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INSULATING HANDLE CONNECTOR AND METHOD OF MAKING SAME

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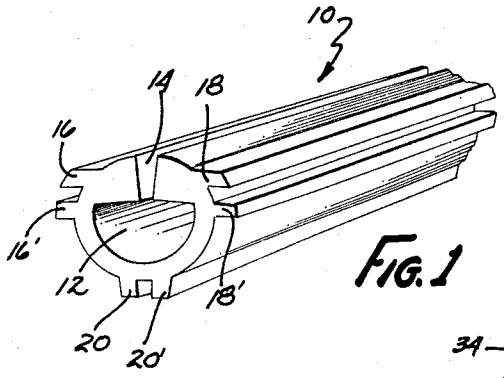


FIG. 1

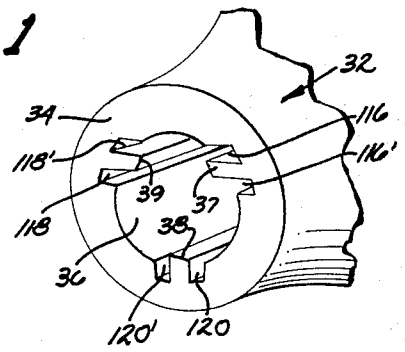


FIG. 2.

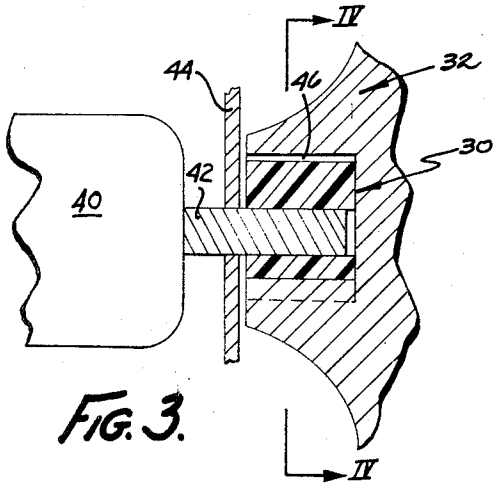


FIG. 3.

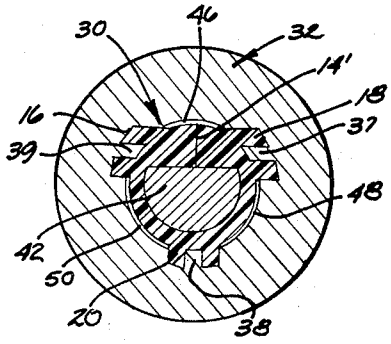


FIG. 4.

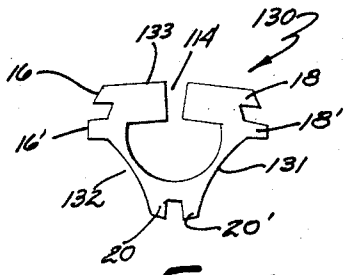


FIG. 5.

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INSULATING HANDLE CONNECTOR AND METHOD OF MAKING SAME

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ABSTRACT OF THE DISCLOSURE

The subject matter of this invention comprises a manual or hand-operated handle and a connector element for non-rotatively coupling the handle to a control shaft which becomes heated in use. The connector element is extruded in long lengths from insulating material such as synthetic resin or plastic, and the extrusion is subsequently cut to size to form individual connector elements. The connector element extrusion is made as an open extrusion, having a lateral slit-like opening which extends longitudinally thereof. It also has a non-round central cavity and a series of longitudinal ridges on its outer periphery. The control shaft to be coupled to a handle is inserted into the non-round cavity of the individual connector element, and the connector element is then circumferentially contracted so that it may be inserted into an appropriate recess in the rear surface of the handle, with the aforementioned ridges on the outside of the connector element fitting into appropriate slot-like lateral enlargements in the handle recess. Circumferential contraction of the connector element closes the lateral opening therein and contracts the central cavity, thereby causing the connector element to grip the control shaft. The inherent plastic memory of the element opposes its contracted condition, thereby urging the ridges on the outer periphery of the connector into and against the inside of the slot-like enlargements of the handle recess to tightly hold the handle upon the connector. The relative size and shape of the outer periphery of the connector element and the handle recess is not such as to bring adjacent surfaces thereof into contact, however. Instead, the handle recess is sufficiently larger than the connector to provide substantial air gaps therebetween which greatly augment the isolation of the handle from the heat of the control shaft.

This invention relates to operating handles and to connector elements for use in attaching a manual or hand-operated handle to a control shaft which becomes heated in use, and more particularly to a new and unique form of such a connector element and handle combination, the connector element preferably being manufactured in a novel manner through an extrusion process.

The handle and connector element combination of the present invention has particularly useful application in conjunciton with valves for gas burners or the like, of the type typically used in cooking ranges and other similar appliances. In the past, the use of plated or attractively finished die-cast or other metal knobs as operating handles for such control valves was completely precluded due to the relatively high temperatures to which the control shaft for the valve is heated during operation of the burner, inasmuch as the high temperature of the control shaft was transferred directly to the heat-conductive operating handle or knob, which in a short time would then become far too hot to operate with the bare hand, as is typically desired to be done. This situation presented a considerable handicap from a design point of view, since operating handles could only be made from materials which were, relatively speaking, extremely resistant

to heat. As is well known, visual design aspects of such consumer commodities as cooking ranges and the like are of paramount importance in the mechandising of such commodities, since it is the visual design attributes thereof which in the end generally leads a purchaser to choose one variety over another. Consequently, the aforementioned design handicap was directly related to, and to a significant extent was directly responsible for, the relative success in merchandising different types of these commodities.

The present invention has as one of its major objects the provision of a unique form of connector element and operating handle by which the handle may be used in connection with a control shaft which becomes extremely hot in use. The connector element is of an insulating type of material, and is also preferably physically shaped in a unique manner by which it isolates or shields the operating handle from the elevated temperatures of the control shaft. Further, the connector element of the invention preferably has physical aspects making it the only required element between the control shaft and the operating handle. The inventive concept which is involved embraces both the connector element itself as an article of manufacture and the method of manufacturing such connector elements in a way which makes them extremely economical to produce and very easy to use in assembly processes.

The foregoing major objects of the invention and the advantages provided thereby, together with other objects and advantages equally a part therof, will become increasingly apparent following consideration of the ensuing specification and its appended claims, particularly when taken in conjunction with the accompanying illustrative drawings setting forth a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a fragmentary lateral perspective view showing the connector element of the invention in the form in which it is manufactured;

FIG. 2 is a fragmentary lateral perspective view of the rear portion of a preferred operating handle for use with the connector shown in FIG. 1;

FIG. 3 is a fragmentary sectional elevation showing a control shaft connected to the operating handle of FIG. 2 by the connector element of FIG. 1;

FIG. 4 is a sectional end elevation taken through the vertical plane IV—IV of FIG. 3; and

FIG. 5 is an end elevation of a second preferred form of connector element.

Summary

Briefly stated, the present invention provides a connector element and a method of manufacturing the same, which element comprises generally a substantially rigid and generally tubular bar-like member which is extruded through a forming die from heat-resistant insulating material. The connector element has a lengthwise cavity therein of a desired non-round cross sectional shape which corresponds to the cross section of the control shaft which the connector element is to be used upon, for non-rotatively receiving such shaft within the cavity, and the connector element further includes a series of ridges on its external periphery which extend lengthwise of the element. The connector is coupled to the operating handle by inserting the connector into an appropriate recess formed in the rear portion of the latter, which recess has a series of slot-like lateral enlargements for receiving the aforesaid lengthwise ridges, so that the handle is coupled to the connector element in a nonrotatable manner.

Referring now in more detail to the drawings, a preferred embodiment of the connector element of the in-

vention is seen at **10** in FIG. 1 in the form in which it is extruded from its forming die, which may be of a conventional nature and thus is not specifically shown. The connector element extrusion **10** is generally tubular in form, having a central cavity **12** which extends lengthwise through it. This tubular structure is formed as an open extrusion, i.e., it has a slot **14** which extends throughout its length. As will be understood, the slot **14** is made by a thin member which supports the mandrel portion within the forming die, so that the mandrel may form the cavity **12** as the material from which the connector is made is forced out of the extruding die. Consequently, the connector extrusion is very economically produceable, inasmuch as the difficulties and expense associated with "floating" mandrels of the type required to produce a closed tubular structure are not encountered.

The outside periphery of the extrusion **10** includes a number of pairs of adjacent ridges or ribs **16**, **16'**, **18**, **18'**, and **20**, **20'**, which are spaced around the generally cylindrical periphery of the extrusion and which extend continuously lengthwise thereof. As will be observed, these ridges or ribs preferably have flat lateral surfaces and the ribs are analogous to rectangular key members attached to the outside of the extrusion, although they are actually formed integrally therewith.

The material from which the extrusion **10** is preferably formed is a thermo-setting or highly heat-resistant synthetic resin or plastic, which is easily extruded from a flowable, unhardened physical condition into a hard and substantially bar-like member such as is illustrated at **10**. As will be understood, the term "rigid" is used herein to describe the compressive or shear strength of the sidewalls of the tubular structure, and is not intended to connote that a long length of the extrusion **10** may be absolutely unbendable or unyieldable, as might otherwise be inferred from such term. That is, shorter sections of the extrusion are relatively hard and non-pliable, although a long section of extrusion need not necessarily have the stiffness and rigidity generally attributed to a post or column.

The extrusion **10** is preferably formed in a substantially continuous process, in which long lengths of the formed material are initially provided. These are subsequently sliced transversely into short lengths **30** (FIG. 3) comprising individual connector elements.

Referring specifically to FIGS. 2, 3, and 4, a portion of a preferred operating handle **32** with which the connector element **30** of the invention is intended to be used is illustrated as having a hub-like rear portion **34** defining a central recess **36**, into which the connector element **30** is inserted. The recess **36** has a series of slot-like lateral enlargements or channels (FIG. 2) designated **116**, **116'**, **118**, **118'**, **120**, and **120'**. These are provided for the purpose of receiving the ridges or ribs **16**, **16'**, **18**, **18'**, and **20**, **20'** on the outer periphery of the connector element **30**. Channels **116** and **116'** are spaced apart by an inwardly-directed divider **37** and similar dividers **38** and **39** serve to space channels **118** and **118'**, and **120** and **120'**, respectively.

In general, the desired size relationship between the recess **36** in the hub portion **34** of operating handle **32** and the outer periphery of connector element **30** is such that the connector element must be circumferentially squeezed and contracted to close the slot **14** therein before the connector element can be inserted into the aforesaid recess. As shown in FIG. 4, this is preferably accomplished by having the dividers **37**, **38** and **39** extend inwardly beyond the arcuate internal walls of recess **36**, so that when the connector element is inserted the ends of the dividers against the portions of the connector element between the ribs or ridges **16**, **16'**, **18**, **18'**, **20**, and **20'** but, due to the length of the dividers, the remaining portions of the connector element are spaced from the arcuate internal walls of recess **36**, thereby providing air gaps or spaces designated **46**, **48**, and **50**. With the dividers **37**, **38**, and **39** fully engaged in this manner between the ridges on the connector element, the slot **14** will be closed to a line of contact **14'**. It will be understood that the extruded plastic connector element has a normal rest condition in which the slot **14** is open, as shown in FIG. 1. Consequently, when the connector element is contracted and inserted into the recess **36** in the handle in the foregoing manner and the squeezing or contracting force is then removed, the normal resiliency or plastic memory of the connector element tends to make it return to its open condition. This forces the ridges **16**, **16'**, **18**, **18'**, **20**, and **20'** on the periphery of the connector element outwardly into the slots **116**, **116'**, **118**, **118'**, and **120** and **120'**, pressing the dividers **37**, **38** and **39** firmly against the periphery of the connector. As will be readily appreciated, this frictionally engages the handle with the connector element in a very firm and tight manner, which is in and of itself completely satisfactory for mounting the handle upon the connector.

In FIG. 3, a portion of a typical device such as a control valve is shown at **40**, with the control shaft thereof being shown at **42**. Normally in gas ranges and the like, the valve or other such device **40** is mounted behind a decorative concealing partition or panel **44**, such that only the control shaft **42** protrudes through the panel for the purpose of engaging the operating handle, in the general manner illustrated. As shown in FIG. 4, the control shaft **42** is of a non-round cross-sectional shape which is conveniently provided by a partially cylindrical shaft having a longitudinal flat area thereupon. The cavity **12** in the extruded connector element should have a similar non-round cross-sectional shape, so that it may properly receive the control shaft and impart rotational movement thereto without slipping. However, the size of the cavity **12** should be such that when the connector element is circumferentially squeezed or contracted for insertion into the recess **36** in the operating handle, the cavity **12** is contracted snugly about the control shaft **42**, as illustrated. That is, with the slot **14** in the open extrusion contracted to a closed condition shown at **14'** in FIG. 4, the cavity **12** should snugly and frictionally embrace and enclose the control shaft **42**, thereby creating a frictional engagement between the inside of the connector element and the outside surface of the control shaft.

A second preferred embodiment for the connector element of the invention is shown in FIG. 5, wherein it is designated **130**. This connector is made in the same manner as connector **30**, i.e., it is made as an open extrusion and has an opening or slot **114** in its side wall extending longitudinally thereof, as well as having the external ridges **16**, **16'**, **18**, **18'**, **20**, and **20'**. Between these ridges, however, the outer periphery of connector **130** is not circularly cylindrical, but instead is at least slightly relieved or recessed at **131**, **132** and **133**. This configuration may be used with handles similar to that shown at **32** in FIGS. 2, 3, and 4, but in which the dividers **37**, **38**, and **39** do not extend inwardly but instead are merely coextensive with the arcuate internal walls of the recess **36** between the channels **116**, **116'**, **118**, **118'**, **120** and **120'**. In such a combination, the reliefs or recesses **131**, **132** and **133** provide air gaps between the connector element and the handle similar to those shown at **46**, **48**, and **50** in FIG. 4.

In accordance with the present invention, the connector element itself is the only component which is required to snugly and securely mount the operating handle **32** upon the control shaft **42**. Consequently, any rotation of the handle **32** will immediately rotate the control shaft **42** to operate the valve or other device **40** in the desired manner. Further, the high temperatures to which the shaft **42** typically becomes heated during operation of the burner or similar structure associated with the device **40** are insulated and isolated from the handle **32**, due to the insulating properties of the con-

nector element and the presence of the aforementioned air gaps between the connector element and the handle. As a result, any desired metal may be used for the handle, such as the bright and attractive plated die-cast metal handles which currently find wide usage in connection with appliances wherein heat is not encountered. Consequently, all of the design approaches which have been so widely exploited in other areas may now be used in cooking ranges and the like, which never before was possible. As will immediately be perceived by those skilled in the art, the present invention thus provides an extremely practical device which opens up areas previously precluded from use, and it does so by an extremely economical extrusion structure which, so far as is known, has never been utilized for the present purposes. Further, the connector element itself, while of a very uncomplicated nature from a purely structural point of view, is designed to firmly hold the handle onto the control shaft without any other elements whatever, such as the clamping members and set screws which are conventionally used.

It is entirely conceivable that upon examining the foregoing disclosure, those skilled in the art may devise embodiments of the concept involved which differ somewhat from the embodiment shown and described herein, or may make various changes in structural details to the present embodiment. Consequently, all such changed embodiments or variations in structure as utilize the concepts of the invention and clearly incorporate the spirit thereof are to be considered as within the scope of the claims appended herebelow, unless these claims by their language specifically state otherwise.

I claim:

1. In combination, a manual operating handle and a heat-insulating connector element for use in attaching said operating handle to a control shaft which becomes heated in use, said combination comprising: a handle having a hub-like rear extremity, including a recess in said extremity having a lateral enlargement; a generally tubular, bar-like connector element of heat-resistant insulating material; said element having a lengthwise internal cavity therein of a particular non-round cross-sectional shape of a size sufficient to slidably receive said control shaft, for non-rotatively engaging said shaft; said element further having at least two ridge means portions on its outer periphery extending laterally thereof a distance greater than other portions of its said periphery; said element having a longitudinally smooth external periphery such that it is slidably insertable into said handle recess with said lateral enlargement receiving said ridge means; and said element having a diametral size sufficient to substantially fill said recess across its diameter and having portions, including said ridge means portion, making contact with said handle at a plurality of spaced positions around the periphery of said recess, wherein said handle recess and the periphery of said connector element are relatively shaped to define at least one air gap therebetween, between said positions of mutual contact, for helping to isolate the heat of said shaft from said handle, whereby said handle is nonrotatively connected to said shaft in a fully insulated manner.

2. The combination of claim **1**, wherein said element has a lateral slit through a side thereof, said slit extending lengthwise of the element.

3. The combination of claim **2**, wherein said element is of an effective diametral size with respect to said handle recess such that said slot must be substantially narrowed by circumferentially squeezing said element in order to insert the same into said handle recess, said element having an inherent plastic memory toward its open-slot condition for biasing portions of the element outwardly against portions of the inside of the said recess, to hold said handle in place upon said element.

4. The combination of claim **3**, wherein said cavity inside said element is of a diametral size with respect to said control shaft such that when the element is circumferentially squeezed to substantially close said slot, said cavity is contracted firmly about the outer periphery of said shaft.

5. The combination of claim **1**, wherein said connector element has at least two of said ridge means located symmetrically about the outer periphery thereof; wherein said handle recess has at least two of said enlargements, each located to receive one of said ridge means; and wherein said air gaps are located between said symmetrically disposed ridge means and recess enlargements.

6. In combination, a manual operating handle and a heat-insulating connector element for use in attaching said operating handle to a control shaft which becomes heated in use, said combination comprising: a handle having a hub-like rear extremity, including a recess in said extremity having a lateral enlargement; a generally tubular, bar-like connector element of heat-resistant insulating material; said element having a lengthwise internal cavity therein of a particular non-round cross-sectional shape of a size sufficient to slidably receive said control shaft, for non-rotatively engaging said shaft; said element further having at least two ridge means on its outer periphery extending laterally thereof a distance greater than other portions of its said periphery; said element having a longitudinally smooth external periphery such that it is slidably insertable into said handle recess with said lateral enlargement receiving said ridge means; and said element having a lengthwise extent sufficient to substantially fill said recess along its length, wherein said element further has a diametral size sufficient to substantially fill said recess across its diameter and having portions, including said ridge means portions, making contact with said handle at at least two spaced positions around the periphery of said recess, and wherein said handle recess and the periphery of said element are relatively shaped to define a plurality of air gaps between positions of mutual contact, for helping to isolate the heat of said shaft from said handle whereby said handle is non-rotatively connected to said shaft in a fully insulated manner.

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