

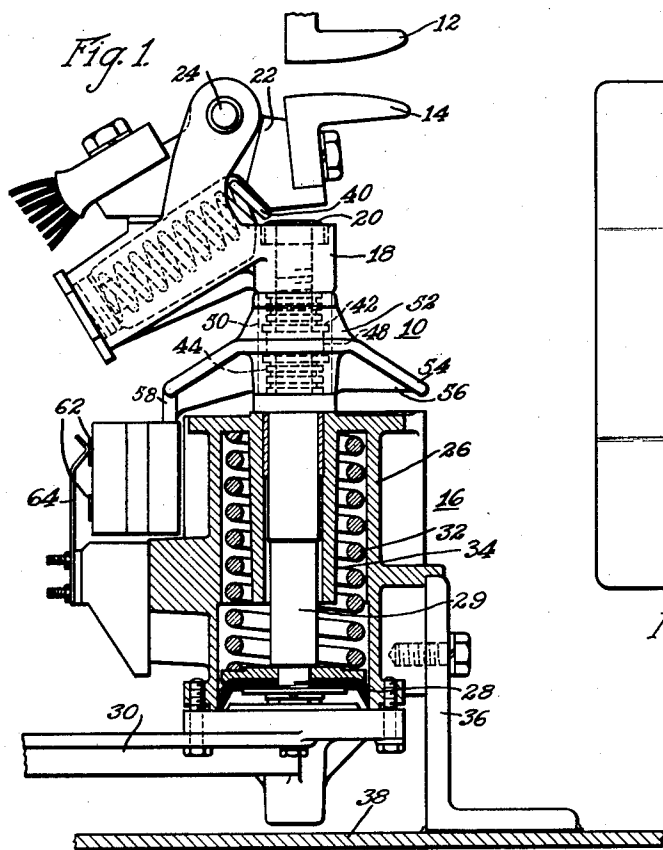
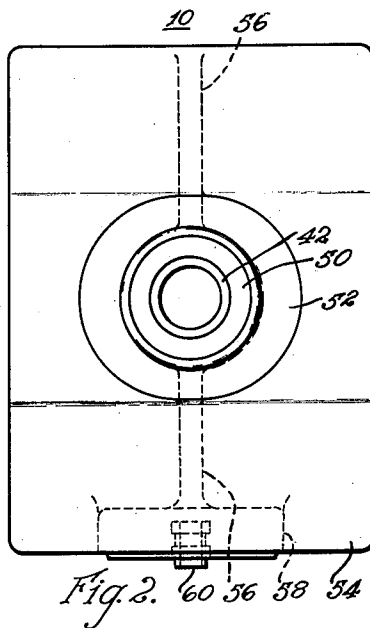
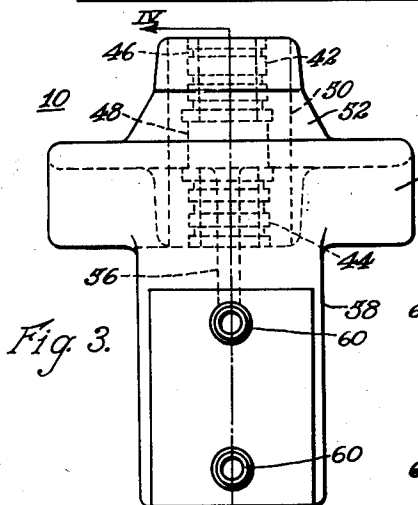
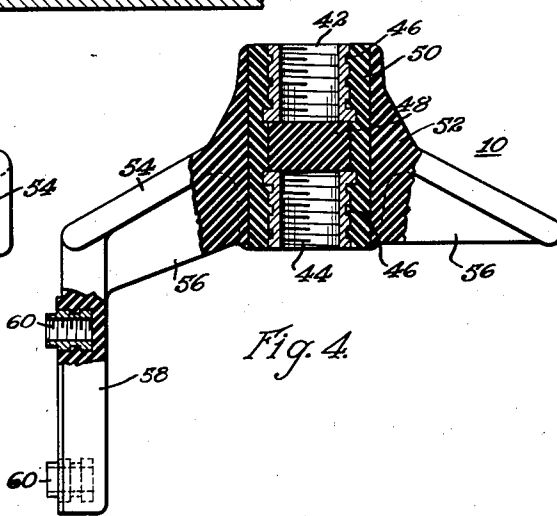
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INSULATOR

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WITNESSES: *IV*

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INSULATOR

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2 Claims. (Cl. 174—178)

This invention relates to insulators, and particularly to insulators of the type employed for mechanically connecting a plurality of movable rod members while electrically insulating them from each other.

In certain types of electrical apparatus, and particularly pneumatic circuit makers and breakers, it is desired to electrically insulate the moving contact member from the actuating mechanism and to provide for protecting the actuating mechanism from any arcing incidental to the making and breaking of a circuit. Many different types of insulators have been employed for this purpose, but have not proven to be satisfactory in service. Failures of such insulators are primarily due to the lack of strength in the insulator, the known insulators not being sufficiently resistant to the shocks encountered during operation of the actuating mechanism. In addition to the requirement of high strength, the insulators used for this purpose act as a shield to prevent the arc from flashing to grounded parts of the apparatus during short circuits.

An object of this invention is to provide an insulator which is suitable for mechanically connecting a plurality of rod members while electrically insulating them from each other.

Another object of this invention is to provide an insulator having receptacles electrically insulated from each other for receiving rod members which are to be mechanically connected and a reinforcing member of insulating material so positioned with respect to the receptacles as to retain them in position for receiving the rod members, the receptacles and reinforcing member being integrally united to give a strong structure.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view in elevation and partly in section of the actuating mechanism of a pneumatic circuit maker and breaker embodying the insulator of this invention;

Fig. 2 is a top plan view of the insulator of this invention;

Fig. 3 is a side elevational view of the insulator constructed in accordance with this invention; and

Fig. 4 is an end view of the insulator of this invention shown partly in section, as taken along the line IV—IV of Fig. 3.

Referring to the drawing and particularly Fig. 1 thereof, the insulator 10 of this invention is

illustrated as employed as the piston insulator in the actuating mechanism of a pneumatic switch having a stationary contact member 12 and a movable contact member 14. As illustrated, the actuating mechanism of the switch comprises a plurality of elements consisting of an air cylinder assembly 16, the insulator 10, a V-type link 18 connected through a rod member 20 to the insulator 10, as will be explained more fully hereinafter, and a carrying member 22 for the movable contact member 14 pivotally mounted to the V-type link 18, as by means of the pin 24.

The air cylinder assembly 16 is of standard construction and consists of a chamber defined by the wall members 26 within which a piston 28 and piston rod 29 are assembled and disposed for movement vertically when air is admitted to the lower end of the chamber below the piston through an air inlet pipe 30. In order to provide for substantially instantaneous movement of the piston 28 to effect substantially instantaneous separation of the contacts 12 and 14 when the air is removed from the air cylinder, a spring member 32 is assembled in the chamber 16 about the piston rod 29 and is biased to move the piston 28 downwardly to its inoperative position. In order to limit the extent of movement of the actuating mechanism, a suitable stop 34 is provided within the air cylinder for abutting against the piston 28 to prevent excessive movement thereof in an upward direction. The air cylinder assembly 16 is suitably carried, as by means of the bracket 36, on any suitable base 38.

In assembling the actuating mechanism, the insulator 10 is mechanically connected to one end of the piston rod 29 in a manner hereinafter described while the rod member 20 is mechanically connected through the V-type link 18 to the other side of the insulator 10.

Upon admission of the air to the air cylinder assembly 16, the piston 28 is moved in a vertical direction, carrying with it by means of the piston rod 29 the insulator 10, rod member 20 and V-type link 18, which in turn, carries the carrying member 22 for the movable contact member 14 upwardly until the movable contact member 14 engages the stationary contact 12. Upon engagement of the contact members, the carrying member 22 is pivoted about the pin 24 in a clockwise direction and the lower portion of the carrying member 22 engages the spring 40 assembled in any suitable fashion within the V-type link, such rotation of the carrying member 22 permitting a rolling contact between the contact members 12 and 14.

If for any reason the air supply to the air cylinder 16 is cut off, the actuating mechanism moves downwardly as hereinbefore referred to, due to the bias of the spring 32 within the air cylinder assembly to effect the disengagement of the contact members. When the actuating mechanism starts to move to separate the contact members 12 and 14, the spring 40 carried by the V-type link biases the carrying member 22 for the movable contact member 14 in a counter-clockwise direction, giving a rolling movement of the movable contact member on the stationary contact members as they disengage. The piston and air cylinder assembly are protected from any arcing between the contact members during the disengagement thereof by the insulator 10.

As is quite evident from the foregoing, the insulator 10 must not only protect the piston rod and air cylinder assembly from arcing effects and electrically insulate them from the movable contact member assembly, but since the disengagement of the contact members is fast, the insulator 10 must have sufficient strength to withstand the shocks encountered in actuating the movable contact member 14 into and out of engagement with the stationary contact member 12.

In order to provide an insulator 10 suitable for the purposes hereinbefore described, it is desired to employ insulating material, such as synthetic resin in the insulator. The different types of known synthetic resins, such as phenolic condensation products, urea and thiourea resins of themselves, however, do not have the strength necessary for the particular application described. Referring to Figs. 2 and 3 of the drawing, the insulator of this invention is illustrated with the details thereof being shown specifically in Fig. 4.

As illustrated, the insulator 10 comprises a plurality of elements molded into an integral structure under heat and pressure. As shown in Fig. 4, a plurality of receptacles 42 and 44, comprising metallic inserts for receiving the rod member 20 and the piston rod 29 of the air cylinder assembly of Fig. 1, are positioned in aligned and spaced relation with respect to each other. These receptacles or inserts have internally threaded surfaces for engaging with the rod members to be connected. In order that the receptacles 42 and 44 may be retained in position in the insulator, their outer walls are provided with a plurality of grooves 46, the purpose of such grooves or roughened surfaces of which will be explained more fully hereinafter.

In positioning the receptacles 42 and 44, in order to maintain them in spaced relation to and electrically insulated from each other, a pre-formed insert 48 of insulating material, such as synthetic resin, is disposed between the adjacent ends of the aligned receptacles. This insert may be either in the uncured or cured state, as desired. If cured, it is desired that its outer surfaces be roughened similar to the outer surface of the receptacles which it maintains in spaced relation and insulated from each other.

In order to strengthen the assembly, a tube 50 of insulating material is positioned about the aligned receptacles 42 and 44 having the insert 48 therebetween. This tube is formed of woven fibre glass of the type recently developed the fibres having an average diameter of about .0003 inch, and which in its woven form is flexible and has an exceedingly high strength. In forming the tube 50, the woven fibre glass in the form of tape or cloth, is wound about a suitable mandrel until the wound layers have a thickness of

about $\frac{1}{8}$ of an inch, the tube having a length equal to that of the aligned receptacles 42 and 44 with the insert 48 therebetween.

In order to form the tube 50 of woven fibre glass and the receptacles 42 and 44 and insert 48 into an integral unit, the tube with the receptacles and inserts therein is positioned in a suitable mold having a configuration of the desired insulator. A quantity of synthetic resin is then disposed about the tube 50, after which the mold is closed and subjected to sufficient heat and pressure for a period of time sufficient to effect the molding of the synthetic resin to form the body 52 of any predetermined shape about the tube 50. In molding the synthetic resin, it is found that the resin completely and thoroughly impregnates the tube 50 of woven fibre glass, and under the action of pressure is forced, together with a portion of the fibre glass, into the grooves 46, which form the roughened outer surfaces of the receptacles 42 and 44. In practice the tube 50 is usually impregnated with the resin before it is positioned about the receptacles in order to insure an adequate supply of resin in the tube for bonding it to the receptacles during the molding operation.

In addition to bonding the fibre glass to the receptacles, the synthetic resin is bonded securely to the insert 48 between the receptacles 42 and 44. Where the insert 48 is of uncured resin, it is found that under the action of the heat and pressure encountered during the molding operation, the insert 48 is completely cured, a portion of the resin combining with the contacting surfaces of the tube 50 and with the synthetic resin of the body portion 52 which impregnates the tube 50. If the insert 48 is formed of the cured resin it is found that in molding the insulator, the resin of the body portion impregnates the tube of fibre glass and securely bonds it to the preroughened outer surfaces (not shown) of the cured insert.

In molding the insulator 10, an arc shielding flange 54 is molded as an integral part of the body 52 of synthetic resin and extends outwardly therefrom radially to the aligned receptacles 42 and 44. As is evident from Fig. 4, in the particular embodiment illustrated, webs 56 of the synthetic resin are also molded integral with the body portion to support the flange 54. The flange 54 extends outwardly for a sufficient distance to protect the piston rod which is threaded into the receptacle 44 and the air cylinder assembly from any arcs encountered. As will readily be appreciated, the body portion 52 of the insulator can be molded into any predetermined shape, depending upon the mold employed in molding the insulator, although in all cases it is preferred that the insulator carry the outwardly extending arc shielding flange 54.

Where desired, a depending portion 58 can also be molded to the outer edge of the flange 54 as illustrated in the drawing, and be provided with inserts 60 for receiving contact members 62, as illustrated in Fig. 1. The contact members 62 cooperate with the contact arm 64 for giving a protective interlock with associated contactors, not shown, with which the described contactor is employed. The control circuits of the interlocking system are not illustrated since they do not form a part of this invention.

In a specific example of the molding of an insulator in accordance with this invention, with the tube 50, receptacles 42 and 44 and insert 48 positioned as described hereinbefore, and the

synthetic resin disposed thereabout, the mold is closed, after which a temperature of between 175° and 180° C. is applied for a period of time of about 50 minutes while simultaneously subjecting the assembly to a pressure of from 20 to 30 tons per square inch. When removed from the mold, it is found that the molded insulator has a mechanical strength superior to that of any known constructions, the synthetic resin and fibre glass cooperating with the roughened surfaces of the receptacles to give an extremely strong integrally molded insulator.

Not only does this insulator have the increased strength over known insulators, but it also has the advantage that in service, it will not lose the mechanical strength due to any deterioration of any of the materials employed. This is because the fibre glass tube employed as the reinforcing agent in the insulator has high strength in tension and compression, is resistant to shear and will not lose its strength when subjected to temperatures above the ambient temperature, as is the case where other fibrous materials are employed. Further the tube of woven fibre glass is of itself an excellent insulator and cooperates in the insulator to not only give it the required mechanical strength, but also to give it high dielectric strength adjacent its metallic portions.

Although this invention has been described with reference to a particular embodiment thereof, it is, of course, not to be limited thereto except insofar as is necessitated by the description hereof and the appended claims.

I claim as my invention:

1. An insulator for connecting a plurality of rods comprising, metallic receptacles disposed in aligned and spaced relation to each other for receiving the rods, the metallic receptacles having roughened outer surfaces, an insert of synthetic resin disposed between the aligned recep-

tacles for electrically insulating them from each other, a tube of woven fibre glass disposed about the aligned receptacles and insert therebetween and in physical contact with the roughened surfaces of the receptacles, and a body portion of synthetic resin consolidated into a hard infusible mass of predetermined shape about the fibre glass tube, the mass having an arc shielding flange as an integral part thereof extending outwardly therefrom radially to the aligned receptacles, the synthetic resin impregnating the tube of fibre glass to bond it to the roughened surfaces of the receptacles and to the insert to give an integral structure.

2. An insulator for connecting a plurality of rods comprising, metallic receptacles disposed in aligned and spaced relation to each other for receiving the rods, the metallic receptacles having roughened outer surfaces, an insert of synthetic resin disposed between the aligned receptacles for electrically insulating them from each other, a tube of woven fibre glass disposed about the aligned receptacles and insert therebetween and in physical contact with the roughened surfaces of the receptacles, a body portion of synthetic resin disposed about the fibre glass tube, an arc shielding flange disposed about and extending outwardly from the body portion and radially to the aligned receptacles, and ribs disposed between the arc shielding flange and the body portion in spaced relation about the body portion for supporting and strengthening the flange, the body portion, flange and ribs being of synthetic resin consolidated into an integral hard infusible structure about the fibre glass tube, the synthetic resin of the body portion impregnating the tube of fibre glass to bond it to the roughened surfaces of the receptacles and to the insert to give an integral structure.

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