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## Embedded strain-relief on box with poka-yoke for main cord\_ ID-05663

Dragan Raus

### 1. Summary of the disclosure

The invention relates a method for fixing of a power supply cord within the plastic box of cooking appliance by the application of the strain-relief with poka-yoke solution and indication on plastic protection box.

More specific, the solution is based on the main cord guidance through the specific configuration of certain number of bosses and ribs, in proximity of wire connection relief, with the scope to arrange a certain number and forms of cord's successive curvatures fit the ribs and bosses configuration, enabling a sufficient level of friction force on the cord to fix it..

Accordingly, the invention provides a method to fix the main cord on the appliance without strain-relief clamp application, excluding by this the specific time and costs for its assembling and quality control testing. Moreover, the method enables the main cord fixing without tightening and possible mechanical damaging of the same.

### 2. Applicable Patent categorization

A47H 11/06	Cord pulleys cable;
A47H 3/04	Automatic cords clamp;
A47H 3/00	Fastening clamping or guiding device;
H02G 15/22	Cable terminations;

### 3. Technology domain

The invention relates to a method of the main cord fixing on a home appliance structure, without use of strain-relief clamps nor a separate work, tool and time for assembly and quality control.

### 4. References

#### **1. WO2015144296A1 Cable holder arrangement**

##### **Abstract**

The invention relates to a cable holder arrangement with a cable holder and a cable maintained therein. Said cable holder comprises at least one projection protruding in the direction of the cable. Said projection engages in a recess introduced into a cover of the cable for holding the cable in a tension-proof manner. The invention also relates to a cable holder of said cable holder arrangement and to a method for producing the cable holder arrangement.

## **2. EP2221947B1 Electrical apparatus.**

### **Abstract**

A cable is sandwiched between a first inner wall surface of a peripheral-wall-side pressing wall portion and a first inner wall surface of a cap-side pressing wall portion, between a second inner wall surface of the peripheral-wall-side pressing wall portion and a second wall surface of the cap-side pressing wall portion, and between a third inner wall surface of the peripheral-wall-side pressing wall portion and a third inner wall surface of the cap-side pressing wall portion to crank the cable to form a cranked portion of the cable. The peripheral-all-side pressing wall portion and the cap-side pressing wall portion sandwich the cranked portion therebetween. Thus, defective soldering may be prevented between a plurality of lead wires and a core-wire soldered portion to which core wires of the lead wires are soldered and connected.

## **3. FR3023986A1 Improved connection device for armored cable**

### **Abstract**

This device for connecting a cable blind on a housing comprises an electrically conductive tip (carried by the housing and intended to be brought into contact with a screening sheath (16) of the substantially tubular cable. The electrically conductive sleeve is contacted with waterproof shielding sleeve and the conductive tip and the sleeve forms a bridge between a sheath of tightness the cable and an electrical insulation sheath. The device comprises complementary axial immobilization means, of the sleeve relative to the endpiece carried by said sleeve (20) and said endpiece.

## **5. Problem to be solved**

Positioning and fixing of the main cord to the home appliance structure requires a reliable method, in order to protect a wire connections, and prevent the damage of the cord itself. For a long time, a technically reliable method for the main cord fixing to the appliance has been based on application of the terminal block (strain-relief clamp).

Accordingly, this approach, based on tightly, by screws assembled one or two-piece clamps, has been applied effectively. However, the method requires the specific assembly work, time and tools, as well as the final testing approach.

Moreover, the method is related with clamps and screws correct assembling and tightening approach. In case of the clamps overtightening effect, the same could fray the cord insulation, expose the wire and cause an electric fire.

## 6. Proposed solution

The present invention solves the above-mentioned problem of the main cord positioning and fixing within the appliance el. box without the application of the screwed assembling strain relief (clap and/or clamps) of cord. The solution is based on multiple bending and guiding of main cord terminal part, within the embedded strain-relief with poka-yoke approach for the same.

In an embodiment of invention, in the proximity of wire connections, within the appliance structure, the strain-relief effect comprises the main cord multiple curvature form and multiple lateral contact (within the plain of curvature) with the guiding elements which determinate the cord semi-rigid positioning within the specific channel configuration, defined by the number of bosses and their mutual disposition as well as the position, length and orientation of the embedded ribs, guide the cord so that cord obtain certain number of successive curvatures of certain radius and opposite orientation, being permanently in contacts with mentioned elements embedded on plastic box surface.

This embedded strain-relief form on appliance box surface, with a poka-yoke approach, is in strong relation with main cord technical characteristics: diameter, flexibility, surface insulation material characteristics and elasticity at room temperature as well as the number of applied bosses, and their geometry (conical, cylindrical and others) including the number of applied ribs (length, orientation, connection with bosses..).

Moreover, the above mention embedded strain-relief configuration, based on mutual bosses position and their connection obtained by ribs, enables the poka-yoke main cord guidance for the cord fixing effect, obtained without screwed clamps assembly and relative tightening, when the cord is placed in certain position within the poka-yoke strain-relief. Means, for the scope of cord fixing in proximity of wire connection, the cord needs to be placed within the bosses and ribs channel geometry, completely, through the all the predicted channel length and its highness, following the gutter configuration geometry.

Accordingly, the cord inlet guidance elements, performed in the form of hook profiles of opposite orientation are placed before the strain-relief configuration, with the scope to give to cord the right inlet orientation before the strain relief. By the mentioned is reduced the possibility of cord pulling out from strain relief configuration and sustained a more regular cord secure effect. Moreover, this manner of the main cord fixing is rapid and does not require additional assembling elements nor the tools application or testing approach, while the quality of performed work is obtainable by the visible control, only.

## 7. Description

In the preferred embodiment of the invention, a main cord fixing solution, comprises a poka-yoke main structure for the scope of cord reliable secure without assembling steps, tool, time and relative control activity.

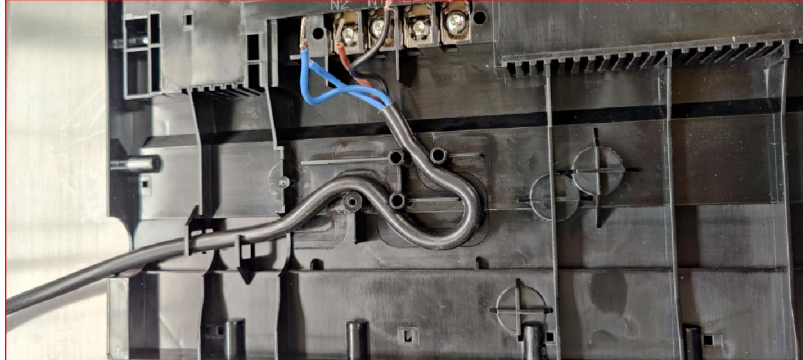


Fig. 1.: The main cord configuration within the bosses and ribs.

The solution is formed as shown in (Fig. 1), from a poka-yoke cord guidance elements enable the main cord fixing effect, based on certain number of the cord bindings within the embedded bosses and appropriately placed and oriented ribs. Means, obtainment of certain strain-relief effect of the main cord in combination with adequate poka-yoke configuration in a proximity of wire connection within the home appliance configuration itself.

The main cord fixing approach and relative strain-relief effect are obtained through the guiding the main cable within the matrix of bosses and ribs, embedded on the wall of appliance structure plastic box.



Fig. 2.: The bosses and ribs cord guiding elements configuration

The same, bosses and ribs, generate a specific configuration of channels (Fig. 2.), characterized by number of elbows and certain number of channel segments itself, characterized by their specific lengths and orientation, within the poka-yoke matrix structure itself.

The effect of strain relief and cord mechanical fixing on appliance structure is obtained by placing the cord within the poka-yoke channels configuration, where the cord, placed within the same configuration, needs to be more time curved, in series, with opposite curvature character, touching more times the channel structure creates the friction effect with cord itself, exceeds the cord's required strain relief threshold, enabling the cord fixing connection to the appliance structure and wire connection successively.

In addition, the dimension of poka-yoke matrix structure, the span of channels and length as well the bosses positions and their total number are related with the main cord technical parameters (e.g. cross-section dimensions, rigidity and surface layer friction coefficient).

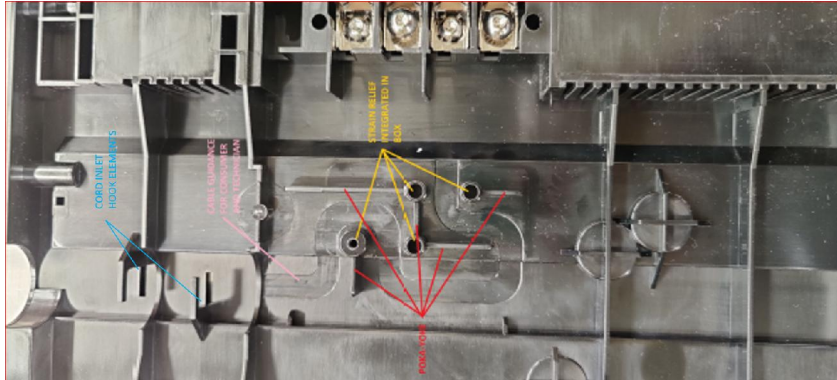


Fig. 3.: The poka-yoke strain-relief configuration with the cord inlet orientation hook profiles

Accordingly, the configuration matrix of bosses and ribs as well as their relative dimensions and positions within the same configuration, means that lengths of channels and their orientation (Fig. 2.), are related with strain-relief threshold force should be ensured through the poka-yoke cord guiding design itself.

In an alternative embodiment of invention, the strain-relief effect of main cord fixing comprises two inlet guiding hook profiles (Fig.3.), embedded on box wall. These elements, embedded in front of poka-yoke configuration, oppositely oriented, enable main cord inlet orientation into poka-yoke strain relief structure.