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(58) Field of Search

UK CL (Edition M ) H1R RAH RAS RAV

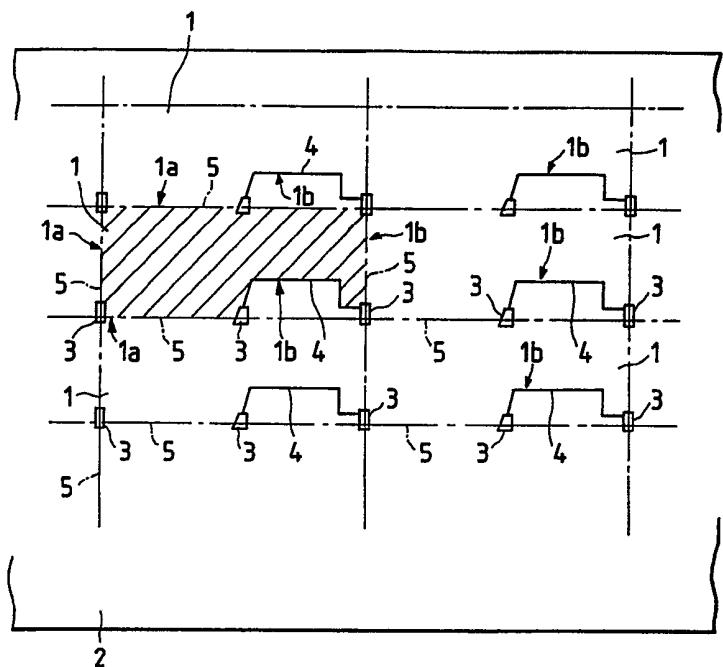
INT CL<sup>5</sup> H05K 3/00

Online databases:WPI

## (54) Production of printed wiring boards

(57) A process of obtaining printed wiring boards (1) by blanking from a printed board material (2) when adjoining printed wiring boards have portions similar in configuration to one another. The adjoining printed wiring boards (1) are laid out so that their portions (1a) similar in configuration to one another have a common outline. After contoured portions (1b) not in conformity with the common outline are cut off using a press or cutting-off tool, the portions (1a) similar in configuration to one another are cut. Since scrap slag is produced in only the contoured portions (1b), material waste is decreased.

FIG. 1(A)



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FIG. 1(A)

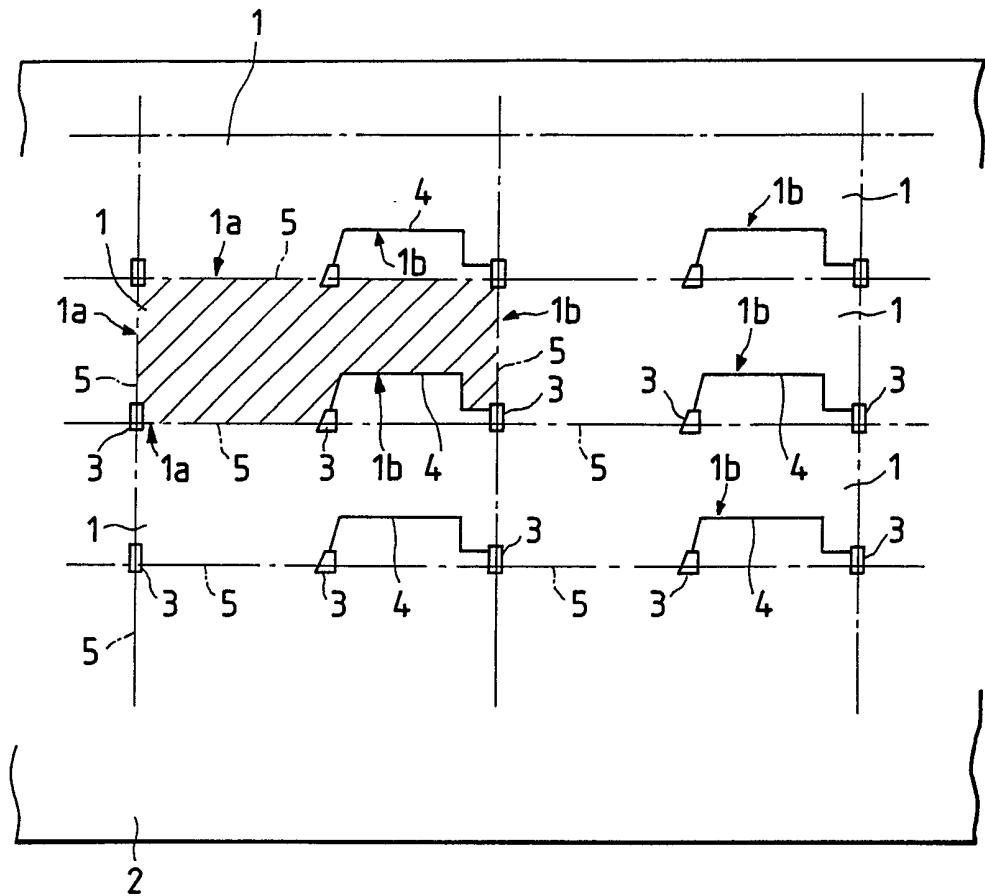


FIG. 1(B)

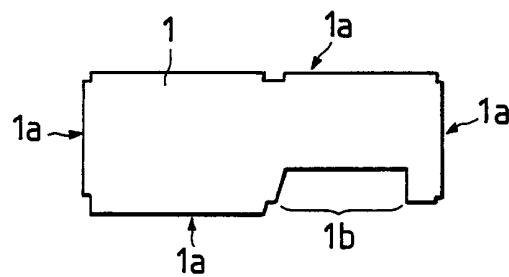


FIG. 1(C)

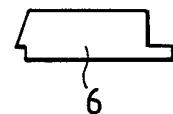


FIG. 2

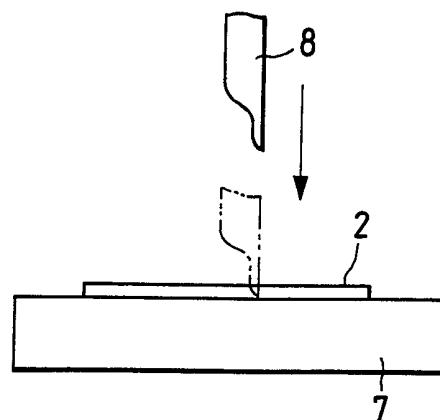


FIG. 3(A)

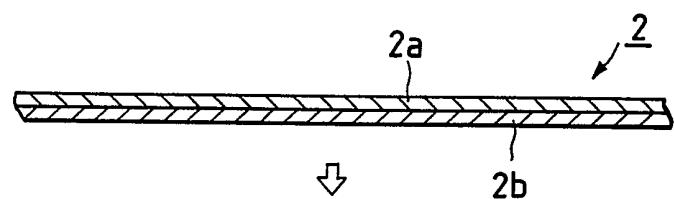


FIG. 3(B)

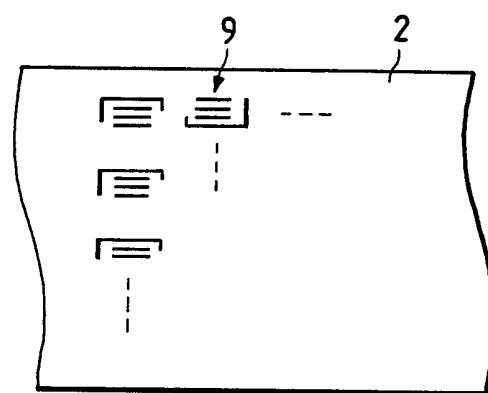


FIG. 3(C)

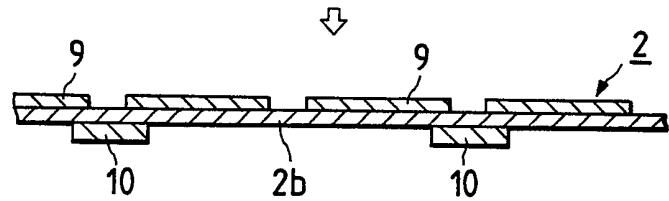


FIG. 4(A)

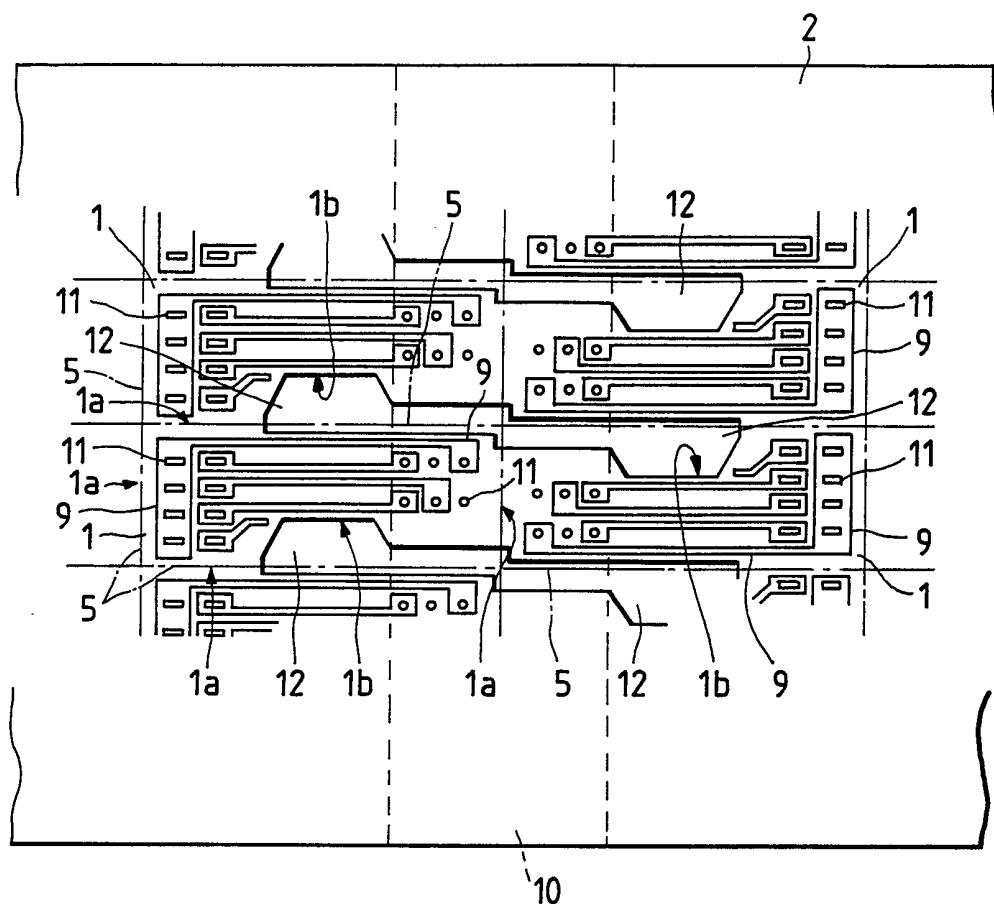


FIG. 4(B)

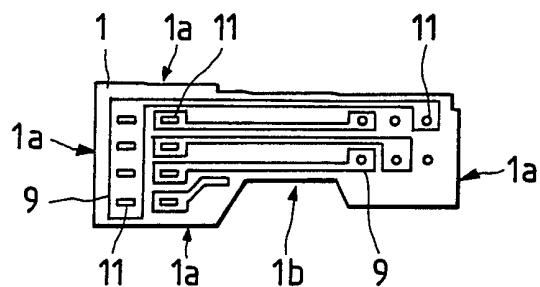


FIG. 5(A)

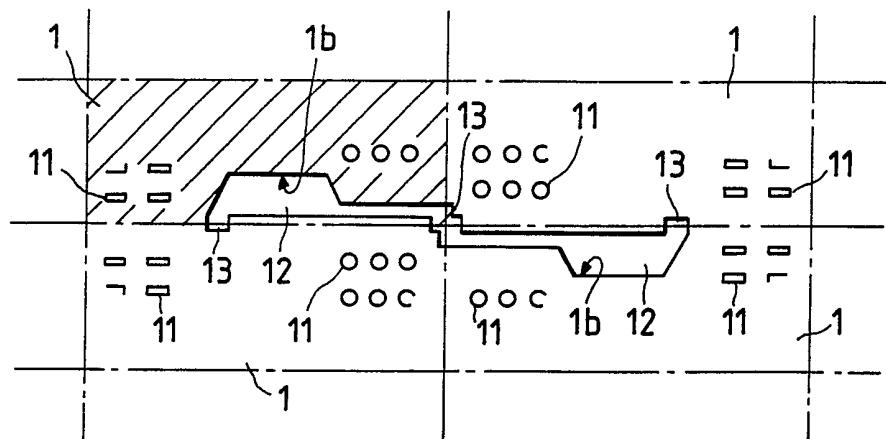


FIG. 5(B)

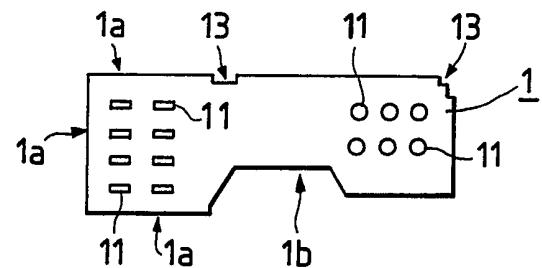


FIG. 6

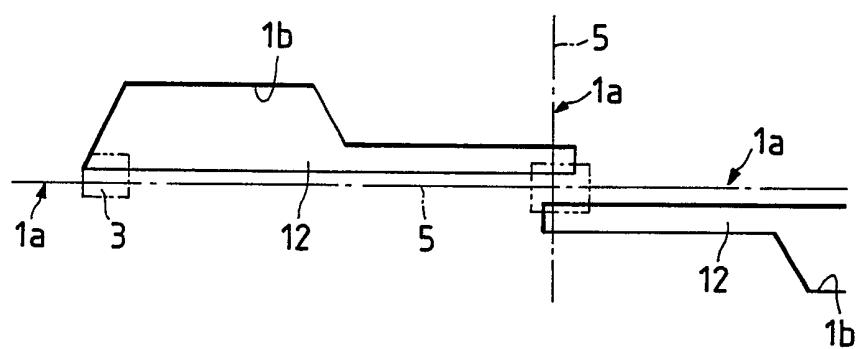


FIG. 7(A)

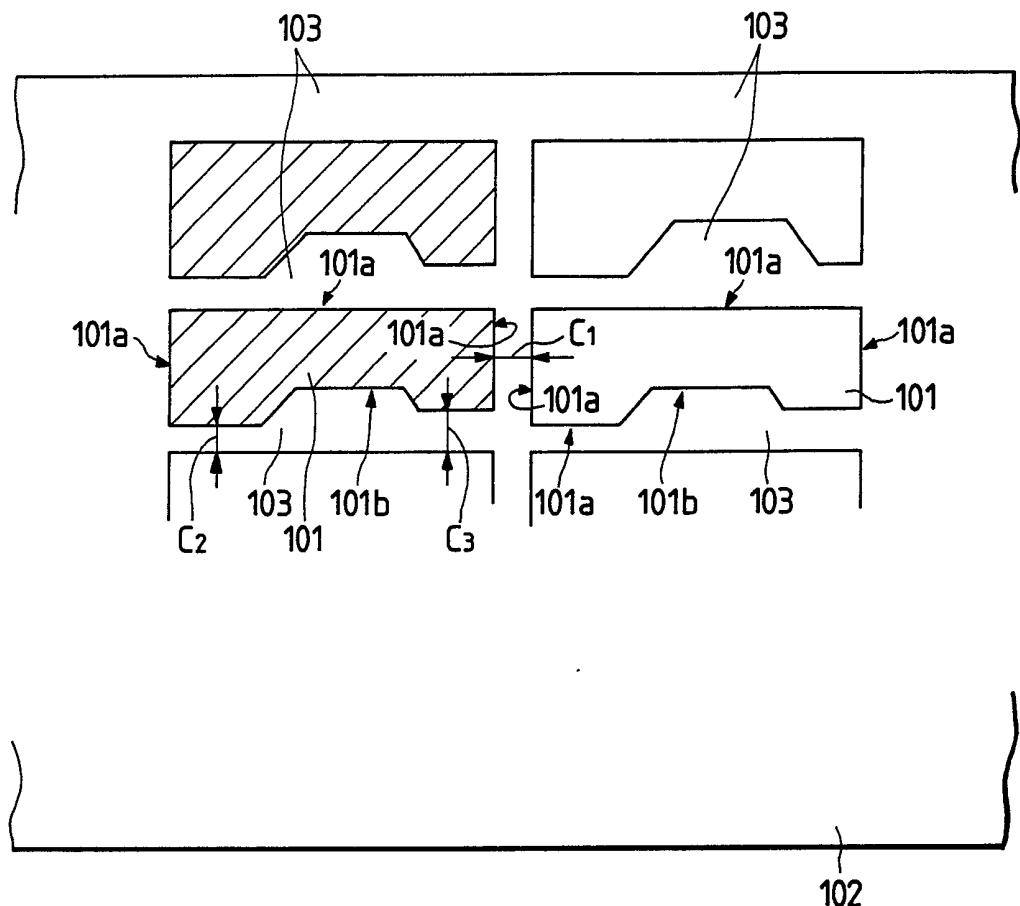
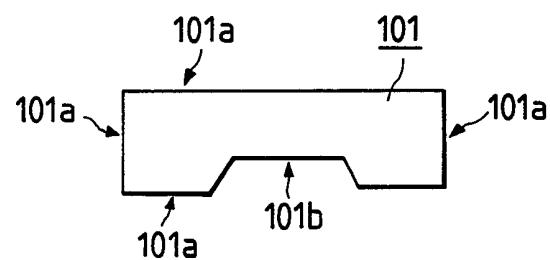


FIG. 7(B)



## PROCESS OF PRODUCING PRINTED WIRING BOARDS

BACKGROUND OF THE INVENTIONField of the invention

The present invention relates generally to methods of producing printed wiring boards. More particularly, the present invention relates to an improved method of producing a number of printed wiring boards by blanking, especially flexible printed circuits (FPC) having copper foil patterns on flexible base films, from a large printed board material, when adjoining boards have portions similar in configuration to one another.

Related Art

Small printed wiring boards have conventionally been obtained by blanking from one large sheet of printed board material 102. In this case, numerous printed wiring boards 101 are laid out with proper clearances C1 left therebetween as shown in Figs. 7 (A) and (B), so that they are prevented from overlapping one another.

In the conventional process of manufacture, a forming press is used to obtain substantially square printed wiring boards 101 by blanking from the sheet of printed board material 102 prepared by forming numerous copper foil patterns (wiring circuits) on a beltlike base film. Such a press is normally equipped with punches and dice having cutting plane lines

continuously following the substantially square contours 101a and what is denoted by 101b of the printed wiring board 101.

In the aforementioned process of manufacture, however, the use of the forming press necessitates securing some spaces 5 C1 ~ C3 around the printed wiring board 101 for blanking purposes and allows scrap slag 103 having a large area to be left in the printed wiring board 102. Therefore, there arises a problem of making it inefficient blanking the printed wiring boards 101 out of the sheet of printed board material, thus 10 causing material waste.

An additional problem is that the use of the forming press requires employing tools complicated in contour to deal with the profile of such a printed wiring board.

#### SUMMARY OF THE INVENTION

15 An object of the present invention is therefore to provide a process of producing printed wiring boards from a printed board material by blanking efficiently without waste and the process thereof which requires no tools complicated in contour.

20 In order to accomplish the object, a process of producing a number of printed wiring boards by blanking from a printed board material comprises the steps of: laying out the adjoining printed wiring boards so that when they have portions similar in configuration to one another, these portions may 25 have an outline common to them and after cutting off contoured

portions not in conformity with the outline common thereto using a press or cutting-off tools beforehand, cutting off and separating the portions similar in configuration to one another.

5 Therefore, the plurality of printed wiring boards which have thus been cut off are separated without being accompanied by scrap slag therebetween. As the portions different in configuration are cut off with the cutting-off tools or the press along their contours beforehand, the printed board material between cutting plane lines passing the common outward portions and breaks along the contours of the portions different in configuration is isolated from the printed wiring boards as the scrap slag immediately after the common outward portions are cut off.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 (A) is showing a plan view of a blank layout under a process of producing printed wiring boards of a first embodiment of the present invention:

Fig. 1 (B) is showing a plan view of a separated printed wiring board;

Fig. 1 (C) is showing a plan view of scrap slag;

Fig. 2 is showing a A diagram illustrative of cutting-off work of the present invention;

Fig. 3 (A) is showing a sectional view prior to preparing conductive patterns in steps of producing a printed board material (FPC);

5 Fig. 3 (B) is a plan view of FPC after the conductive patterns are prepared;

Fig. 3 (C) a sectional view of FPC with reinforcing plates bonded thereto.

Fig. 4 (A) is a plan view of a blank layout according to a second embodiment of the present invention; and

10 Fig. 4 (B) is a plan view of a separated printed wiring board;]

Fig. 5 (A) is a plan view of a blank layout according to a third embodiment of the present invention: (A) a plan view;

15 Fig. 5 (B) is a a plan view of a separated printed wiring board;

Fig. 6 is a plan view of a modified example of the embodiment of Figs. 5 (A) to (C);

20 Fig. 7 (A) is a plan view of a blank layout under a conventional process of producing printed wiring boards; and

Fig. 7 (B) a plan view of a printed wiring board formed by blanking.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 to 6, a description will 25 subsequently be given of a process of producing printed wiring

boards embodying the present invention. The following embodiments of the present invention refer to a case where the aforementioned process is applied to FPC with a flexible plastic film as a base material.

5       First, a printed board material 1 will be described. FPC as a printed board material 2 is, as shown in Fig. 3(C), prepared by forming conductive patterns 9 with copper foil 2a on a base film 2b made of polyimide resin or the like. For example, pattern resist is printed by screen printing onto the 10 copper foil 2a on the base film 2b structured as shown in Fig. 3(A) before being etched to form the desired conductive patterns 9. Then reinforcing plates 10 made of polyethylene resin are bonded, if necessary, onto the underside of the base film 2b. In this manner, printed wiring boards 1 are obtained 15 from the printed board material 2 with numerous conductive patterns 9 formed on one sheet of base film 2b as follows:

Referring to Figs. 1 (A) to (C) and 2, a description will be given of a process of producing printed wiring boards embodying the present invention in the first place.

20       When adjoining printed wiring boards have portions different in configuration from one another, the portions are cut off with cutting-off tools beforehand according to the present embodiment. First, the printed wiring boards are, as shown in Fig. 1, laid out on the printed board material 2 in 25 such a way that when the adjoining printed boards have portions similar in configuration to one another, the portions, that is,

square portions 1a have a contour common to them according to the present embodiment.

Then holes 3 for preventing interference are punched with a press or the like in corners where points of contact between the square portions 1a of the adjoining printed wiring boards 1, and between the square portions 1a and the contoured portions 1b thereof, respectively. The holes 3 are used to prevent interference when the adjoining printed wiring boards are cut along their contours.

Subsequently, the contoured portion 1b situated between the holes 3 for preventing interference in the printed wiring board 1 is cut off. This cutting-off work of the present invention is, as shown in Fig. 2, done by pointing a tool 8 having a knife edge against the printed board material 2 mounted on a die 7. In this case, the punching of the holes 3 for preventing interference may be made after the cutting-off work.

Further, the printed board material 2 is continuously cut with the cutting-off tools, rotary round teeth or the like along square cutting plane lines 5 passing the square outward portions 1a of the numerous printed wiring boards 1 to be cut out. At this time, the printed board material between the square cutting plane lines 5 passing the substantially square common outward portions 1a and cuts 4 along the contours of the contoured portions different in configuration is isolated from the printed wiring boards 1 as scrap slag 6. The printed

wiring boards 1 are also separated from each other. When the printed board material is cut, the cutting-off tools, the rotary round teeth or the like is allowed to freely pass through the punched holes 3 for preventing interference.

5 Since the adjoining printed wiring boards are so laid out that their square portions 1a have a contour common to them according to the present embodiment, no scrap slag 6 is produced in between the external square portions 1a of the printed wiring boards 1, whereas such scrap slag 6 is only 10 produced in between the contoured portion 1b and the external square portion 1a of another printed wiring board 1. Therefore, the amount of scrap slag becomes reducible and this results in increasing the efficiency of utilizing the printed board material 2. Moreover, the scrap slag cut out together 15 with the printed wiring boards 1 is prevented from being left in the printed board material 2 which may look like a worm-eaten belt and as the scrap slag is totally separated in the form of a chip, it is readily processible afterward.

Unlike the conventional form blanking by means of a 20 press, any tool having a complicated cutting plane line following the square portions 1a and the contoured portion 1b can be dispensed with and this makes simple tools usable for working.

25 While the provision of dice complicated in configuration becomes unnecessary, the production cost becomes reducible partly because the efficiency of utilizing the

material is improved and partly because scrap slag is readily processible afterward.

Referring to Figs. 4 (A) and (B), a second embodiment of the present invention will be described. According to 5 present embodiment, the contoured portion 1b is formed with the contour of the opening bored by blanking with a press beforehand.

According to present embodiment, such a press is used to form the contoured portion 1b of each printed wiring board 10 1 by blanking when small holes 1 for use in fitting devices to the conductive pattern 9 on the printed board material 2 are punched by pressing. In order to prevent the failure of the separation between the contoured portion 1b and the square portion 1a due to the deviation of the former from the latter 15 at the time of blanking and cutting, an opening 12 slightly cutting into another printed wiring board beyond the square cutting plane line 5 passing the square portion 1a of each printed wiring board 1 is bored to obtain the contoured portion 1b by blanking.

20 Then the printed board material 2 is continuously cut under the cutting-off process or by the rotary round teeth along square cutting plane lines (shown by alternate long and short dash lines of Fig. 4(A) passing the square portions 1a of the plurality of adjoining printed wiring boards 1 so as to cut 25 off numerous square printed wiring boards 1 continuously as in the case of the first embodiment.

The printed wiring boards 1 according to present embodiment are laid out so that they are set upside down on every other line in the length direction of the printed board material 2 (in the horizontal direction of Fig. 4 (A)). The 5 openings 12 for use in forming the contoured portions 1b of the printed wiring boards 1, 1 in the horizontal direction are made to communicate with each other, whereby they can be formed by blanking at a time. In this case, the blanking of one printed wiring board 1 is therefore set free from interfering that of 10 another.

In the case of present embodiment, no increase in the number of process steps is practically induced since the work of cutting off the contoured portion 1b is done simultaneously with that of punching the small holes 11 for use in fitting 15 electronic parts to the conductive pattern 9.

Referring to Figs. 5 (A), (B) and 6, a third embodiment will be described. According to the present embodiment, the opening 12 for use in forming the contoured portion 1b is made not to cut into another adjoining printed wiring board 1 too 20 much. In Fig. 9, the illustration of the conductive pattern 9 has been omitted.

As shown in Figs. 5 (A) and (B), for example, the opening 12 formed by blanking is allowed to cut into another adjoining printed wiring board 1 in the vicinity of places 25 where the contoured portion 1b intersects the external square portion 1a, whereas the edge of the opening 12 formed by

blanking is caused to remain inside the square cutting plane line 5 in the remaining portion.

In the case of Fig. 6, moreover, holes 3, 3 for preventing interference are provided in the vicinity of places 5 where the contoured portion 1b intersects the external square portion 1a after or before the opening 12 formed by blanking is bored inside the cutting plane line 5. In this case, the printed board material 2 between the opening 12 formed by blanking and the cutting plane line 5 is isolated as scrap slag 10 when the printed wiring boards 1 are cut off along the cutting plane line 5.

Although a description has been given a case where each printed wiring board is square according to the aforementioned embodiments, the present invention is not limited to such 15 contour definition but may be applicable to any other printed wiring board having at least one portion common in configuration to others.

As is obvious from the description given above, the steps of laying out the adjoining printed wiring boards so that 20 when they have portions similar in configuration to one another, these portions may have an outline common to them and after cutting off contoured portions not in conformity with the outline common thereto using a press or cutting-off tools beforehand, cutting off and separating the portions similar in 25 configuration to one another allow scrap slag to be produced in only the contoured portions, thus reducing the amount of scrap

slag by a large margin. As a result, the efficiency of utilizing the material increases while material waste decreases and the production cost is also reducible.

5 Since the scrap slag produced together with the printed wiring boards is in the form of chips, moreover, it is readily processible afterward.

Under the process of producing printed wiring boards according to the present invention, forming tools can be dispensed with, though they may be employed if necessary, which 10 makes it possible to process numerous boards only using simple tools.

CLAIMS

1. A method for producing a number of printed wiring  
2 boards (1) by blanking from a printed board material (2), the  
3 process comprising the steps of:

4 laying out adjoining printed wiring boards (1) so that  
5 when they have portions (1a) similar in configuration to one  
6 another, these portions having an outline common to them;

7 cutting off contoured portions (1b) not in conformity  
8 with the outline common to adjoining printed wiring boards  
9 using one of press or cutting-off tools beforehand; and

10 cutting off and separating the portions similar in  
11 configuration to one another.

1. 2. A method for producing a number of printed wiring  
2 boards as claimed in claim 1, further comprising the steps of:

3 forming a hole (3) in a portion defined between the  
4 portion (1a) similar in configuration to one another and the  
5 contoured portion (1b), the hole for preventing interference  
6 in the printed wiring board being cut off.

1. 3. A method for producing a number of printed wiring  
2 boards as claimed in claim 1, wherein the step of the cutting  
3 off contoured portions includes the cutting-off work.

4. A method for producing a number of printed wiring boards as claimed in claim 2, wherein the step of forming hole includes the cutting-off work.

5. A method for producing a number of printed wiring boards as claimed in claim 1, wherein edge of the contoured portions (1b) is positioned inwardly a line defined by extending from the outline.

6. A method of producing printed circuit or printed wiring boards substantially as described with reference to and as illustrated in any one or more of the Figures of the accompanying drawings.

<b>Relevant Technical Fields</b>		Search Examiner J DONALDSON
(i) UK Cl (Ed.M)	H1R (RAH, RAS, RAV)	
(ii) Int Cl (Ed.5)	H05K 3/00	Date of completion of Search 3 AUGUST 1994
<b>Databases (see below)</b>		Documents considered relevant following a search in respect of Claims :- 1 TO 6
(ii) ONLINE DATABASES: WPI		

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	GB 1474504 (NORTHERN TELECOM) see page 2, lines 1-20	

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