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C. A. BERNAT

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METHOD OF MOLDING ELECTRICAL CONNECTOR PLUGS

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Fig. 1

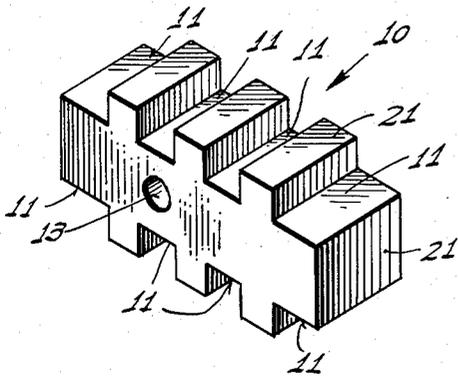


Fig. 2

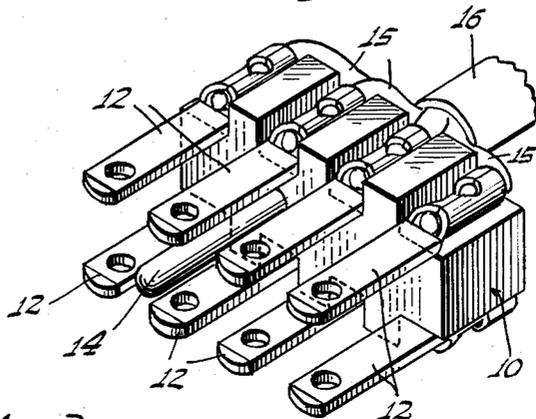


Fig. 3

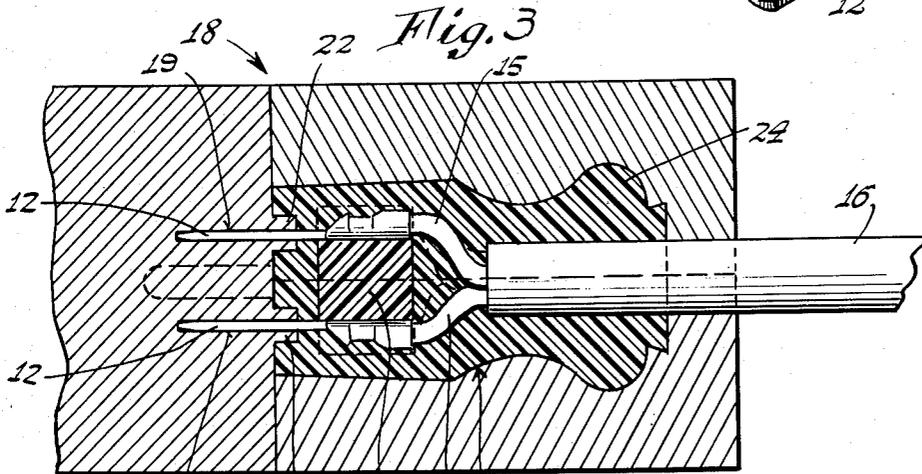
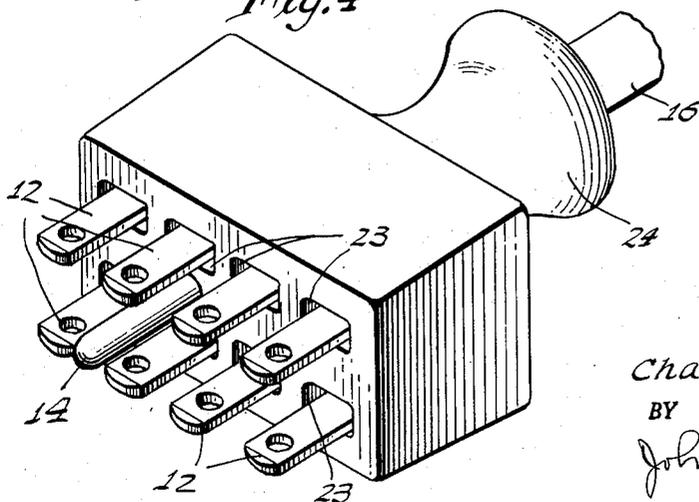


Fig. 4



INVENTOR.  
Charles A. Bernat  
BY  
Johnson and Kline  
ATTORNEYS

1

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## METHOD OF MOLDING ELECTRICAL CONNECTOR PLUGS

Charles A. Bernat, Jewett City, Conn., assignor to Plastic Wire & Cable Corporation, Jewett City, Conn., a corporation of Connecticut

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3 Claims. (Cl. 18-59)

The present invention relates to a method of molding electrical connectors on the end of a cable and particularly heavy electrical connectors having a multiplicity of contacts therein.

Heretofore, in molding multiple contact plugs on a cable, which plugs are provided with a large solid body to carry the contacts, problems have been encountered in properly molding the plug because substantial amounts of material had to be forced around the contacts and the conductors connected thereto to embed them in the body and a high pressure was required which had a tendency to displace the contacts and even break or short-circuit the conductor connected to the contact which would result in a defective plug and require the molding of a new plug on the cable. In some circumstances the material would not properly flow around the components of the plug and sinks would be formed in the molded body causing rejection of the plug.

The present invention overcomes these difficulties by providing a method of molding the connector or plug, which avoids sinks in the body and effectively maintains the contacts and their connected conductors in proper position so that shorts or other faults are avoided.

In carrying out the invention, a preformed molded block of thermoplastic material is provided with contact-receiving means in the form of recesses formed in the surface thereof and may include one or more apertures through the body for receiving additional contacts. The contacts and their connected conductors are mounted on the block with the contacts positioned in the contact-receiving portions and temporarily held in place thereon. The assembly of the block and contacts is then inserted in a mold cavity with the contacts positioned in locating means in the mold for properly locating the contacts with respect to the body of the plug and for holding the block in position. The mold cavity is closed and hot thermoplastic material is injected into the mold under pressure to fill the mold and to complete the plug body. While the thermoplastic material can merely fill the contact-receiving means or recesses in the block to complete the plug, it is at present preferred to mold a relatively thin body surrounding the block and which will embed the block therein. Inasmuch as this would require less material and less movement of the material around the contacts, a lower injection pressure can be used. Further, because less material is required a shorter curing or setting period is needed. Also, since the material would not have to be forced in and around the contacts, the danger of sinks occurring in the body from faulty disposition of the material would be greatly lessened.

As the hot thermoplastic insulating material is injected into the mold cavity and around the block it will cause a softening of the surface of the thermoplastic block and cause the body of the plug to be firmly connected thereto and integrated therewith.

Other features and advantages of the invention will be apparent from the specification and claims when considered in connection with the accompanying drawings in which:

FIGURE 1 shows a perspective view of the block.

FIG. 2 is a view of the block with the contacts in position thereon.

FIG. 3 is a sectional view through the mold showing

2

the block and contacts in position and the body molded therearound.

FIG. 4 is a perspective view of the block.

In carrying out the method of the present invention a block 10 of thermoplastic insulating material is pre-molded. These can be molded in quantities and are each provided with a plurality of contact-receiving portions or recesses 11 around the periphery thereof into which contacts 12 are adapted to be positioned. If desired, a hole 13 can be molded within the body for receiving a member 14, such as a ground contact or a guide pin for assisting the connector plug in its connection to a complementary connector.

The contacts 12 which have been connected to conductors 15 of the cable 16 are then assembled with the thermoplastic block with the contacts positioned in the recesses or contact-receiving portions as shown in FIG. 2. The assembly can be temporarily held together by removable clamps, Scotch tape or by a small amount of adhesive securing the contact to the block as shown in FIG. 2. After the assembly is completed, it is inserted in a cavity 17 of a plural part mold 18 with the contacts extending into contact-locating means formed in the mold as shown in FIG. 3. The contact-locating means are herein illustrated as recesses 19 opening in the end of the mold into which the contacts of the assembly are inserted. With the contacts held in fixed position on the block, they can be quickly and easily inserted into the plurality of contact-locating recesses in the mold. This quickly and accurately locates the contacts and the block in the mold cavity. While the block can be so positioned that its outer surfaces 21 form part of the outer surface of the plug, it is herein illustrated as being located in spaced relation with the walls of the cavity. The mold is then closed and hot thermoplastic insulating material is injected into the mold cavity in the usual manner and under sufficient pressure to cause the thermoplastic material to flow around and embed the block and to fill in the recesses 11 in the periphery of the block so that a uniform exterior of the body, as shown in FIG. 4, is obtained in the molded part. Since the thermoplastic material is needed only to surround the block and fill up the recesses carrying the contacts and to thereafter fill up the mold and it is not required to be forced in and around the contacts as heretofore, a lower pressure can be used in injecting the insulating material to completely fill the cavity. With the block making it unnecessary to force material around the contacts, sinks in the plug resulting from improper distribution of the material around the contacts are avoided and with the lower pressure the tendency to displace the contacts or to cause malfunctioning of the conductors connected thereto is greatly reduced.

If desired, the contact-locating means in the end of the mold can have bosses 22 extending into the mold, as shown in FIG. 3, so as to provide recesses 23 around the contacts, as shown in FIG. 4, should it be desired to have such recesses for cooperation with a female contact plug.

If desired the plug can have a grip 24 molded thereon surrounding the end of the cable 16.

As the hot thermoplastic material is forced into the mold it will heat the surfaces of the block and become integrated therewith. Since less material is required to fill the cavity to make the plug, shorter curing times are required, thus cutting the molding cycle.

It will be seen that through the facility of assembling the contacts with the pre-molded block, the holding of the contacts in proper relation by the block as they are inserted in the mold, the use of less pressure and less material, and the shorter curing time, the present method greatly expedites and speeds up the manufacture of plugs, particularly of the heavy duty type and insures greater accuracy in the finished product.

While the invention has particular advantage in molding large plugs, it can also be used on connector plugs embodying only a single pair of contacts having a molded plug body.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. The method of making a molded electrical connector plug comprising forming a block of thermoplastic insulating material with a plurality of contact-receiving recesses in the periphery thereof, connecting electrical contacts to a plurality of conductors, positioning the connected contacts on the block with the contacts disposed in the contact-receiving recesses, securing the contacts in said recesses to provide a readily handleable assembly, inserting the assembly in a mold cavity having contact positioning means with said contacts engaging said positioning means for holding said contacts and connected block in predetermined spaced relation in said mold cavity, and injecting hot thermoplastic material into said mold cavity under pressure to surround the block and complete the plug with the hot thermoplastic material softening the surface of the block and becoming integral therewith.

2. The method of making a molded electrical connector plug comprising forming a block of thermoplastic insulating material with a plurality of contact-receiving recesses in the periphery thereof, connecting a plurality of conductors to electrical contacts, assembling the conductor connected contacts with the block with the contacts positioned in the contact-receiving recesses, securing the contacts in said recesses to provide a readily handleable assembly with portions of said contacts projecting from one end of the block, inserting the assembly in a mold cavity having contact positioning means for receiving the pro-

jecting portions of said contacts and holding said block and contacts in predetermined spaced relation to said mold, and injecting hot thermoplastic material into said mold cavity under pressure, said contacts holding the block and connected contacts and conductors in position against displacement by the hot thermoplastic material filling the mold to complete the plug with the hot thermoplastic material softening the surface of the block and becoming integral therewith.

3. The method of making a molded connector plug comprising molding a block of thermoplastic insulating material with a plurality of contact-receiving recesses in the periphery thereof, mounting a plurality of electrical contacts having conductors secured thereto on the block with portions of the contacts disposed in the contact-receiving recesses, temporarily securing the contacts disposed in said recesses to said block to provide a readily handleable assembly, inserting the block and assembled contacts in a mold cavity having contact positioning means for receiving said contacts with said contacts holding said block in predetermined position in said mold, and injecting hot thermoplastic material into said mold cavity under pressure to fill the recesses and enclose the block and contacts disposed in the recesses to complete the plug, the hot thermoplastic material softening the surface of the block and becoming integral therewith, and setting the plug and removing it from the mold cavity.

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