(12) UK Patent Application (19) GB (11) 2 249 876 (13) A

(43) Date of A publication 20.05.1992

(21) Application No 9124547.2

(22) Date of filing 19.11.1991

(30) Priority data
(31) 02313089 (32) 19.11.1990 (33) JP

(71) Applicant
Nippon CMK Corp

(Incorporated in Japan)

1106 Fujikubo, Miyoshi-cho, Iruma-gun, Saitama, Japan

(72) Inventors
Kameharu Seki
Yasuaki Otani
Isamu Kubo

(74) Agent and/or Address for Service
Stevens, Hewlett & Perkins
1 Serjeant's Inn, London, EC4Y 1LL, United Kingdom

(51) INT CL[5]
H05K 13/00

(52) UK CL (Edition K)
H1R RAE

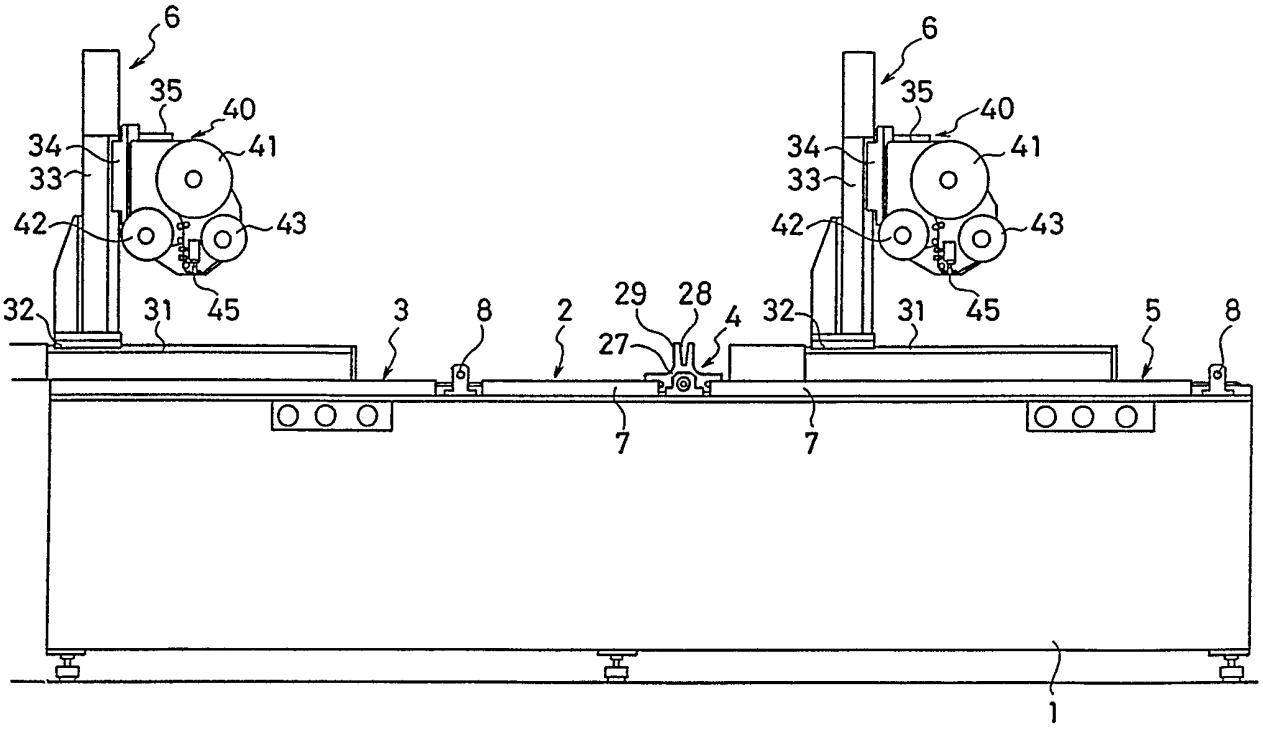
(56) Documents cited
None

(58) Field of search
UK CL (Edition K) H1R RAE RAF RAH RAN RAV
INT CL[5] H05K
On-line databases: WPI

(54) Hole masking in printed board manufacture

(57) A hole masking apparatus for use in the manufacture of a printed wiring board is disclosed. The apparatus comprises spaced apart first and second positioning sections 3, 5 provided on a conveying path 2 of a base material 10 having a plurality of through holes at respective given positions; a masking device 6 provided on each positioning section 3, 5 and having a head 40 operable to paste seals on selected through holes by moving the head 40 in such a manner that the head is positioned over those through holes which do not require plugging up. A reversing section 4 is arranged between the first and the second positioning sections for reversing the face and back of the base material 10 on the conveying path thereof.

FIG. 1



GB 2 249 876 A

FIG. 1

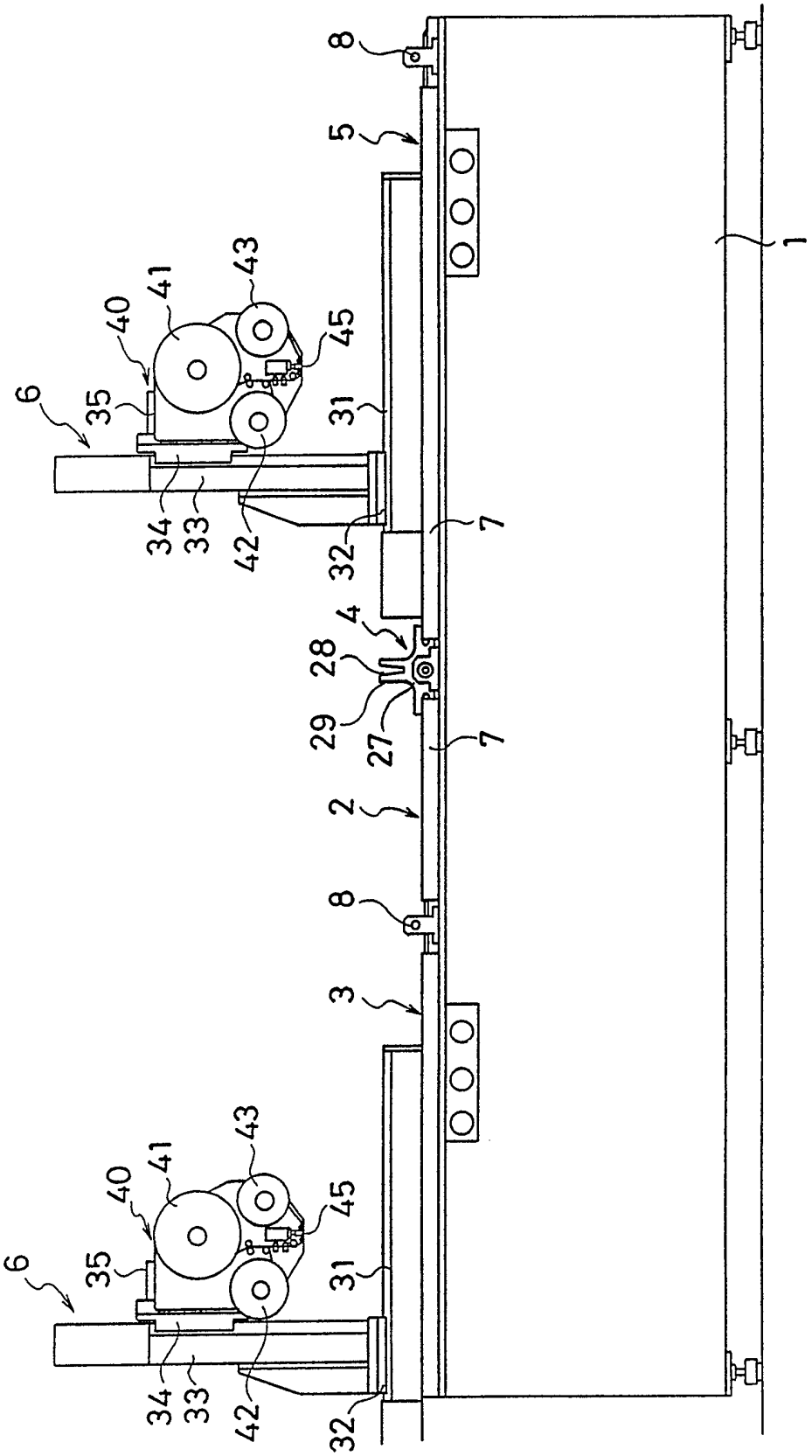


FIG. 2

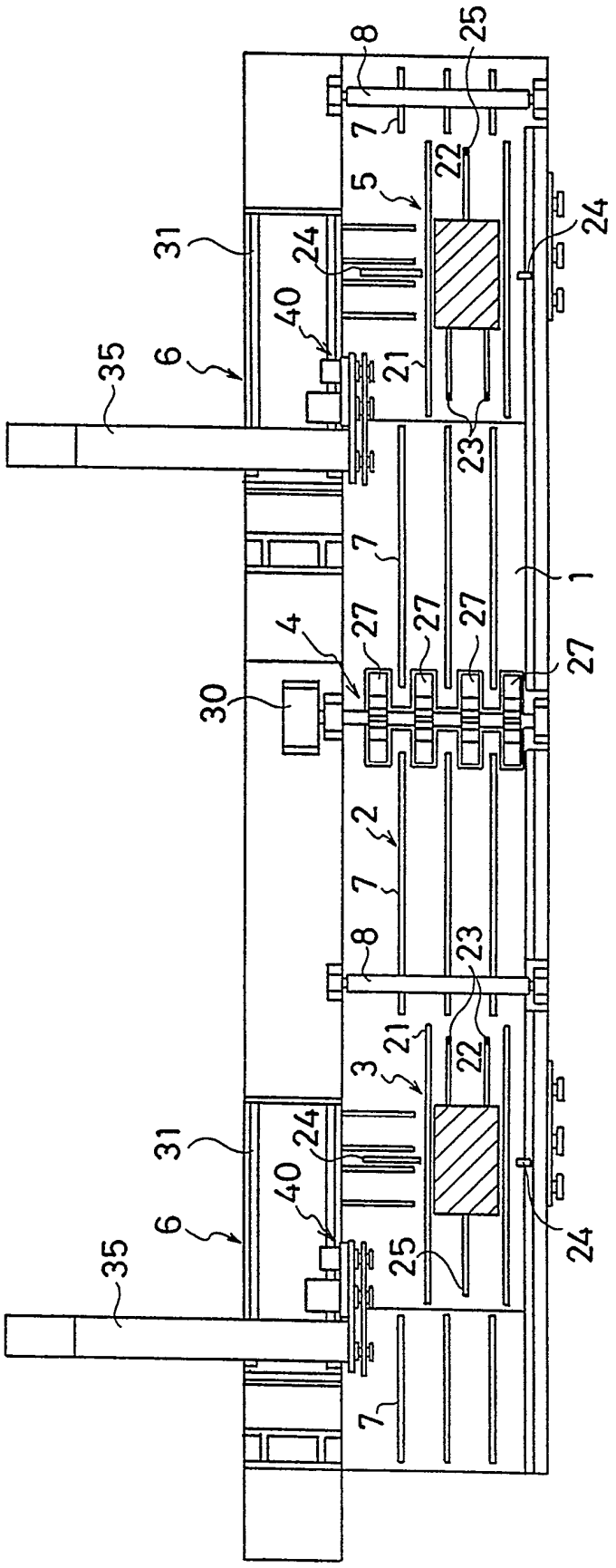

8
25
7
22
5
24
31
24
40
6
35
21
23
7
1
4
27
27
27
27
30
2
7
8
23
21
22
3
31
24
40
6
35
25
24
7

FIG. 3

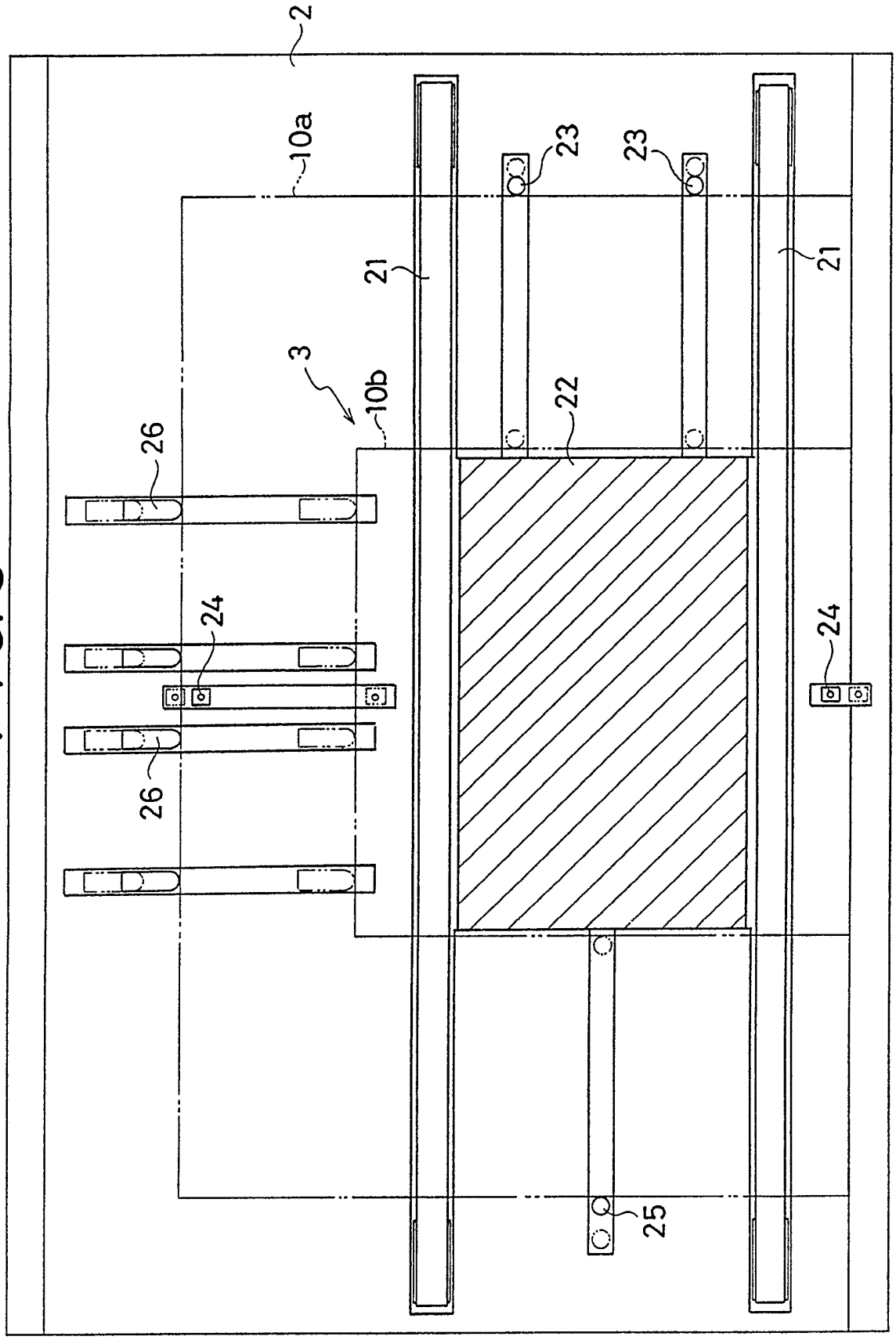


FIG. 4

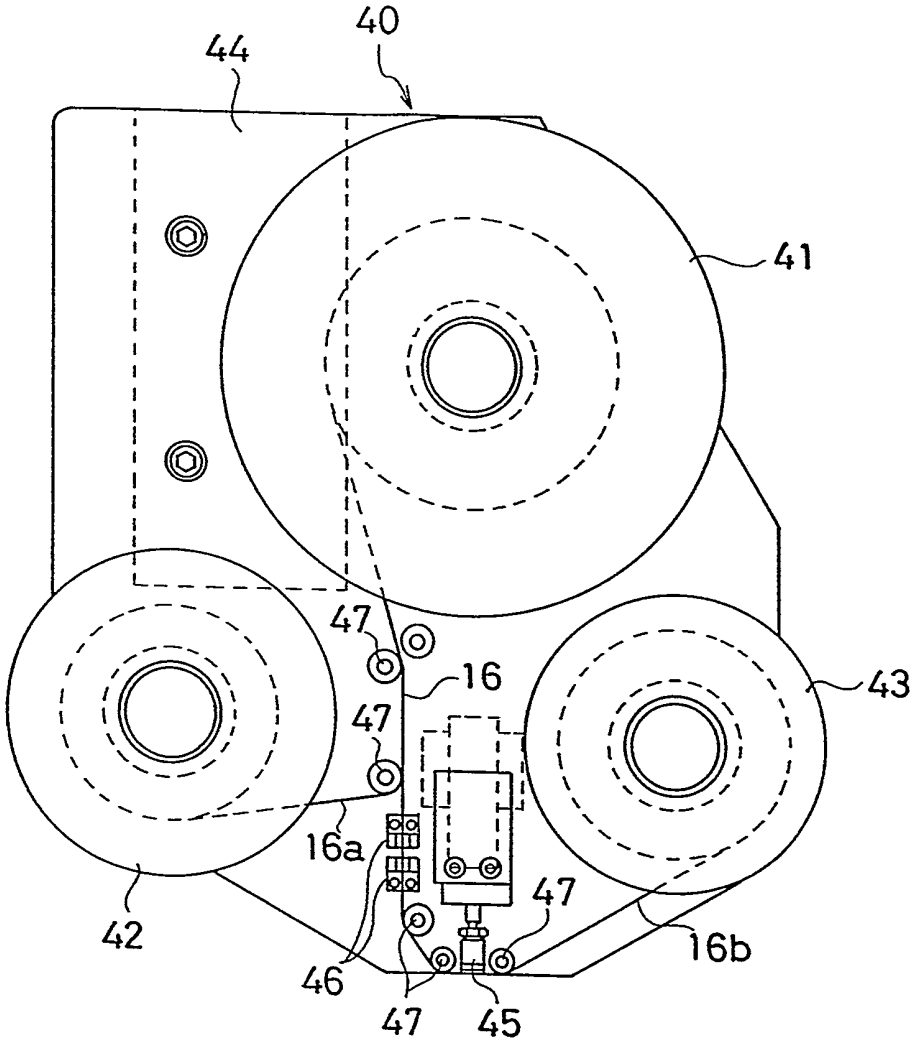


FIG. 5

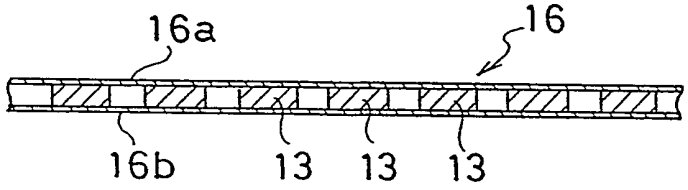


FIG. 6

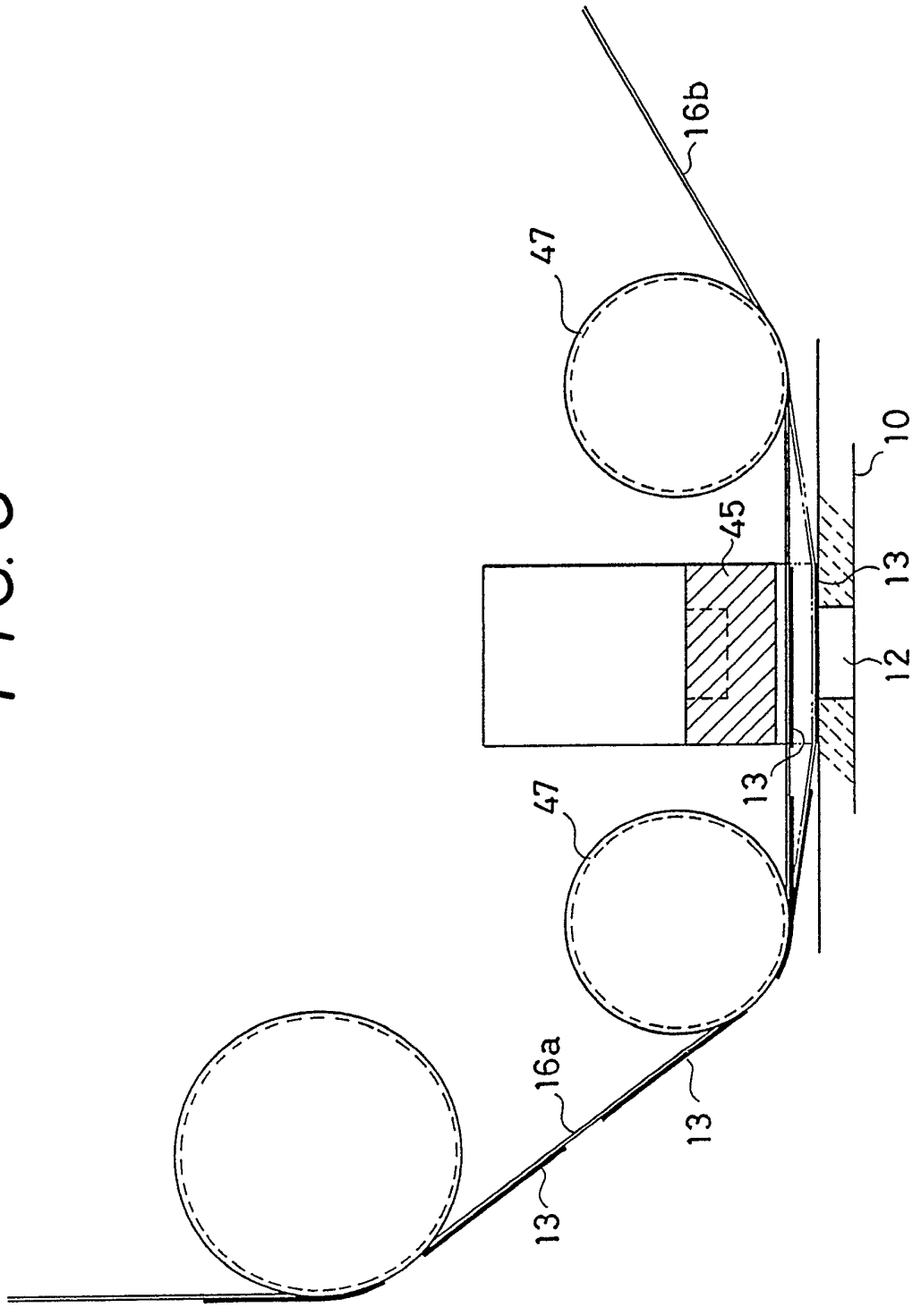


FIG. 7

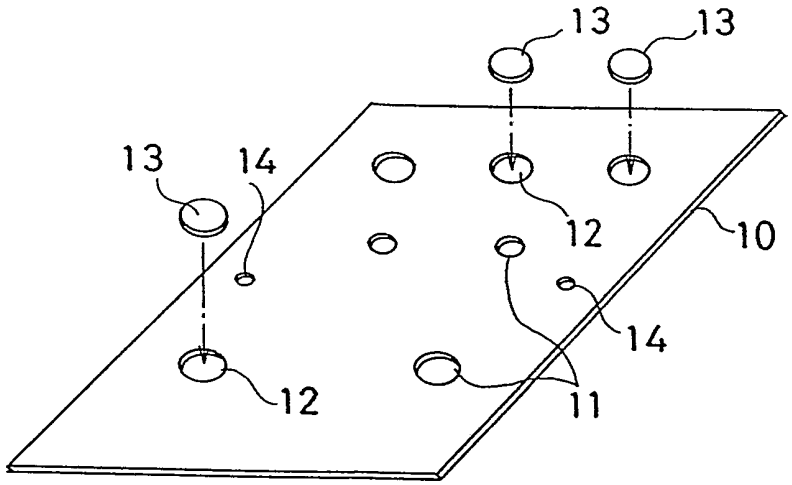
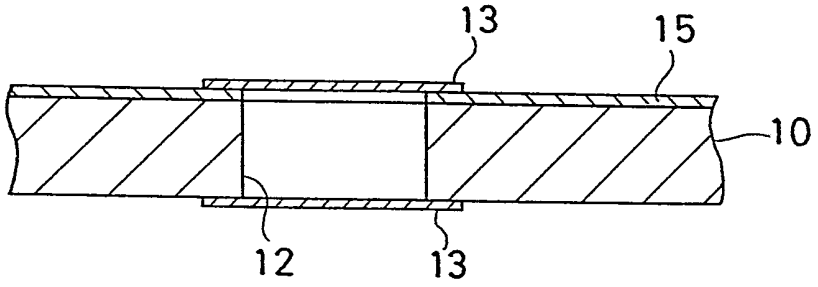


FIG. 8



"IMPROVEMENTS IN THE MANUFACTURE OF PRINTED WIRING BOARDS"

The present invention relates to improvements in the manufacture of printed wiring boards and in particular to a hole masking apparatus for masking a through hole portion perforated in a base plate or material by applying or pasting a seal on the through hole.

During the process of manufacturing printed wiring boards, the step of plugging the through holes perforated in the base material of the printed wiring board with a filling material is generally performed by a filling operation applied to the through holes over the whole surface of the base material by means of a silk screen. In this case, before the filling operation, there is required a masking operation, by which the opening portions of those through holes which do not require filling such as, for example, component attaching holes or the like, are masked.

Figure 7 of the accompanying drawings show such a masking operation. A base plate or material 10 is formed with a plurality of through holes 11 and 12. The through hole 11 is a through hole which is pasted by the filling material, and the through hole 12 is a through hole which does not require plugging up by the filling material. In this case, masking is performed by pasting a seal 13 on the opening portion of the through hole 12.

The reference numeral 14 refers to dummy holes perforated in the base material 10 at opposite positions of outer periphery sides and for obtaining a reference for positioning of the base material during various steps in the process of manufacturing the printed wiring board. As shown in Figure 8, the masking for the through hole 12, which does not

require plugging, is performed by pasting a seal 13 on both opening end portions of the through hole 12. In the conventional process, this pasting of the seal 13 is performed manually.

In Figure 8, the reference numeral 15 is a conductive layer formed on one surface of the base material 10.

The conventional masking operation cannot perform elimination or reduction of labour because of manual operations necessary in the conveying of the base material, and it is necessary to complicate the operation, such as marking of the through hole which requires masking, cutting of the seal and pasting of the seal, all resulting in a less workability. Particularly, the masking operation requires that the seal be pasted onto both surfaces of the base material, and the above operations are repeated so that efficiency becomes decreased and it takes a long time.

The present invention seeks to overcome the above described disadvantages of the conventional hole masking apparatus by providing a hole masking apparatus for automatically performing masking by a seal applying or pasting, and in which the pasting of the seal onto those through holes which do not require plugging, may be performed automatically so that elimination or reduction of labour may be achieved because of the elimination of unnecessary manual operations.

According to the present invention, there is provided a hole masking apparatus comprising first and second positioning sections provided at spaced positions on a conveying path of a base material having a plurality of through holes at respective given positions; a masking device provided at each respective positioning section and having a head

operable to paste a seal on each of a number of selected through holes by moving the head in such a manner that the head is positioned over those through holes which do not require plugging up; and a reversing section arranged between the first and the second positioning sections for reversing the face and back of the base material on the conveying path thereof.

The conveying path of the base material is arranged at the downstream side of respective positioning sections with a pressure roller transferring and touching the base material surface, to which the seal is pasted.

The first and the second positioning sections comprise a stopper pin engaging and touching the forward end surface of the base material in the conveying direction thereof and a lock pin capable of being detachably inserted in dummy holes of the base material.

The head of the masking device comprises a supply means for on the one hand supplying a tape having a plurality of seals sandwiched between peeling papers at given pitches and on the other hand peeling one of the peeling papers, and a hammer for pasting the seal on the base material by pressing the tape for which one of the papers is peeled off onto the base material.

The reversing section has a plurality of engaging pawls each having slits, into which the forward end portion of the base material is inserted, thereby reversing face and back of the base material by rotating the engaging pawl in the same direction as the conveying direction of the base material.

According to the hole masking apparatus of the present invention, the masking device at the first positioning section is operated with respect to one

surface of the base material which is stopped at the positioning place by the first positioning section, thereby automatically pasting the through holes which do not require plugging, and then when the base material is positioned and stopped at the second positioning section, the masking device at the second positioning section is operated to paste the seal onto the opposite surface of the base material. Therefore, the masking operation for pasting the seal may be performed automatically.

In order that the invention may be better understood, an embodiment thereof will now be described by way of example only and with reference to the accompanying drawings in which:-

Figure 1 is a side view showing one embodiment of a hole masking apparatus according to the present invention;

Figure 2 is a plan view showing the embodiment of Figure 1;

Figure 3 is a plan view showing the positioning sections for use in the hole masking apparatus according to the present invention;

Figure 4 is a side view showing the head of the masking device for use in the hole masking apparatus according to the present invention;

Figure 5 is a sectional view showing the tape holding the seal for use in the hole masking apparatus according to the present invention;

Figure 6 is a side view showing the operation of the head;

Figure 7 is a perspective view showing the base material for use in the hole masking apparatus according to the present invention; and

Figure 8 is a partially sectional view of the base material shown in Figure 7.

Referring now to the drawings, there is shown

an embodiment of a hole masking apparatus according to the present invention. Like parts are shown by corresponding reference characters throughout the several views of the drawings.

Figures 1 and 2 show the construction of one embodiment of the hole masking apparatus according to the present invention. A conveying path 2 is formed on a platform 1, the horizontal of which can be adjusted. Along this conveying path 2, a first positioning section 3, a reversing section 4 and a second positioning section 5 are arranged and the first and the second positioning sections 3 and 5 are each provided with a respective masking device 6. The conveying path 2 is formed by continuously arranging a given length of conveyer 7 in the longitudinal direction so that base material 10 inputted in the conveying path 2 is conveyed to the first positioning section 3 → the reversing section 4 → the second positioning section 5 in sequence. In this case, the first positioning section 3 and the second positioning section 5 are provided with downstream pressure rollers 8, 8, respectively, which are changed and touched to the base material 10 which has finished the process at the respective positioning sections 3, 5. The first positioning section 3 and the second positioning section 5 stop the positioning of the base material 10 at respective positions.

Figure 3 shows the first positioning section 3 in detail. The first positioning section 3 comprises a pair of belt conveyers 21 provided between the conveyers 7 of the conveying path 2 in the same direction as the conveyers 7, a vacuum table 22 provided between the belt conveyers 21 for suction and fixing the base material 10 by means of a vacuum suction force, a pair of stopper pins 23 provided so as to come in and out to the platform 1 at the

downstream side of the vacuum table 22, and lock pins 24 provided so as to come in and out at both sides of the belt conveyer 21.

The stopper pins 23 serve to stop the conveyance of the base material 10 and performs positioning of the base material 10 in the conveying direction by touching the front end surface of the base material 10 in the conveying direction thereof. The lock pins 24 perform the positioning of the base material 10 in the transverse direction by projecting with respect to the base material 10 which is positioned and stopped by the stopper pin 23, and entering into a respective dummy hole 14 (Figure 7) of the base material. The stopper pins 23 and the lock pins 24 can be adjusted with respect to the position of the base material 10 in accordance with the size thereof and thus can be slid and moved, respectively, with respect to the platform as shown in Figure 3 by a chain line. This sliding and moving can perform the positioning of the base material with respect to the size therefore within a range shown by chain lines 10a and 10b.

Since the base material 10 is touched to the stopper pins 23, moreover, a butt pin 25 is provided so as to slide and move in the conveying direction of the base material at the upstream side of the vacuum table 22. The belt conveyer 21 is provided at one side thereof with a plurality of sizing heads 26. The sizing head 26 slides and moves in a direction orthogonal to the conveying direction of the base material, so that this sliding and moving performs positional registration of the lock pins 24 in the transverse direction of the base material.

The second positioning section 5 has substantially the same construction as the first positioning section 3, so that the parts corresponding

to those shown in Figure 2 designated by the corresponding reference characters and its explanation is omitted. The stopper pins 23 and the butt pin 25 of the second positioning section 5 are provided at the symmetrical position to those of the first positioning section 3. At the second positioning section 5, that is, the stopper pins 23 are provided at the upstream side of the base material in the conveying direction thereof, while the butt pin 25 is provided at the downstream side of the base material in the conveying direction thereof. The base material 10 is slid in the reverse direction to the conveying direction thereof to stop the positioning of the base material.

The reversing section 4 is provided at the central portion of the first positioning section 3 and the second positioning section 5 as shown in Figures 1 and 2. The reversing section 4 is constructed by arranging a plurality of reversing rollers 27 on the platform 1 in parallel. Each reversing roller 27 has engaging pawls 29 each having a slit 28 provided thereto at equal spaces on a circumference, and synchronously rotates in the same direction as the conveying direction of the base material by driving a motor 30. The slit 28 of the engaging pawl 29 is engaged with the base material 10 by inserting the forward end portion of the base material conveyed from the first positioning section 3 into the slit 28, so that the engaged base plate or material is rotated in accordance with the rotation of the engaging pawl 29, and then the base material 10 is reversed with its face and back thereof and conveyed to the second positioning section 5.

The masking devices 6 are provided to the first positioning section 3 and the second positioning section 5, respectively. Each masking device 6 comprises a slide base 32 running along a guide rail

31 provided parallel to the conveying direction of the base material, a slider 34 for sliding a mast 33 studded on the slide base 32 up and down, and a head 40 moving in a transverse direction with respect to the slider 34 by means of a cylinder 35 which is expanded and contracted in a direction orthogonal to the conveying direction of the base material.

The head 40 serves to paste a seal 23 on a through hole 12 (Figure 7) of the base material which does not require plugging up, as described later, and moves on the through hole 12 with a motion in a three dimensional direction defined by the slide base 32 and the slider 34 which are moved in an orthogonal direction to each other, and by the cylinder 35 operating in a direction orthogonal to the slide base 32 and the slider 34. In this case, the moving amount of the slide base 32 and the slider 34 and the expansion and contraction amount of the cylinder 35 are controlled by a control box (not shown) which memorise a given programme, so that the head 40 is successively positioned on all through holes 12 of one base material in order.

Figure 4 shows the head 40 of the masking device 6. The head 40 comprises a supply reel 41 and two take-up reels 42,43 which are rotatably mounted on a bracket 44. Respective reels 41, 42 and 43 are secured to output shafts of respective motors (not shown) to form a supply means for supplying tapes 16 held on a seal 13, by driving these motors intermittently in synchronism with each other. The bracket 44 is provided at its lower portion with a hammer 45 which pastes the seal 13 held on the tape 16 onto the base material. The hammer 45 (the actual construction of which is not shown) is moved up and down by a combination of a return spring and an eccentric cam or an actuator such as a cylinder or a

solenoid, so that the downward operation of the hammer pushes the seal 13 onto the base material and pastes it thereon.

Figure 5 shows the tape 16 held on the seal 13, in which the seals 13 are sandwiched between upper and lower peeling strips 16a and 16b with a certain pitch. The supply reel 41 of the head 40 on which the tape 16 is wound, supplies the tape 16 in order, and the left take-up reel 42 peels and takes up one of the peeling papers 16a at the upstream side of the hammer 45. By the peeling off of the peeling paper 16a, the lower surface of the seal 13 is exposed, and under this condition the seal 13 is pressed on the base material 10 by the hammer 45, so that the seal 13 is pasted or adhered on the base material. The another peeling paper 16b, from which the seal 13 is removed, is taken up on the right take-up reel 43.

For the seal 13 and the adhesive applied to the seal 13, a water-soluble adhesive, a photo-setting adhesive or thermo-setting adhesive may be selected, hereby preventing the rest adhesive in case of peeling the seal 13 from the base material 10. In Figure 4, the reference numeral 46 is a sensor for detecting the seal 13 in case of running the tape 16. The signal from the sensor 46 operates the hammer 45. The reference numeral 47 is a plurality of guide rollers arranged on the running path of the tape 16.

Next, the operation of the hole masking apparatus of one embodiment of the present invention is explained.

In Figures 1 and 2, when the base material 10 reaches the first positioning section 3 by the conveyer 7, the butt pin 25 is slid to touch the stopper pin 23 with the front end portion of the base material 10, thereby performing the positioning of the base material in the conveying direction thereof.

The sizing head 26 is slid in an orthogonal direction thereto and after this sliding the lock pin 24 is projected and inserted into the dummy hole 14 of the base material 10, thereby performing positioning of the base material 10 in a direction orthogonal to the conveying direction thereof, and at the same time, the vacuum table 22 is operated to absorb the base material 10. After such positioning, the adhesion of the seal to the base material is performed by the masking device 6.

The masking device 6 is controlled by the control box, in which data such as the size of the base material and positions and the number of those through holes which do not require plugging, are memorised, so that the hammer 45 of the head 40 is positioned on the through hole 12 of the base material 10. Figure 6 shows the condition that the positioning of this head 40 is performed. Under such a condition, the hammer 45 is pressed down and depressed the peeling paper 16b, so that the seal 13, whose lower surface is exposed, is pressed as shown by the condition changed from a solid line to a dotted line, thereby pasting the seal 13 onto the base material 10. Such a pasting of the seal 13 is performed with respect to all through holes 12 on one side of the base material 10. After this pasting, the base material 10 is discharged from the first positioning section 3 to move in the pressure rollers 8. The pressure roller 8 is transferred and touched to the surface of the base material 10 which is pasted by the seal 13, thereby surely adhering the seal 13 onto the base material 10. The forward end portion of the base material 10 is inserted into and engaged to the slit 28 of the engaging pawl 29 at the reversing section 4. The reversing roller 27 having the engaging pawl 29 is rotated in the same direction

as the conveying direction of the base material 10, so that the rear end portion of the base material 10 is lifted up and rotated, thereby performing the reversal of face and back of the base material. This face and back reversal exposes the other surface of the base material 10, on which no seal is pasted, and under these conditions the base material 10 is conveyed to the second positioning section 5. At the second positioning section 5, the positioning of the base material 10 and the pasting of the seal onto the other surface of the base material 10 by the masking device 6 are performed in the same manner as in the first positioning section 3.

The present invention is not limited to the above described embodiments, and various changes or modifications can be performed. For example, the positioning of the base material may be performed by either of the stopper pin 23 and the lock pin 24 at the first positioning section 3 and the second positioning section 5. Moreover, robot hands are mounted on the head of the masking device and the seal may be pasted by the robot hands.

CLAIMS

1. A hole masking apparatus comprising first and second positioning sections provided at spaced positions on a conveying path of a base material having a plurality of through holes at respective given positions; a masking device provided at each respective positioning section and having a head operable to paste a seal on each of a number of selected through holes by moving the head in such a manner that the head is positioned over those through holes which do not require plugging up; and a reversing section arranged between the first and the second positioning sections for reversing the face and back of the base material on the conveying path thereof.

2. A hole masking apparatus as claimed in claim 1, wherein the conveying path of the base material is arranged at the downstream side of the respective positioning sections with a pressure roller transferring and touching the base material surface, to which the seal is pasted.

3. A hole masking apparatus as claimed in claim 1, wherein the first and the second positioning sections comprise a stopper pin engaging and touching the forward end surface of the base material in the conveying direction thereof and a lock pin capable of being detachably inserted in dummy holes of the base material.

4. A hole masking apparatus as claimed in claim 1, wherein the head of the masking device comprises a supply means for on the one hand supplying a tape comprising a plurality of spaced seals sandwiched between peeling papers at a given pitch and on the other hand peeling one of the peeling papers, and a hammer for pasting the seal on the base material by

pressing the tape, for which one of the peeling papers is peeled off, onto the base material.

5. A hole masking apparatus as claimed in claim 1, wherein the reversing section has a plurality of engaging pawls each having slits, into which the forward end portion of the base material is inserted, thereby reversing face and back of the base material by rotating the engaging pawl in the same direction as the conveying direction of the base material.

6. A hole masking apparatus substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

9124547.2

Relevant Technical fields

(i) UK Cl (Edition K) H1R (RAH, RAN, RAV, RAE, RAF)

(ii) Int Cl (Edition 5) H05K

Search Examiner

W A MORRIS

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Date of Search

17 JANUARY 1992

Documents considered relevant following a search in respect of claims 1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	None	

SF2(p)

sw - c:\wp51\doc99\fil000738

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

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.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Published 1992 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.