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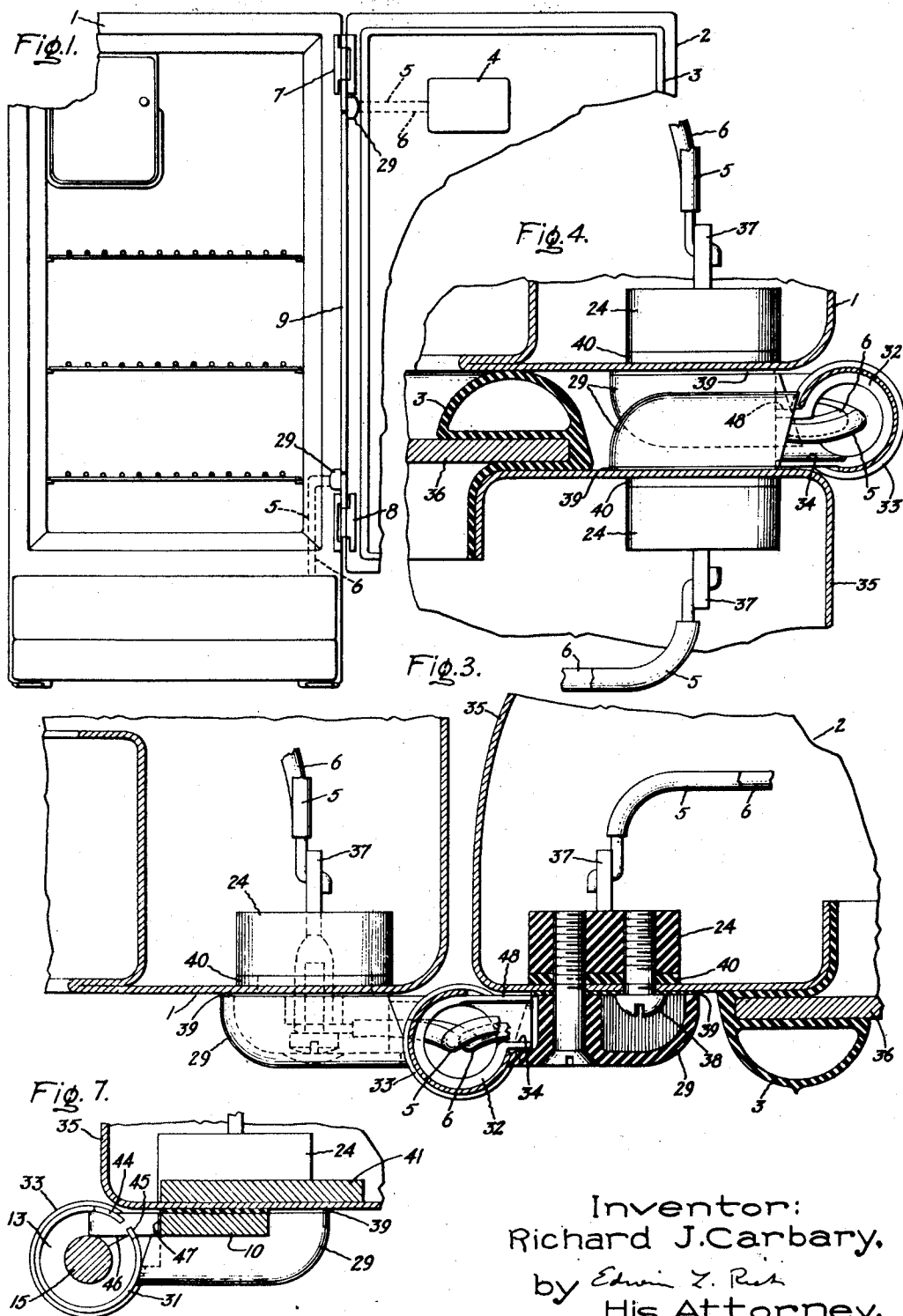
R. J. CARBARY

2,522,989

ELECTRICAL CONNECTION FOR HINGED STRUCTURES

Filed March 25, 1947

2 Sheets-Sheet 1



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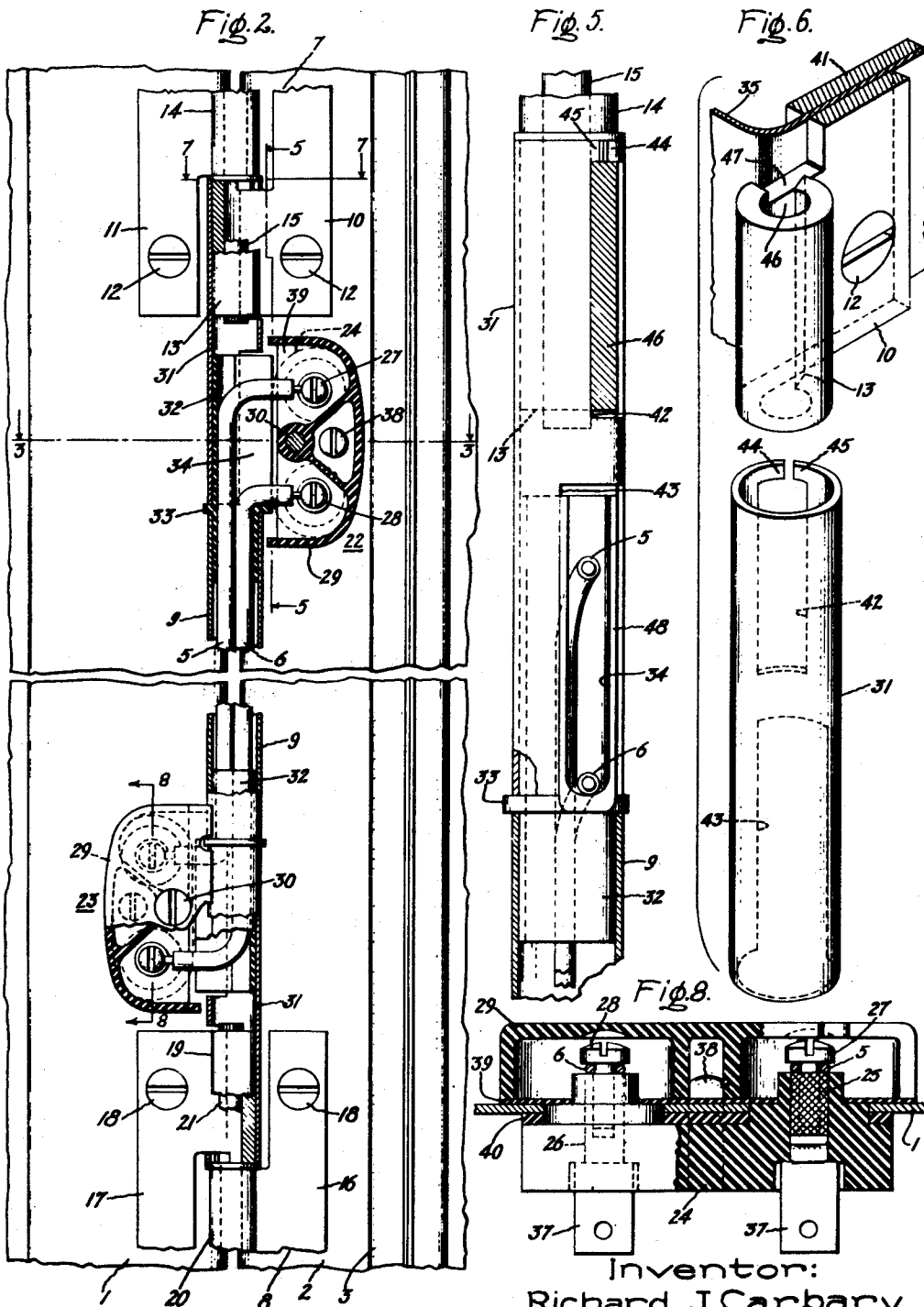
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UNITED STATES PATENT OFFICE

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ELECTRICAL CONNECTION FOR HINGED STRUCTURES

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9 Claims. (Cl. 173—324)

1

My invention relates to electrical connections and more particularly to electrical connections extending from a stationary structure to apparatus on a door hinged thereto.

It is sometimes necessary to provide an electrical circuit between a stationary structure such as a cabinet and a door or lid hinged to the cabinet. In some cases this may involve the supplying of power to a power-consuming device located in the door or lid. For example, in refrigerator cabinets a butter conditioner may sometimes be placed in the door. When the conditioner employs an electric heating element its location on the door introduces the problem of supplying power from the cabinet to the door. The frequent opening and closing of the door may result in serious wear of the electrical leads used to supply power to the butter conditioner, and it is desirable to provide some arrangement for minimizing the wear on the electrical leads.

Accordingly, it is an object of my invention to provide an improved arrangement for conducting electrical leads from a stationary structure to a door hinged thereto wherein provision is made for minimizing the wear on electrical leads extending between the stationary structure and the door.

It is another object of my invention to provide an improved arrangement including electrical leads extending from a stationary structure and a door hinged thereto wherein torsional stress on the electrical leads is minimized.

It is a further object of my invention to provide an improved arrangement for providing an electrical circuit between a cabinet and a door hinged thereto, wherein the cabinet and the door may be separately manufactured and electrical leads extending between the cabinet and the door may be readily connected when the door is assembled on the cabinet.

Further objects and advantages of my invention will become apparent as this description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 shows a refrigerator including an embodiment of my invention; Fig. 2 is a view, partly in section, taken in the area of the hinges shown in Fig. 1, illustrating details of this embodiment; Fig. 3 is an enlarged view, partly in section, taken along the lines 3—3 of Fig. 2 and showing the door in its open position; Fig. 4 is a view, partly in section, similar to Fig. 3 show-

2

ing the door in its closed position; Fig. 5 is an enlarged view, partly in section, taken along the line 5—5 in Fig. 2; Fig. 6 is an exploded view showing details of a portion of this embodiment; Fig. 7 is an enlarged view, partly in section, taken along the line 7—7 in Fig. 2; and Fig. 8 is an enlarged sectional view taken along the line 8—8 in Fig. 2.

Referring now to Fig. 1, there is shown a refrigerator including a cabinet 1 and a door 2 hinged thereto. A sealing gasket 3 is provided on the door. Within the door, there is located a power-consuming device 4, such as a butter conditioner. Electrical energy is supplied to the butter conditioner 4 from the cabinet through electrical leads 5, 6. The leads 5, 6 in the cabinet may be connected in any suitable manner to the source of power for the refrigerating machinery. The door is hinged to the cabinet by two hinges 7 and 8 which are located near the opposite ends of the door, the hinges thus being spaced a substantial distance apart. In order to provide the finished appearance of a piano-type hinge and to provide a passage for the electrical leads 5, 6 between the cabinet and the door there is provided a tubular member or conduit 9 which extends between the hinges 7 and 8 and is arranged in line with these hinges.

Referring to Fig. 2, the hinge 7 at the upper end of the door is composed of two parts 10 and 11. The part 10 is mounted on the door and the part 11 is mounted on the cabinet by any suitable fastening means, such as screws 12. The part 10 includes knuckles 13 at the top and bottom portions thereof, only the lower of these knuckles being shown in Fig. 2. The part 11 is provided with a single corresponding knuckle 14. A hinge pin 15 extends through the knuckles 13 and 14 to mount the two parts of the hinge in pivotal relationship. The hinge 8 located near the lower end of the door is similarly composed of two parts 16 and 17 which are mounted on the door and cabinet respectively by screws 18 or other suitable fastening devices. The arrangement of the two parts of the hinge are reversed from the form shown for hinge 7, the part 17 which is provided with knuckles 19 at its upper and lower ends, only one such knuckle being shown in Fig. 2, being mounted on the cabinet. The part 16 which has a single knuckle 20 adapted to fit between the knuckles 19 is mounted on the door. A hinge pin 21 is provided to engage the knuckles 19 and 20 to assemble the parts 16 and 17 in pivoted relationship.

In order to mount the tubular member 9 between the hinges 7 and 8 and in line therewith,

3

and to provide terminals for the electrical leads on the door and on the cabinet, terminal assemblies 22 and 23 are provided adjacent each of the hinges. Referring to the upper terminal assembly 22, this assembly includes an insulating terminal block 24, clearly shown in Fig. 8, and a set of terminals 25, 26 mounted on the door to receive the leads 5, 6. The leads are fastened in electrical contact with the terminals by any suitable fastening devices such as screws 27 and 28. In order to cover the terminals to prevent accidental contact therewith an insulating cap 29 is arranged to surround the terminals and is mounted on the door by a screw 30. In order to mount the upper end of the conduit 9 in aligned relationship with the hinge 7, there are provided a metallic tube or coupling member 31 and an insulating bushing 32, this assembly providing a coupling element for connecting the conduit and the hinge. The upper end of the tube 31 is arranged to engage the knuckle 13 of the hinge 7. The lower end of the tube 31 is adapted to receive the upper end of the insulating bushing 32, the position of the bushing 32 within the tube being determined by a flange 33 on the bushing which butts against the lower end of the tube in the assembled position. The upper end of the conduit 9 fits about the lower end of the bushing 32 and the flange 33 also determines the relationship of the bushing with the conduit 9, since the flange butts against the upper end of the conduit 9 and limits the amount which the bushing may extend into the conduit. In order to provide a passage for the electrical leads a longitudinal slot or opening 34, clearly shown in Fig. 5 is formed in the bushing in line with the terminals 25, 26. By the arrangement just described, the upper end of the conduit 9 is mounted in aligned relationship with the upper hinge 7. The lower terminal assembly 23 includes corresponding parts for mounting the lower end of the conduit 9 in line with the hinge 8 and for connecting the leads 5 and 6 to the cabinet.

In Fig. 3 there are illustrated further details of the terminals. As shown in this figure, the electrical leads 5 and 6 which extend through the space between an outer wall 35 of the door and an inner liner 36 of the door for supplying power to the butter conditioner are fastened by soldering, or by any other suitable fastening arrangement, to the inwardly projecting ends of the terminals 25, 26, one such end being shown at 37. The leads for supplying power from any suitable source of power on the cabinet extend within the spaced walls of the cabinet and are connected to similar inwardly projecting ends of the terminals mounted on the cabinet. The terminals are positioned in the terminal block 24, which is mounted on the door by a screw 38 or by any other suitable securing device. In order to provide a seal against the leakage of moisture into the insulation between the spaced walls of the door in the area of the terminals a gasket 39 is provided between the insulating cap 29 and the door, and a gasket 40 is provided between the terminal block 24 and the door. An arrangement corresponding to that just described is employed in connecting with the terminals mounted on the cabinet.

The relation of the various parts of the hinges and the terminal assemblies when the door is in the closed position is shown in Fig. 4. The same numerals have been applied to corresponding parts in Figs. 3 and 4.

In Fig. 5 there is illustrated the assembly for

4

mounting the conduit 9 in alignment with the hinge 7, and in Fig. 6 some of these parts are shown in an exploded view in order to illustrate the relationship more clearly. The same numerals have been applied to corresponding parts in Figs. 2, 5 and 6. As has been previously described the part 10 of the hinge is mounted on the outer wall 35 of the door 2 by two screws, one of which is shown at 12. To furnish additional support for the hinge the screw 12 extends into a backing plate 41 located on the opposite side of the wall 35. The metallic tube 31 is provided with two longitudinally extending slots or openings 42 and 43, the former being provided for facilitating assembly of the tube about the knuckle 13 of the hinge and the latter providing an opening for the leads 5, 6 and generally corresponding to the slot 34 in the bushing 32. At its upper end the tube 31 is provided with lips 44 and 45 which narrow the width of the slot 42 at this point. In assembling the tube 31 on the knuckle 13 of the hinge the lips 44, 45 are spread apart so as to provide an opening of sufficient width to pass over the portion 46 of the hinge part 10. When the assembly is completed the lips 44, 45 fit within a recess 47 formed in the hinge part 10 and the lips then spring together into the form shown in Fig. 6 because of the natural resilience of the metal of which the tube 31 is composed. The lips 44 and 45 fitting within the recess 47 prevent downward movement of the tube 31 and thus maintain a definite relationship between the hinge 7 and the remaining parts of the assembly. Upward movement of the tube 31 is prevented by the knuckle 14 of the part 11 of the hinge which in the assembled position is located immediately above the top of the tube 31. In order to position the bushing 32 within the tube 31 in such a manner as to prevent relative rotation of the parts 31 and 32, the bushing is provided with an outwardly extending lip 48 extending around the edge of the slot 34. In the assembled position, as shown in Fig. 5, the lip 48 extends outwardly through the slot 43 in the tube 31 and is arranged to butt against the longitudinal edges of the slot 43 to prevent relative rotation of the tube 31 and the bushing 32. This assures that the slots 34 and 43 will be maintained in circumferential alignment so that a passage will be provided for the leads 5, 6 through the two slots to the terminals 25, 26. The slots 34 and 43 are maintained in longitudinal alignment to insure a passage for the leads 5, 6 by the flange 33, as previously explained.

The various elements of the upper terminal assembly 22 and their relation to the hinge 7 are shown in Fig. 7. This figure illustrates the tube 31 in its assembled position on the knuckle 13 of the hinge and shows the lips 44, 45 after they have sprung together into the recess 47.

Fig. 8 illustrates the mounting of the terminals and the terminal block. The terminals 25 and 26 are positioned within the terminal block 24, and each is provided with a portion 37, previously described, to which the leads extending within the walls of the cabinet or the door are secured. The leads 5, 6 which extend through the conduit 9 are clamped to the terminals 25 and 26 respectively by screws 27 and 28. The terminal block is mounted on the cabinet or the door, as the case may be, by a screw 38 and gaskets 39 and 40 are employed to seal the area around the terminals against the leakage of moisture.

It can be seen from the preceding description that arranging the two hinges a substantial dis-

5

tance apart and passing the electrical leads through a conduit extending between the hinges the twisting of the wire is distributed over a considerable length of wire and the possibility of injury to the leads through repeated opening and closing of the door is minimized. I have also provided an arrangement for extending electrical power to a butter conditioner or other device located in a door wherein the electrical leads are concealed within a conduit aligned with the hinges. Further, I have provided an arrangement wherein the door and the cabinet including the electrical leads enclosed within each may be separately manufactured and wherein the electrical circuit may be completed during the assembly of the door on the cabinet by connecting the section of electrical leads which extends between the terminal assemblies at the top and at the bottom of the door.

While I have described my invention in connection with the supplying of power to a butter conditioner located in the door of a refrigerator cabinet, it will be apparent that its use is not so limited and that it may be used in any apparatus wherein it is necessary to provide electrical leads extending from a stationary structure to a door or lid hinged thereto. Therefore, I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In apparatus including a cabinet and a door hinged thereto, a pair of hinges for mounting said door on said cabinet, said hinges being located a substantial distance apart, a conduit connected to said hinges and extending therebetween in aligned relationship therewith, and electrical leads extending through said conduit, said conduit concealing said electrical leads.

2. In apparatus including a cabinet and a door, a pair of hinges for mounting said door on said cabinet, said hinges being located near the opposite ends of said door, a conduit connected to said hinges and extending therebetween, means including a bushing for mounting said conduit in alignment with each of said hinges, each of said bushings being aligned with one of said hinges and including a portion extending into said conduit and a flange abutting an end of said conduit, a terminal block mounted on said door adjacent one of said hinges, a second terminal block mounted on said cabinet adjacent the other of said hinges, and electrical leads extending between said terminal blocks through said conduit.

3. In apparatus including a cabinet and a door therefor, a pair of hinges for mounting said door on said cabinet, said hinges being located near opposite ends of said door, a conduit connected to said hinges and extending therebetween, means including a bushing engaging each of said hinges for maintaining said conduit in alignment with said hinges, a set of terminals mounted on said door adjacent one of said hinges, a second set of terminals mounted on said cabinet adjacent the other of said hinges, and electrical leads extending between said sets of terminals through said conduit, each of said bushings including a longitudinal opening and a flanged portion, said flanged portions butting against the ends of said conduit to maintain said longitudinal openings aligned with said sets of terminals.

4. In apparatus including a cabinet and a door therefor, a pair of hinges for mounting said door on said cabinet, said hinges being located near opposite ends of said door, a set of terminals

6

mounted on said door adjacent one of said hinges, a second set of terminals mounted on said cabinet adjacent the other of said hinges, a metallic tube surrounding a portion of one of said hinges and having a longitudinal opening therein aligned with the set of terminals mounted adjacent said one of said hinges, a bushing extending within said tube and having a longitudinal opening therein, and a flange on said bushing butting against an end of said tube for maintaining the openings in said tube and in said bushing in longitudinal alignment, a conduit engaging said insulating bushing and extending between said hinges, said conduit being connected to the other of said hinges, and electrical leads extending between said sets of terminals through said conduit.

5. In a refrigerator including a cabinet and a door, electrical leads extending between said cabinet and said door, means for minimizing the torsion in said leads resulting from the opening and closing of said door, said means including a pair of hinges located a substantial distance apart for mounting said door on said cabinet, a conduit mounted on said hinges and extending therebetween in aligned relationship therewith, said electrical leads extending through said conduit, said conduit concealing said electrical leads.

6. In apparatus including a cabinet and a door therefor, a pair of hinges located near opposite ends of said door for mounting said door on said cabinet, a set of terminals mounted on said door adjacent one of said hinges, a second set of terminals mounted on said cabinet adjacent the other of said hinges, a conduit extending between said hinges, electrical leads extending between said terminals through said conduit, an assembly cooperating with each of said hinges for mounting said conduit in alignment with said hinges, at least one of each of said mounting assemblies including a metallic tube engaging one end of its respective hinge, said metallic tube including a longitudinal slot adjacent its respective set of terminals, a bushing having one end engaging said metallic tube, the other end of said bushing engaging said conduit, said bushing including a longitudinal slot and a flange adapted to bear against an end of said metallic tube to maintain said slot in longitudinal alignment with said terminals and with said slot in said metallic tube, and a lip along the edge of the slot in said insulating bushing adapted to engage an edge of the slot in said metallic tube to maintain the slot in said bushing in circumferential alignment with its respective set of terminals and with the slot in said metallic tube.

7. In apparatus including a cabinet and a door hinged thereto, a pair of hinges located near opposite ends of said door for mounting said door on said cabinet, a conduit cooperating with each of said hinges and extending therebetween, a pair of bushings, one engaging each end of said conduit, a coupling member engaging each of said bushings and engaging a portion of each of said hinges for maintaining said conduit in alignment with said hinges, a set of terminals mounted on said door adjacent one of said hinges, a second set of terminals mounted on said cabinet adjacent the other of said hinges, and electrical leads extending between said sets of terminals through said conduit.

8. In apparatus including a cabinet and a door therefor, a pair of hinges located near opposite ends of said door for mounting said door on said cabinet, a conduit extending between said hinges,

7

a pair of terminal assemblies, one cooperating with each of said hinges and with each end of said conduit, each of said terminal assemblies including a set of terminals, a metallic tube mounted on its respective hinge and having a slot therein in alignment with its respective set of terminals, a bushing engaging said metallic tube and having a slot therein, said bushing having a flanged portion adapted to butt against an end of said metallic tube to maintain said slot in said bushing in line with said slot in said tube and with said set of terminals, said bushing engaging one end of said conduit, said flanged portion adapted to butt against said end of said conduit, and electrical leads extending between said sets of terminals through said conduit.

9. In apparatus including a cabinet and a door hinged thereto, a pair of hinges for mounting said door on said cabinet, said hinges being located a substantial distance apart, a conduit extending

8

between said hinges, a tubular coupling element for connecting said conduit to each of said hinges in aligned relationship therewith, and electrical leads extending from said cabinet to said door through said conduit.

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