

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) A SOLDER-ABSORBING WICK AND A METHOD OF MANUFACTURE THEREOF

(71) I, JESSE CARL HOOD, Jr. of 1023 Locklayer Street, San Dimas, California, United States of America; a citizen of the United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is concerned with the provision of a wick made of braided metal strands, the wick being for the purpose of drawing up molten solder.

Solder-absorbing wicks are used to quickly and economically remove solder from a joint. Such wicks are made of metal strands braided to provide a capillary structure. In operation, the wick is placed on the solder joint and the joint is heated through the wick with a soldering iron. The solder melts and is drawn up into the wick by capillary forces.

Such wicks are generally made of copper, for its heat conducting property, and flux is applied to the soldered joint prior to contact with the wick to improve the wetting properties of the solder. Solder-absorbing wicks have recently been provided with an overcoating of corrosive flux so that flux need not be separately applied to the soldered joint. However, it has been found that when copper wicks are merely overcoated with this flux, they tend to rapidly corrode and have a short shelf life. Accordingly, the wicks are usually precoated with tin or other non-corrosive metal prior to being overcoated with flux. Such precoating substantially increases the cost of the wicks.

According to a first aspect of the present invention a wick consists of braided copper strands, for drawing up or absorbing molten solder by capillary action, the braid having an exterior surface of copper directly in contact with and substantially entirely coated with a non-corrosive flux.

According to another aspect of the present invention a method of making a wick accord-

ing to the first aspect of the invention comprises the step of contacting the braided copper strands with a volatile solution of the non-corrosive flux and volatilising the solvent, said solvent having a sufficiently low surface tension that the exterior surface of the braid is substantially entirely coated with the flux when the solvent is volatilised, yet the wick retains sufficient capillarity to draw up molten solder.

In specific embodiments, the flux is rosin and the solvent portion of the flux solution is substantially more volatile than water. In a particular embodiment the solvent has an atmospheric boiling point of less than 85°C. In other particular embodiments, the solvent has an air contact surface tension of less than 30 dynes/cm.

Figure 1 is a perspective view of a soldered joint on a printed circuit board from which the solder is to be removed;

Figure 2 is a perspective view of a solder-absorbing wick of this invention in operation, removing the solder from the connection of Figure 1;

FIGURE 3 is a perspective view of the unsoldered wire and strip components of FIGURE 1 following removal of the solder connecting them;

FIGURE 4 is a plan, close-up view of the solder-absorbing wick depicted in FIGURE 2; and

FIGURE 5 is a diagrammatic representation of a process for coating the wick.

Referring to FIGURES 1 and 3, a printed circuit board 10 is shown having a printed, connecting strip 12 thereon adjacent a lead hole 14 (FIGURE 3) from which protrudes a copper wire 16 from a component (not shown) affixed beneath the board 10. A globule of solidified solder 18 (FIGURE 1) connects the wire 16 to the connecting strip 12.

In the event of a faulty joint, or for any other reason, one may remove the solder globule 18 by utilizing a solder-absorbing wick 20 of this invention. Referring to FIGURE 2, a rolled-

up length of solder-absorbing wick 20 is shown with an end 22 thereof overlying the solder globule 18. A hot soldering iron tip 24 (rated at about 40—50 watts) is placed atop the wick end 22 so that its heat is transferred to the solder globule 18. After a moment of such contact the solder globule 18 melts and is immediately drawn up into the wick end 22 by capillary action. The wick end 22 and soldering iron tip 24 are removed simultaneously to leave the wire 16 and connecting strip 12 free of solder, as shown in FIGURE 3.

Referring to FIGURE 4, the wick 20 comprises a braid of strands 26 of copper wire, entirely overcoated with non-corrosive flux. In this case, the wire is 40-gauge and the strands 26 are in groups of 4. The wick is braided from a machine having 16 heads so that the wick is 64 strands thick with twenty three tucks 27 per inch. Other grades of copper wire, and braiding patterns can be used, e.g. 96 strands of 44 gauge can be braided in 16 groups of 6 strands, etc.

Referring to FIGURE 5, the somewhat-tubular braided wick 20 is flattened by pressure rollers 28 and from there travels over and under guide rollers 29 into a tank 30 of flux solution 32. From there it travels past a hot air blower 34 and, after drying, to a take-up roller (not shown). If the wick 20 is already in flattened form, the pressure rollers 28 may be omitted.

The flux solution 32 is such as to wet the exterior surface of the wick 20 sufficiently to substantially entirely coat such surface, while retaining the capillary properties of the wick after the solvent is removed. Any of a number of common solvents can be used for this purpose; generally, any solvent for the flux having an air contact surface tension of less than 30 dynes/cm. and which is substantially more volatile than water can be used where time and volume production are important. Solvents having an atmospheric boiling point of greater than room temperature and less than 85°C. are particularly suitable. Such solvents include, acetone, cyclohexane, methyl formate, tert-butyl alcohol, ethyl bromide, vinyl acetate, n-propylamine, ethylene chloride, methyl sulfide, n-hexane, isopentane, methyl acetate, methyl alcohol, n-propyl formate acetyl chloride, carbon tetrachloride, ethyl acetate, ethyl alcohol, methylene chloride, methyl ethyl ketone, ethyl formate, isopropyl alcohol, and the like, and mixtures thereof.

Solvents boiling well below room temperature can also be used, such as dimethylamine or acetaldehyde but appropriate refrigeration should be utilized. Mixtures of solvents can advantageously be used, especially to increase the solubility of the flux.

As flux one can use any non-corrosive flux such as the methyl ester of abietic acid, the methyl ester of primaric acid, or rosin, e.g. pine rosin, or rosin obtained from tall oil by removal of fatty acid components. The rosins are particularly suitable as being highly effective under a wide variety of conditions.

When using a rosin, a particularly effective solution thereof is obtained by dissolving about 25 parts by weight of the rosin in about 75 parts by weight of a 4:1 volume mixture of methyl acetate: methyl alcohol. the braided solder wick can be submerged in such solution for about 0.5—1 second and then dried with the hot air blower 34 to yield a wick having rosin flux substantially completely coating its entire exterior surface and yet retaining the capillary properties of the wick.

The foregoing process allows direct contact between the copper surface of the wick and the flux. Activators are not required as they are for fluxes in contact with tin plated wicks; accordingly, the wick can be used with high quality electrical solder joints with a minimum danger of corroding the joint. The process also allows thinner coatings of flux to be applied to the wick, leaving less residue in use than more thickly coated tin plated wicks.

WHAT I CLAIM IS:—

1. A wick consisting of braided copper strands, for drawing up or absorbing molten solder by capillary action, the braid having an exterior surface of copper directly in contact with and substantially entirely coated with a non-corrosive flux.

2. A wick as claimed in claim 1 wherein the flux is a rosin.

3. A method of making a wick as claimed in claim 1, comprising the step of contacting the braided copper strands with a volatile solution of the non-corrosive flux and volatilising the solvent, said solvent having a sufficiently low surface tension that the exterior surface of the braid is substantially entirely coated with the flux when the solvent is volatilised, yet the wick retains sufficient capillarity to draw up molten solder.

4. A method as claimed in claim 3 wherein the flux is a rosin.

5. A method as claimed in claim 3, wherein the solvent portion of the solution has an air-contact surface tension of less than 30 dynes/cm.

6. A method as claimed in claim 3 wherein the solvent portion of the solution is more volatile than water.

7. A method as claimed in claim 3 wherein the solvent portion of the solution has a boiling point of less than 85°C.



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2. A wick as claimed in claim 1 wherein the flux is a rosin.
3. A method of making a wick as claimed in claim 1, comprising the step of contacting the braided copper strands with a volatile solution of the non-corrosive flux and volatilising the solvent, said solvent having a sufficiently low surface tension that the exterior surface of the braid is substantially entirely coated with the flux when the solvent is volatilised, yet the wick retains sufficient capillarity to draw up molten solder.
4. A method as claimed in claim 3 wherein the flux is a rosin.
5. A method as claimed in claim 3, wherein the solvent portion of the solution has an air-contact surface tension of less than 30 dynes/cm.
6. A method as claimed in claim 3 wherein the solvent portion of the solution is more volatile than water.
7. A method as claimed in claim 3 wherein the solvent portion of the solution has a boiling point of less than 85°C.

8. A solder-absorbing wick or a method of making it, substantially as described with reference to the accompanying drawings.
POTTS, KERR & O'BRIEN.

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