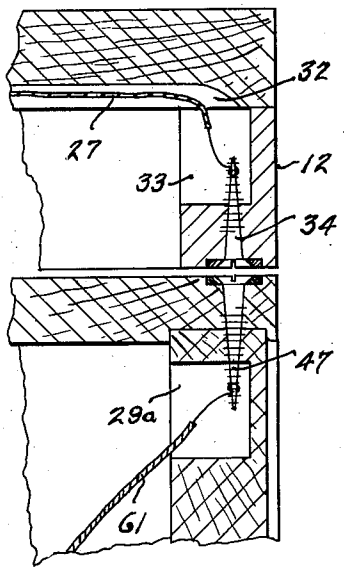


Fig-7



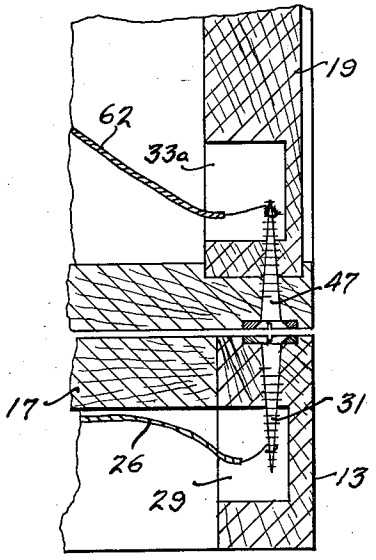


Fig-8-

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United States Patent Office 3,103,398
Patented Sept. 10, 1963

3,103,398

DOOR HINGE FOR ELECTRICAL CONNECTION

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Filed Aug. 16, 1960, Ser. No. 49,869
3 Claims. (Cl. 339—4)

This invention relates to improvements in hinges for mounting doors on cabinets and more specifically is directed to hinges that are particularly adapted for use to support cabinet doors wherein electrical connection must be established and maintained between one or more devices within the cabinet and door-mounted units. In this reference, the invention is well suited for use in mounting the doors of a cabinet in which certain units of a high fidelity stereophonic reproducing device are located.

In the past, stereophonic reproducing devices have consisted of a combined record player or other reproducer with an amplifier unit and a pair of separate and independently movable speakers. These speakers were required to be spaced apart and in such angular arrangement with respect to each other that sound emanating therefrom would have a point of intersection. It is at this point that stereophonic sound may best be heard; but, of course, by changing the angular relationship of the speakers, the point of sound intersection may be a variable distance from the speakers.

As stereophonic reproducing devices became of greater interest to the purchasing public, manufacturers of such equipment endeavored to make them more attractive and compact. One way of accomplishing this was to house the recording or reproducing unit in one cabinet and attach the speakers to the bi-parting doors of another cabinet. These doors were of hollow design and the contained speakers were so positioned that sound therefrom came from the inside face of the doors. Of course, the doors were so mounted or hinged that they could be opened upwards of 180°, thus permitting directing the sound from the speakers to intersect close to or at a suitable distance from the cabinet. An amplifier connected with the reproducing device was located in the cabinet and electrical connections were provided between it and the door-contained speakers.

Keeping in mind that the speakers can only properly function when the doors are both open to an extent greater than 90°, it is evident that wires leading from the amplifier to each of the speakers would generally be visible at all times the speakers were in use. Even though only a relatively short amount of slack wire may be necessary to enable swinging the doors into fully opened position, it appears that repeated movement of the doors subjects the wire to wear and deterioration by flexing and that in time the wire's usefulness to cleanly transmit electrical impulses is impaired. Furthermore, it would seem that the open doors of a cabinet of this nature invite wire abuse or damage by small inquisitive children.

It is a general purpose and object of the invention to provide hinges for cabinet doors that enable establishing electrical connections between units carried by the doors and a cabinet contained amplifier unit.

Another object of the invention is to provide means for substantially concealing all wiring connections between a door mounted unit and a cabinet contained unit through the assistance of a pair of hinge leaves having positive electrical connection.

A further object of the invention lies in the provision of a pintle that so connects a pair of hinge leaves as to assure positive electrical connection in all rotatable positions of said leaves.

A still further object of the invention is to provide a hinge in which certain of the parts thereof not only contribute to smooth relative rotation of the leaves but also create a positive electrical connection therebetween at all times and in all relative positions.

Other objects and advantages of the invention will be more fully understood and appreciated from a consideration of the following specification, taken in conjunction with the accompanying drawings; in which

FIG. 1 is a generally front view of a cabinet having speaker carrying doors shown in wide-open position, the doors being mounted by hinges embodying one form of the invention;

FIG. 2 is an enlarged transverse vertical sectional view of the structure shown in FIG. 1, being taken substantially on the line 2—2 of this figure;

FIG. 3 is a horizontal sectional view taken substantially on the line 3—3 of FIG. 2, parts being broken away to disclose the location of one of the lower hinge elements;

FIG. 4 is an enlarged view of the structure appearing in the circle in FIG. 3;

FIG. 5 is an enlarged side elevational view of the hinge embodying the invention;

FIG. 6 is an exploded perspective view showing the relationship of the elements that make up the hinge shown in FIG. 5;

FIG. 7 is a fragmentary front elevational view of the left-hand portion of the cabinet with the corresponding door in closed position, dotted lines being used to show electrical connections through the hinge elements to the speaker and amplifier; and

FIG. 8 is a greatly enlarged fragmentary vertical sectional view, taken substantially as indicated by the line 8—8 of FIG. 7.

Referring more particularly to the drawings, the reference numeral 10 is employed to generally designate a cabinet in which one form of the invention is embodied. The cabinet may be of any desired artistic form and, for present purposes, is merely shown as a box-like structure having a top 11, upper rail 12, lower apron 13, and side portions 14, all of which define a front opening in the cabinet. As the present invention relates to cabinets for use with stereophonic reproducing devices, two amplifiers 15 and 16 are shown to be located on the cabinet base or floor 17. These amplifiers have suitable connection with a reproducing device (not shown or forming part of the invention).

The cabinet opening is intended to be closable by a pair of identical reversely disposed bi-parting doors 18. As is apparent in FIGS. 2 and 3, each door 18 is of hollow construction and includes an outer solid panel 19 from which marginal panels 21 extend at right angles in a rearward direction. A rear panel 22 is provided and centrally thereof is an opening 23. It is evident from the drawings that the hollow doors 18 are each intended to mount and conceal speakers 25 and, in consequence, the marginal panels 21 are of appropriate depth for this purpose. Also, since speakers of different diameter are contemplated as being used in this manner, the opening 23 in each door will preferably be of a diameter sufficiently less than the diameter of the speakers provided, in order that the speaker rim may be secured in any conventional manner, as by screws, to the inner marginal edge of the opening 23. Each of the doors 18 is secured by top and bottom hinges, generally designated at 24, and which constitute the essence of the invention. One leaf of each hinge is attached to apron 13 or upper rail 12, the other leaf being attached to the top and/or bottom of the door 18.

As will have been understood from the above introduction to the invention, it is necessary to provide posi-

tive and what may be termed "clean" electrical contact between the amplifier units 15 and 16 and their respective speakers 25, despite the fact that the speakers are contained in the doors 18 and that these doors of necessity must be movable into a predetermined angular relationship if true stereophonic sound is to be obtained. Obviously, it is a simple matter to run leads 26 and 27 from each of the amplifiers upwardly and downwardly in concealed condition within a hollow rear panel 28.

Referring particularly to FIGS. 7 and 8, and considering only one amplifier unit and speaker, it will be noted that the lead 26 extends beneath the cabinet base 17 to the inside face of the apron 13 where there is a recess 29. As clearly shown in FIG. 8, this recess exposes the pointed end of one of the screws 31 that secure one of the hinge leaves to the cabinet apron. The other lead 27 passes upwardly through the rear wall 28 and continues along a groove 32 to a recess 33 which, being similar to the recess 29, exposes the pointed end of one of the screws 34 that secure the upper leaf of one of the hinges to the rail 12 of the cabinet opening. Similarly, with reference to the leaves attached to the door 18, the ends of certain of the screws securing such leaves are exposed by providing recesses such as 29*a* and 33*a*.

From the foregoing, it is evident that whatever electrical impulses are available at the amplifiers 15 and 16, such impulses are now carried through leads 26 and 27 to the bottom leaf of the hinge for one door and the top leaf of the hinge for the same door. The problem, of course, is to provide for positive transmission of impulses from the amplifier to the other leaves of the hinges in order that connection may be had with the speaker contained in the door.

Attention is now particularly directed to FIGS. 5 and 6 of the drawings. Herein the hinge is shown to consist of two leaves. For purposes of explanation, leaf 36 is considered the top leaf and leaf 37 the bottom leaf of each hinge. However, this position would be reversed when referring to the lower hinges. As is common in hinges where it is desired that cabinet doors be capable of swinging into approximately 180° open position, the pin or pintle end of the hinge is offset, as suggested by the angularly disposed portions 38 and 39 of the leaves 36 and 37, respectively. The body portion 41 of leaf 36 is provided with three countersunk openings 42. At the end of the portion 38 of this leaf is a circular opening 43. Still in the portion 38 is a small opening 44 which is perhaps slightly closer to the opening 43 than the nearest screw opening 42. At the end of the portion 39 is an opening 45. This opening is deliberately made with multiple angular side walls such, for example, as a rectangle, star, etc. However, the innermost, opposite surfaces of any two sides of this opening are equal to the diameter of the opening 43 in portion 38. Leaf 37 has countersunk screw openings 46 through which screws 47 may project to secure the adjacent leaves to the top and bottom edges of the door 18. In the drawings, the countersinking appears in this leaf but not in leaf 36 inasmuch as it is secured by screws that extend upwardly from beneath the leaf.

Between the end portions 38 and 39 of the leaves is a spacing washer 48. This washer serves no other purpose than to properly space the leaves and, of course, may be formed from a material such as nylon to promote smooth relative pivotal movement of the leaves. Above the portion 38 is a further washer 49, preferably formed from the same material as washer 48. A pivot pin 51 is provide and includes a rounded head 52, the under surface of which is flat and conventionally perpendicular to the axis of the body of the pin. As suggested in the exploded view of FIG. 6, the hinge leaves are joined by merely projecting the pin through washer 49, opening 43, washer 48 and opening 45. The length of the pin is such that it will project slightly beneath the portion 39 of the lower leaf 37 and this projecting portion, during the process of peening it over to prevent withdrawal, is expanded to completely fill the multiple sided opening 45. In this manner, the pin 51 is not only secured against displacement or any possible separation from the leaves, but is also virtually integrally locked to the lower leaf 37 in order that any movement of said leaf relative to leaf 36 will require movement of the pin.

When the leaves of a given hinge have been joined, as above stated, a cap 53 is applied to the head 52 of the pin. This cap consists of a securing tab 54 connected to a cup portion 56 by an offset spring-like portion 57. The tab 54 has an opening 58 which, when made to register with the opening 44, is held in place by a rivet 59. As clearly suggested in FIG. 5, the cap 53, when mounted, completely encloses the head 52 of the pivot pin and has pressure contact with said top to the extent of the strength of the offset portion 57.

From the foregoing description of the hinge elements and their assembly, it will be evident that any relative pivoting movement of the hinge leaves causes a rotating, wiping, frictional contact between the head 52 and the cup portion 56 of the cap 53. These parts are accurately matched and, since the cap entirely encloses the head 52, there is no opportunity for any foreign matter whatsoever to come between these contacting surfaces. Furthermore, due to the pressure exerted by the cap 53, the contacting surfaces are maintained in a clean, bright and highly satisfactory electrical conducting condition at all times. It makes no difference which of the two leaves moves during a door opening and closing operation, inasmuch as the head 52 of the pin and the cup portion 56 are carried by different leaves and wiping rotation will always occur.

At the time of mounting the speakers 25 in their respective doors 18, the top and bottom hinges, the leaves of each of which having previously been joined, are secured by screws 47 identified as those used to secure a bottom leaf 37 of the upper hinge and a top leaf 36 of the lower hinge. As pointed out, the end of one screw for each of these leaves is exposed in recesses 29*a* and 33*a*. It becomes a simple matter to connect leads 61 and 62 from the speaker with these screws. Thus, through the pin and cap arrangement, the complementary leaf of each hinge has electrical connection with the speaker. When the other leaf of each hinge is secured to the rail 12 and apron 13 of the cabinet, one screw of each leaf—namely, 31 and 34—projects into recesses 29 and 33, respectively. Leads 26 and 27, from each of the amplifiers having already been secured as above described, may now be joined to the exposed ends of the screws. In this manner all wiring is concealed and thereby protected against wear or damage and positive electrical connection is established as between each speaker and its respective amplifier.

Although applicant has shown and described only one manner of establishing wired connection as between leaves of door hinges and amplifiers, it will be understood that this arrangement may be varied without in any way changing the scope of the invention as set out in the annexed claims.

Having thus set forth my invention, what I claim as new and for which I desire protection by Letters Patent is:

1. A hinge adapted to provide a positive electrical connection between the leaves thereof, said hinge comprising a first leaf having an opening through one end, a second leaf having a multi-sided opening through an end corresponding to the one end of said first leaf, a pivot pin projecting through the openings in the leaves, one end of said pin being expanded to fill said multi-sided opening and prevent relative rotation of said pin and said second leaf, a rounded head on said pin, a spring strap secured to said first leaf, and a cupped portion on said strap enclosing said head and having total frictional contact therewith.

2. A hinge adapted to provide a clean electrical connection between the leaves thereof, said hinge comprising

a first leaf having an opening through one end, a second leaf having an opening through an end corresponding to the one end of said first leaf, said second leaf opening being out-of-round, a pin projecting through said leaf openings, one end of said pin being expanded to fill said out-of-round opening whereby to prevent pin rotation with respect to said second leaf, means carried by said pin and serving to space one leaf from the other, a rounded head on the other end of said pin, and means enclosing said head and having total frictional contact therewith.

3. A hinge adapted to provide positive electrical connection between the leaves thereof comprising a first leaf having a circular opening in one end thereof, a second leaf having an opening at one end thereof formed by multiple side walls, a pivot pin projecting through the openings in said leaves, a head on said pin having a flat under surface and a rounded top, a washer interposed between said head and said first leaf, and a further washer located between and serving to space one leaf from the other, the free end of said pin being expanded to fill the opening in said second leaf whereby to prevent relative rotation, a strap secured to said first leaf, a cupped portion on said

strap enclosing the top of said pin, and having total frictional contact therewith, relative pivotal movement of said leaves causing the top to have a continuous wiping contact with said portion whereby to establish and maintain a clean electrical connection between said first and said second leaf.

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