

July 3, 1962

R. E. HASLUP

3,042,471

FLEXIBLE CONDUIT HINGE FOR DOMESTIC APPLIANCES

Filed Nov. 16, 1959

3 Sheets-Sheet 1

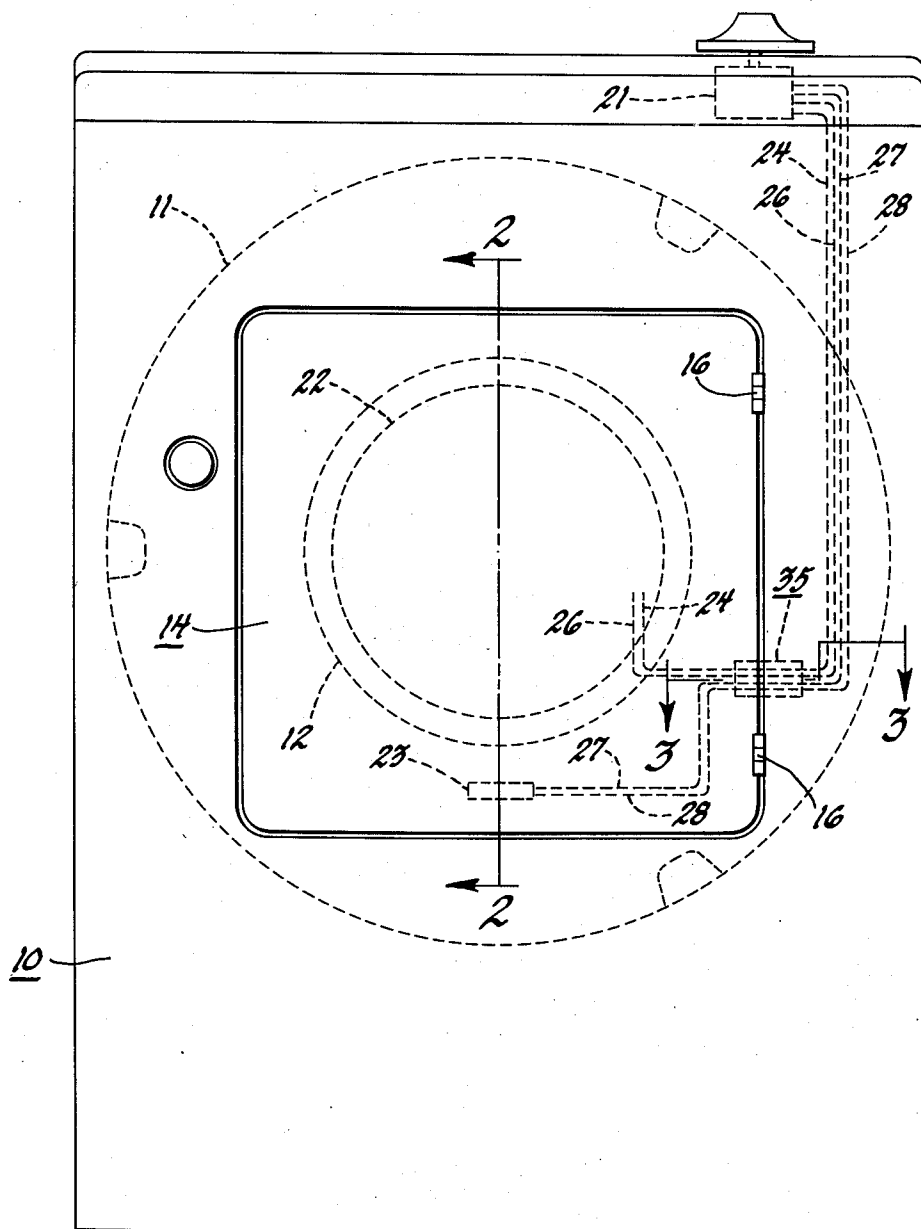


Fig. 1

INVENTOR.
Robert E. Haslup
BY
 Lloyd M. Keighley
 HIS ATTORNEY

July 3, 1962

R. E. HASLUP

3,042,471

FLEXIBLE CONDUIT HINGE FOR DOMESTIC APPLIANCES

Filed Nov. 16, 1959

3 Sheets-Sheet 2

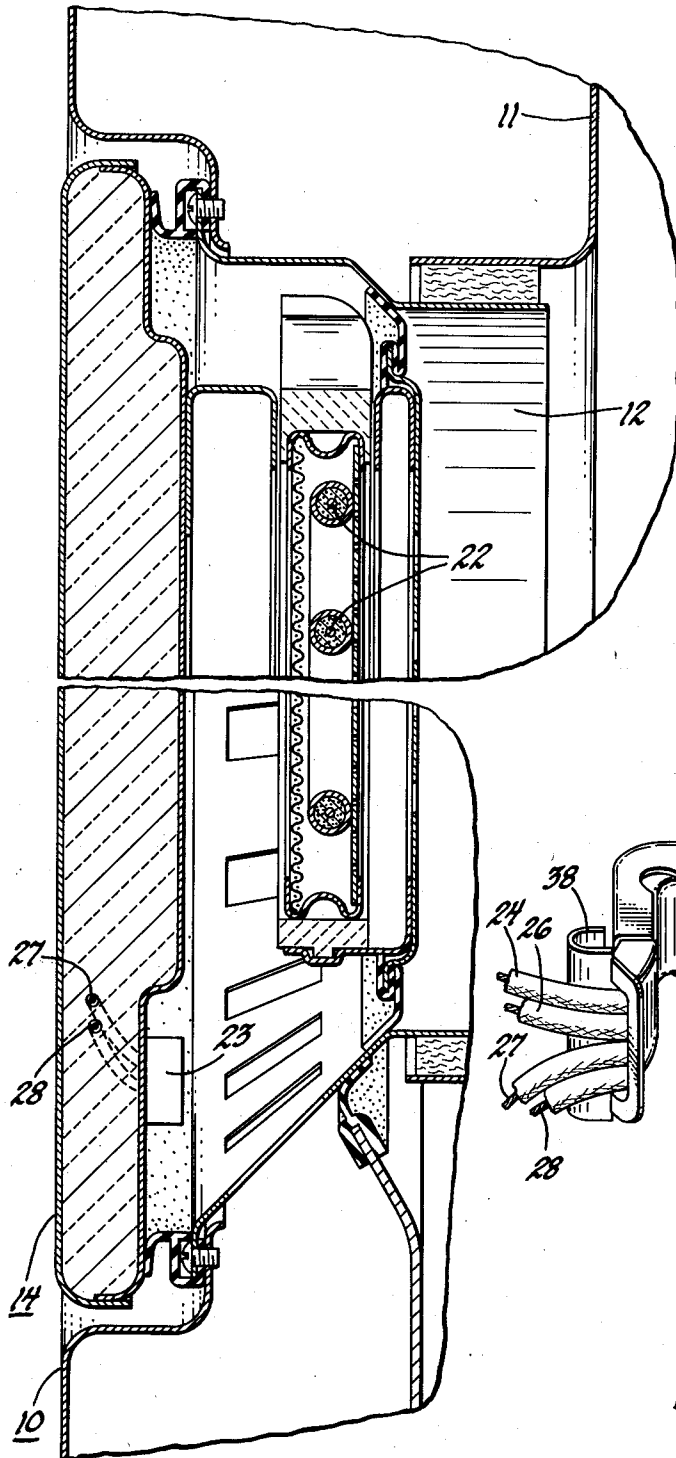


Fig. 2

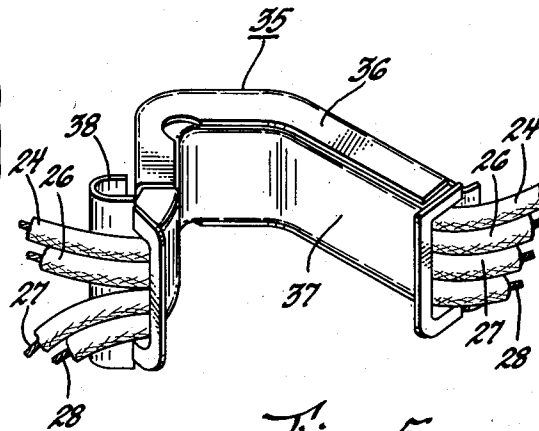


Fig. 5

INVENTOR.
Robert E. Haslup
BY

Lloyd M. Keighley,
HIS ATTORNEY

July 3, 1962

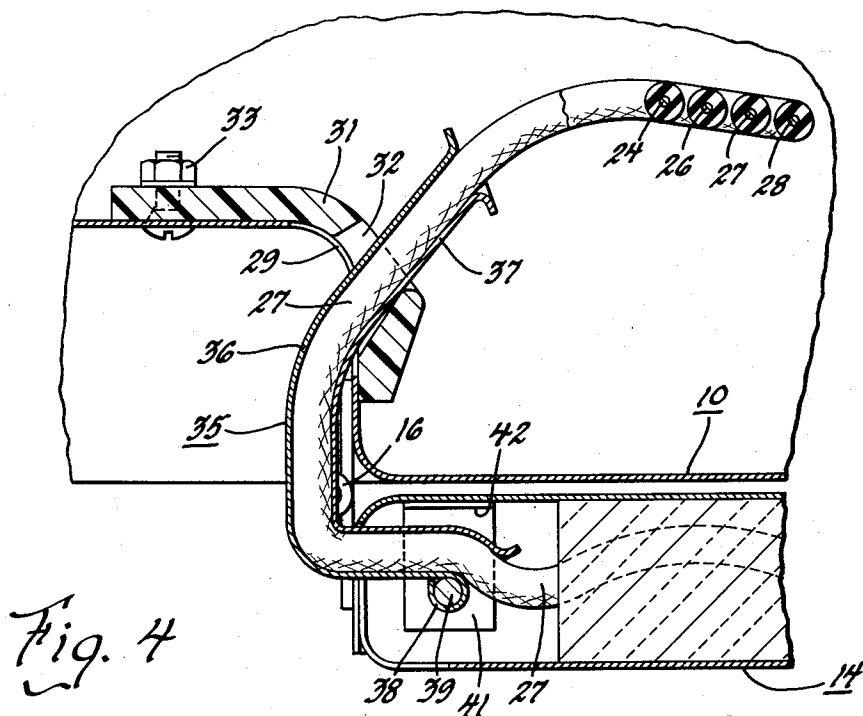
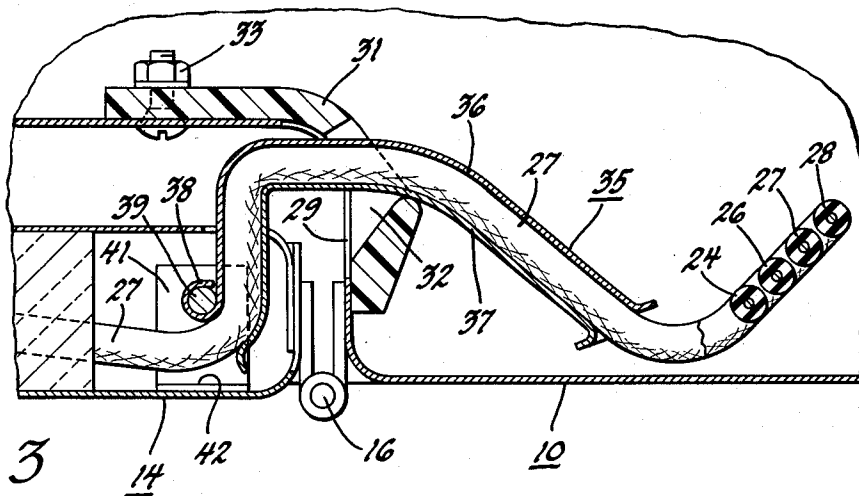
R. E. HASLUP

3,042,471

FLEXIBLE CONDUIT HINGE FOR DOMESTIC APPLIANCES

Filed Nov. 16, 1959

3 Sheets-Sheet 3



INVENTOR.
Robert E. Haslup
BY
Lloyd M. Keighley
HIS ATTORNEY

1

3,042,471

**FLEXIBLE CONDUIT HINGE FOR
DOMESTIC APPLIANCES**

Robert E. Haslup, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Nov. 16, 1959, Ser. No. 853,151
4 Claims. (Cl. 312—223)

This invention relates to domestic appliances and particularly to an improvement in a clothes dryer cabinet.

In certain types of clothes or fabric dryers, a door which closes an access opening to a tumbling chamber provided by a rotatable drum within the cabinet thereof has incorporated in the structure of the door an electrically energizable heater or lint burner and/or other automatically actuated controls or switches of an electric circuit associated with the dryer and adapted to be connected to a source of supply of electric current. The lint burner and other controls or switches form component parts or elements of the electric circuit. Some of these component elements may be located in or on the dryer cabinet and others thereof may be mounted in or on the cabinet door, which normally closes the access opening of the clothes or fabric tumbling chamber, so as to be swingable with the door relative to the cabinet. This requires inclusion in the electric circuit of means for connecting component elements thereof located on the cabinet with other of its component elements on the door in order to conduct electric current to and from the various elements. It is highly desirable to hinge a clothes dryer cabinet door on the cabinet for swinging movement relative thereto throughout an arc of 180° back against the front wall of the cabinet so that the door does not form an obstruction at the cabinet front which will interfere with the user of the dryer while loading clothes or fabrics into the drying machine or removing same therefrom. It has been proposed to freely extend insulated wire-like conductors from component elements of an electric circuit incorporated in a clothes dryer out of the cabinet thereof to or into the cabinet door. However, due to the 180° swinging movement of a dryer cabinet door and the frequency of subjecting insulated wire conductors to high heating temperatures within the dryer, such proposition is not entirely satisfactory and presents problems. For example, the door swinging about its hinge means throughout an arc of 180° bends or flexes such freely extending flexible wire conductors or leads in different directions relative to one another too much. Abnormal flexing of insulated wire conductors particularly after they have been subjected to high temperatures, which deteriorates the insulation thereon and renders the metal of the wire thereof brittle, causes short circuiting of the conductors and severance of the wire. This results in periodic service calls for repairing or replacing portions of the electric circuit in a clothes dryer and is objectionable and expensive to the user thereof. I therefore contemplate an improvement for use in conjunction with flexible wire conductors of an electric circuit in a clothes dryer and particularly that portion of conductors which lead out of a cabinet of the dryer to or into the cabinet door so as to prolong the life of the conductor leads and to eliminate frequent service calls.

An object of my invention is to provide a means on a cabinet member which is substantially floatingly anchored to a door member hingedly mounted thereon and surrounding a portion of flexible wire conductors of an electric circuit associated with the cabinet and leading therefrom into the door so as to be shiftable relative to the door when same is swung about its hinged mounting for limiting rotation of the means and consequently the

2

conductors therein with respect to the cabinet to an arc less than the swinging arc of the door member.

Another object of my invention is to provide an arrangement which protects the extension of flexible wire conductors of an electric circuit associated with a cabinet particularly at the point the conductors are directed out of the cabinet to or into a door hingedly secured thereto and reduces bending or flexing of the conductors at or adjacent such point to thereby increase the life of the circuit and to render its installation in a cabinet practical.

A further object of my invention is to provide a rigid sheath or conduit about the portion of flexible wire conductors or an electric circuit associated with a cabinet extending outwardly thereof to or into a door hinged thereon that is swingable with the door and shiftable relative thereto in such fashion as to rotate the sheath or conduit with respect to the cabinet only throughout a part of the arc of rotation of the door for minimizing bending and flexing of the flexible conductors during movements of the door.

In carrying out the foregoing objects, it is a still further and more specific object of my invention to enclose or confine that portion of flexible wire conductors of an electric circuit associated with a cabinet at the hinge side of a door hingedly mounted thereon, for swinging movement throughout an arc of 180° relative to the cabinet, in a rigid conduit pivotally anchored to the door and shiftable about its anchorage with respect thereto as the door is rotated for limiting rotation of the conduit to an arc of substantially 90° of the 180° door swinging arc whereby flexure of the wire conductors is minimized.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front elevational view of a fabric dryer cabinet having a tumbling drum therein forming a chamber provided with an access opening in the cabinet front wall normally closed by a door with which my invention is associated;

FIGURE 2 is an enlarged broken fragmentary sectional view taken on the line 2—2 of FIGURE 1 showing a lint collecting and burning compartment or device and a thermostat incorporated in the door structure of the dryer cabinet;

FIGURE 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIGURE 1 with the cabinet door closed and showing a rigid conduit surrounding a portion of flexible wire conductors of an electric circuit associated with the dryer;

FIGURE 4 is a view similar to FIGURE 3 showing the cabinet door opened 180° and the conductor containing conduit rotated only throughout 90° of the door opening swinging arc; and

FIGURE 5 is an enlarged perspective view of the rigid conduit with flexible wire conductors sheathed therein and extending outwardly thereof.

Referring to the drawings, for illustrating my invention, I show in FIGURE 1 thereof a clothes or fabric dryer comprising a cabinet member 10 having a plurality of walls enclosing a rotatable preferably perforated drum, indicated by the dotted lines 11, which forms a clothes tumbling chamber in the cabinet. A circular opening, indicated in FIGURE 1 by the dotted lines 12, in the front wall of cabinet 10 provides access to the clothes or fabric tumbling chamber, formed by drum 11, as is conventional in the art and a door member or structure 14 normally closes the chamber access opening. Door member or structure 14 is hingedly secured to cabinet 10

by a hinge, hinges or hinge means 16 for horizontal swinging movement relative to the cabinet throughout an arc of 180° about hinge means 16 to open the chamber access opening 12 (see FIGURE 4). The construction of door member 14 includes a double walled square or rectangular insulated outer section and a circular inner lint collecting and burning section secured to the outer section of the door. The outer section of door member 14 closes against a square or rectangular recessed portion of the cabinet front wall and the inner section of door member 14 is adapted to extend into opening 12 when the door is in closed position (see FIGURE 2). The clothes dryer herein briefly shown and described may be of any conventional type well known to those skilled in the art and is preferably constructed and operated in accordance with the more complete illustration and detailed explanation of such a dryer as is contained in the R. H. Whyte and L. J. Mitter copending application S.N. 818,160, filed June 4, 1959, and assigned to the assignee of this application. The manner of rotating drum 11, of heating and circulating air over clothes in the drum of cabinet 10 into contact with the lint collecting and burning housing or compartment on door member 14 and out of the dryer cabinet member form no part of my invention and, consequently, may be carried out as proposed in the copending application just referred to.

In accordance with my invention, dryer 10 has an electric circuit associated therewith adapted to be connected to a source of supply of electric current. This circuit includes as components thereof a control 21 at the top of cabinet member 10, an electrically energizable heater unit 22, in the lint collecting and burning housing or section of door member 14 and one or more temperature responsive thermostats or thermostatically operated switches generally indicated at 23 mounted on the door member in association with the heater unit 22 (see FIGURE 2). Since thermostat or switch 23 and heater unit 22 are mounted in or on door member 14, they are swingable or rotatable therewith. The electric circuit has suitably insulated flexible preferably stranded wire-like conductors or leads 24, 26, 27 and 28 extending downwardly from component element, control 21 out of cabinet 10 through an aperture 29 provided in a wall thereof at the hinged side of door 14 (see FIGURES 3 and 4) and to the component elements, heater unit 22 and thermostat 23, for connecting them to the source of supply of electric current. Wire conductors 24 and 26 conduct electric current to the lint burner heater unit 22, through detachable or disconnectable terminal blocks or plugs as shown in the copending application hereinbefore referred to, under control of the control 21 and thermostat 23. Wire conductors 27 and 28 conduct electric current to and from thermostat 23 which thermostat may act through control 21 or a timer device associated therewith to energize or deenergize heater unit 22 as desired. The flexible wire conductors 24, 26, 27 and 28 each have two vertically extending portions and an intermediate horizontal portion (see FIGURE 1). A molded plastic plate 31, having an aperture 32 therein registering with the aperture 29 in the wall of cabinet member 10, is fastened to the cabinet by bolts or the like 33 (see FIGURE 3). The horizontal portion of leads or wires 24, 26, 27 and 28 are grouped together in side by side relationship and then embraced or surrounded by a rigid sheath or conduit generally represented by the reference numeral 35 which has one end thereof disposed within the cabinet 10 and has its other or outer end projecting through the aperture 29—32 into door 14. The rigid conduit 35 is formed of two sheet metal pieces 36 and 37, of substantially U-shape in cross section, which are separately placed over the grouped horizontal portion of wires 24, 26, 27 and 28 and the legs of the U-shaped metal pieces are thereafter fitted into one another and pressed together (see FIGURE 5).

The legs of metal piece 36 are crimped or clamped tightly to the legs of the metal piece 37 for securing them together so as to form the flat relative wide unitary conduit 35. The legs of metal pieces 36 and 37 of conduit 35 may, if desired, be spot welded or brazed to one another. A part of the metal pieces 36 and 37 at ends of conduit 35 is flanged or flared outwardly to prevent sharp edges thereof from piercing or slitting insulation on the wires projecting out of the conduit. The outer end of metal piece 36 of the two secured together metal pieces of rigid conduit 35 is looped, as at 38, to provide the conduit with a pin or shaft receiving bearing. This end of conduit 35 projects into door member 14 and a pin or shaft 39, secured to suitable ears 41 or the like provided on a bracket 42 mounted in door 14, is passed through loop 38 to pivotally or substantially floatingly anchor the conduit to or on the door for rotation therewith and for shifting movement relative thereto as the door is swung about its hinge means 16. The general configuration of conduit 35 is such that aperture 29—32 cooperates with the pivotal anchorage of conduit 35 on door 14, offset with respect to the axis of hinge means 16, to guide and shift the conduit 35 with respect to the door during swinging thereof. Conduit 35 bears or rubs against the walls of aperture 32 in molded plastic plate 31 and the inherent characteristics of the material of this plate reduces friction of the conduit as it is shifted relative to cabinet 10. Shifting of the substantially flat free floating conduit 35 with respect to door 14, as the door is swung about the axis of hinge means 16, limits rotation of the rigid conduit relative to cabinet 10 to an arc less than the arc throughout which the door is swung. The feature of limiting rotation of conduit 35 reduces to a minimum bending or flexing of the flexible wire conductors 24, 26, 27 and 28 whereby the vertical portions of these conductors readily absorb a slight twisting thereof during the swinging movement of door 14 without harming or damaging them. In the present disclosure, the hinging arrangement of door member 14 permits the door to be swung about the axis of hinge means 16 relative to cabinet member 10 throughout an arc of 180° so that the door can be fully opened or rotated into a substantially parallel position against the front wall of the cabinet at the side of opening 12 therein. The configuration of rigid conduit 35 together with its pivotal anchorage to door member 14, in spaced relation to the door hinge axis, cooperating with the aperture 29—32 in the cabinet wall causes conduit 35 to shift about its anchorage, shaft or pin 39, relative to door 14 as the door is swung throughout a full 180° arc and this simultaneous shifting of the conduit limits rotation thereof and, consequently, conductors 24, 26, 27 and 28 relative to cabinet 10 to an arc of 90° of the 180° swinging arc of the door. It is to be understood that the swinging movement of door member 14 throughout a predetermined arc about hinge means 16 of less than a 180° arc will limit rotation of conduit 35 to an arc less than 90°. It is also to be understood that walls of door 14 are suitably cut or notched out in the vicinity of the shaft or pin 39 supporting bracket 41 to receive the outer end portion of conduit 35 and to permit of its limited shifting or rotation with respect to the door and to cabinet 10. Furthermore, it is to be understood that one, after having knowledge of my conception, could modify the present disclosure without departing from the realm of the invention. For example, one end of conduit 35 could be pivotally anchored to cabinet member 10 with the other end thereof having a sliding connection to door member 14 to thereby produce a restricted shifting movement or limited rotation of the conduit with respect to the door and the cabinet. For this reason, the scope of my invention is to be determined by the breadth of claims appended hereto.

It should be apparent from the foregoing that I have made an improvement in domestic appliances and par-

particularly clothes or fabric dryers wherein flexure of portions of flexible wire conductors of an electric circuit associated therewith, extending from the cabinet thereof to or into the cabinet door and subjected to high heating temperatures, is minimized. By limiting rotation and flexure of wire conductors, leading from a cabinet to a door hinged thereon for swinging movement relative thereto, the life of the conductors is prolonged to thereby substantially eliminate service calls insofar as leads or wires of an electric circuit associated with the cabinet is concerned. Also by binding or grouping a portion of a plurality of flexible wire conductors together in a common sheath or conduit which rotates only approximately one half the distance of rotation of the door, this portion of the conductors bodily move as a unit and I thereby prevent wire conductors adjacent the hinged side of a door from being bent and/or shifted in various directions relative to one another.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a first member, a second member, means hingedly securing said members together for swinging movement relative to one another, an electric circuit associated with said members having a component on said first member and another component on said second member, said electric circuit including a flexible conductor extending between said members and connecting said components, a single rigid unitary conduit surrounding that portion of said connecting conductor disposed intermediate said members, said conduit being pivotally mounted on one of said members at the hinged side thereof for rotation therewith and for movement as a unit relative thereto, a wall of said conduit being upon swinging said one member relative to the other of said members engageable with a wall portion of said other member, and the engagement of said conduit with said other member limiting rotation of the unitary conduit about its said pivotal mounting with respect to said members to an arc substantially less than the arc of relative swinging movement of the members for minimizing flexure of said flexible conductor.

2. In combination, a first member, a second member, means hingedly securing said members together for swinging movement about an arc of 180° relative to one another, an electric circuit associated with said members having a component on said first member and another component on said second member, said electric circuit including a flexible conductor extending between said members and connecting said components, a single rigid unitary conduit surrounding that portion of said connecting conductor disposed intermediate said members, said conduit being pivotally mounted on one of said members at the hinged side thereof for rotation therewith and for movement as a unit relative thereto, a wall of said conduit being upon swinging said one member relative to the other of said members engageable with a wall portion of said other member, and the engagement of said con-

duit with said other member limiting rotation of the unitary conduit about its said pivotal mounting with respect to said members to an arc of substantially 90° of the 180° relative swinging movement of the members for minimizing flexure of said flexible conductor.

3. In combination, a cabinet having a chamber therein provided with means defining an access opening normally closed by a door secured to the cabinet by a hinge for swinging movement relative thereto throughout a predetermined arc, an electric circuit associated with said cabinet having a component thereon and another component mounted on and swingable with said door, said electric circuit including a flexible conductor extending between said cabinet and said door and connecting said components, a single rigid unitary conduit surrounding that portion of said connecting conductor disposed intermediate said cabinet and said door, said conduit being pivotally mounted on said door at the hinged side thereof for rotation therewith and for shifting movement as a unit relative thereto, a wall of said conduit being upon swinging said door relative to said cabinet engageable with a wall portion of the cabinet, and the engagement of said conduit with said cabinet limiting rotation of the unitary conduit about its said pivotal mounting with respect to the cabinet to an arc substantially less than said predetermined door swinging arc for minimizing flexure of said flexible conductor.

4. In combination, a cabinet having a chamber therein provided with means defining an access opening normally closed by a door secured to the cabinet by a hinge for swinging movement relative thereto throughout an arc of 180°, an electric circuit associated with said cabinet having a component thereon and another component mounted on and swingable with said door, said electric circuit including a flexible conductor extending between said cabinet and said door and connecting said components, a single rigid unitary conduit surrounding that portion of said connecting conductor disposed intermediate said cabinet and said door, said conduit being pivotally mounted on said door at the hinged side thereof for rotation therewith and for shifting movement as a unit relative thereto, a wall of said conduit being upon swinging said door relative to said cabinet engageable with a wall portion of the cabinet, and the engagement of said conduit with said cabinet limiting rotation of the unitary conduit about its said pivotal mounting with respect to the cabinet to an arc of substantially 90° of the 180° relative swinging movement of the door for minimizing flexure of said flexible conductor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,665,414	Hubacker et al.	Jan. 5, 1954
2,769,246	Shapter	Nov. 6, 1956
2,812,593	Olthuis	Nov. 12, 1957

FOREIGN PATENTS

592,743	Great Britain	Sept. 26, 1947
---------	---------------------	----------------