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EP 0212911 A2

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(54) Abstract Title
Nozzle for soldering apparatus

(57) A nozzle for a soldering apparatus of the type in which solder 12 is pumped through the nozzle 8 to overflow the nozzle outlet 10, providing a solder surface into which leads can be dipped, has a region 16, preferably of iron, at the outlet 10, which is wetted by the solder. The remainder of the outlet is of non-wetted material, preferably stainless steel. The solder flow will be confined to the wetted region, providing a more clearly defined flow, and hence enabling soldering in more restricted areas.

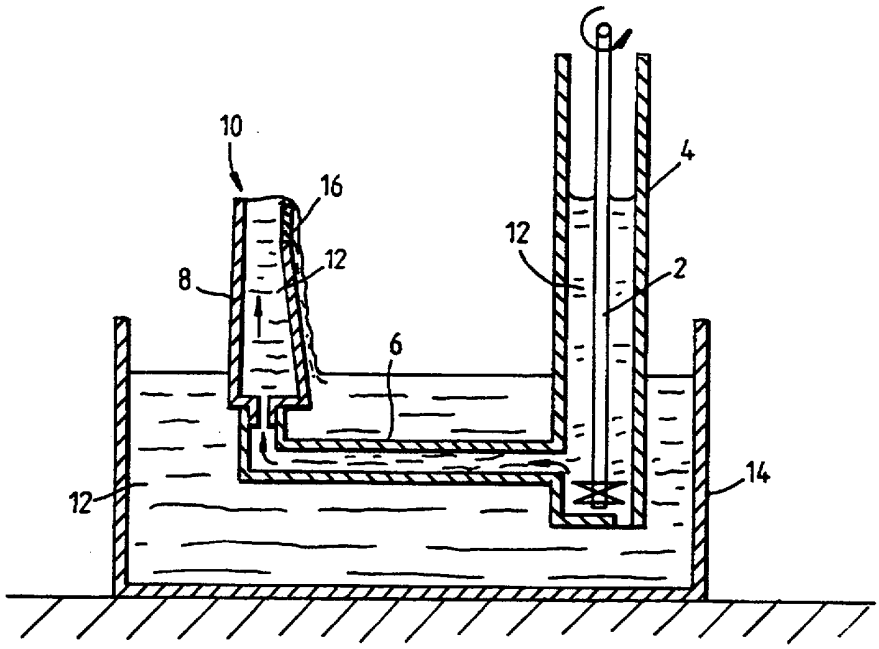

Fig. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

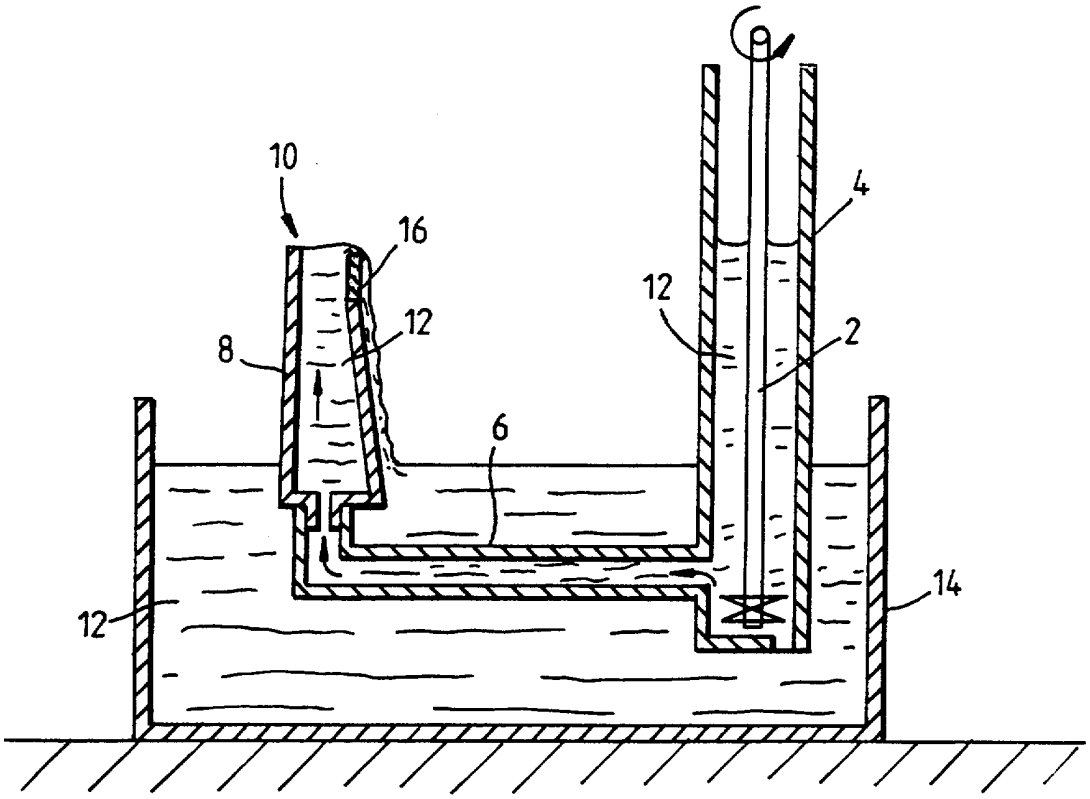

Fig. 1

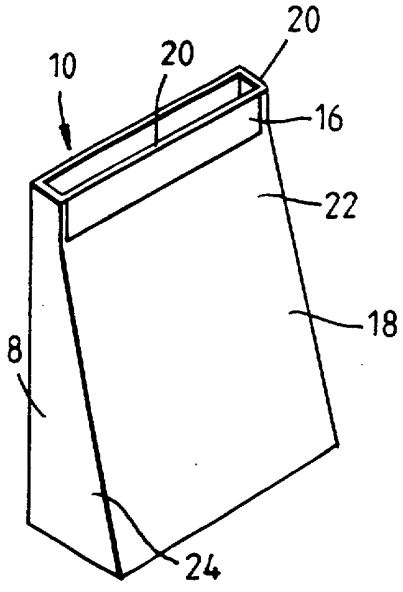

Fig. 2

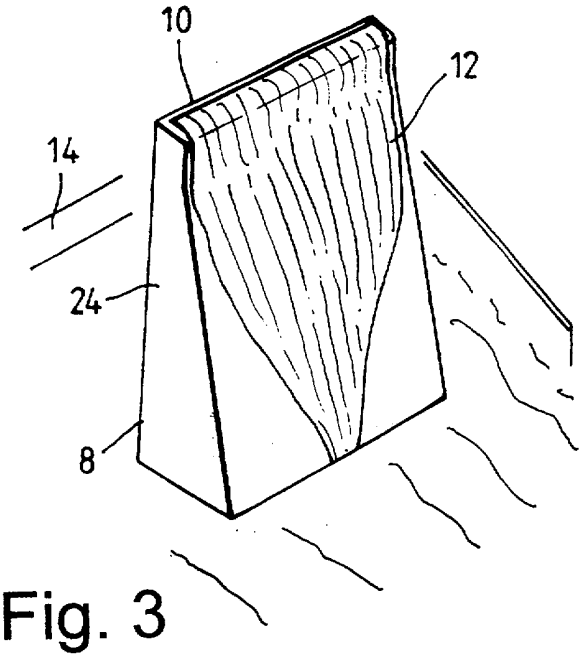

Fig. 3

M&C Folio: GBP82045 Document #: 500428

Nozzle for Soldering Apparatus

The present invention relates to a nozzle for soldering apparatus, particularly for dip soldering apparatus. Such apparatus is described in EP-A-212 911, EP-A-481 710 and EP-A-564 096, for example.

In such apparatus, one way of providing a fresh surface of molten solder is to pump solder up from a solder bath and through a generally vertical nozzle. The solder overflows the nozzle and is returned to the bath.

For many applications a relatively large nozzle, that is having at least one horizontal dimension more than one or a few centimetres, is required. When solder oveflows such nozzles, it is difficult to maintain a steady stream. In particular, the flow of solder will fluctuate at the nozzle edges due to the solder intermittently flowing over side walls of the nozzle. When designing a soldering process this intermittent flow must be taken into account. Thus, a significant free area; or margin, must be provided around the leads which are to be soldered, to allow for the variable surface area or lateral extent presented by the solder overflowing the nozzle.

The present invention provides a nozzle for a soldering apparatus, the nozzle being formed at least at its outlet by a first material which is not wetted by the solder, and a second material which is wetted. The solder, as it oveflows the nozzle outlet, will flow over the region of the second material, and the solder stream will be inhibited from flowing over the region of the first material. In this way, the solder flow is constrained to a more clearly defined area and so a smaller free area is required around leads or components to be soldered.

The invention will be further described by way of example with reference to the accompanying drawings, in which,

Figure 1 is a schematic view of a soldering apparatus according to the invention,

Figure 2 is a perspective view of a nozzle for the apparatus of figure 1, and

Figure 3 illustrates the nozzle of Figure 2 in use.

Figure 1 shows an apparatus of the type generally seen in EP-A-212 911.

An impeller 2 in a pump housing 4 pumps solder 12 along a conduit 6 and up through a nozzle 8, until the solder overflows the nozzle outlet 10. The solder 12 is contained in a bath 14 which is heated by a heater (not shown) to keep the solder at soldering temperature. Typically the solder bath 14 will include a cover (not shown) and/or be contained in an inert gas atmosphere. Such a construction is well known in the art.

Figure 2 illustrates the nozzle 8 in more detail. In accordance with the invention, the nozzle 8 is provided at its outlet 10 with an insert 16 of a material which is wetted by the solder 12, in this the insert is of case of pure iron.

The body 18 of the nozzle 8 is formed of stainless steel, in this case 316ST, which is not easily wetted by the solder 12.

In the embodiment illustrated, the insert 16 provides the full thickness of the nozzle wall at the nozzle outlet 10. However, it could be provided as a surface covering, extending over the lip or upper edge 20 of the outlet 10 and down the front surface 22. The insert 16 can be held in place by gluing, welding, or mechanically by screws or a form-locking connection, for example.

As shown in Figure 3, the solder 12 overflows the nozzle outlet 10 and is drawn by surface tension effects to flow over only the area of the insert 16 at the outlet 10. Without the insert 16, there is a tendency for the overflowing solder to flow over the

side walls 24, as well as front wall 22. Hence, the horizontal surface area occupied by the solder at the nozzle outlet is more closely defined and it is possible to solder leads with other components in close proximity.

It will be appreciated that the lip 20 may be slightly lower at the insert 16 to help facilitate flow of the solder over the insert 16 during start up.

Although described with respect ot a relatively large nozzle, the invention also has use with small nozzle sizes. Various modifications may be made. For example, the insert 16, may be replaced by a surface coating of material which is wetted by the solder. It is desired to include all such modifications as fall within the scope of the accompanying claims.

CLAIMS:

1. Soldering apparatus comprising a bath for containing molten solder, a nozzle having an outlet, and a pump for pumping the solder through the nozzle to overflow the nozzle outlet, wherein the surface of the nozzle at the outlet is formed by a first area of material which is not wetted by the solder and a second area of material which is wetted by the solder.

2. Apparatus as claimed in claim 1, wherein the first area is of stainless steel.

3. Apparatus as claimed in claim 1 or 2, wherein the second area is of iron.

4. Apparatus as claimed in claim 3, wherein the iron forms part of a wall defining the nozzle outlet.

5. Apparatus as claimed in cliam 5, wherein the apparatues is a dip soldering apparatus.

6. A nozzle for a soldering apparatus, the nozzle having an outlet, wherein the surface of the nozzle at the outlet is formed by a first area of material which is not wetted by the solder and a second area of material which is wetted by the solder.

7. A nozzle as claimed in claim 6, wherein a portion of the external surface of the nozzle at the outlet is formed of material which is wetted by the solder.

Application No: GB 0006402.2 **Examiner:** Dr Steve Chadwell
Claims searched: 1-7 **Date of search:** 3 November 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B3R (RDC, RDE, RFG, RGA)

Int Cl (Ed.7): B23K 1/08, 3/06

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2146564 A	(DOLPHIN MACHINERY)	
A	GB 2008013 A	(FRY'S METALS)	
A	GB 1110892	(BRITISH AIRCRAFT)	
A	EP 0212911 A2	(DOLPHIN MACHINERY)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.