



1 DESCRIPTION

2 MACHINE FOR THE OPPOSITE CONTROL OF PRINTED CIRCUITS

3 Technical Field

4 This invention has as object a machine for the opposite control of
5 printed circuits .

6 The invention finds particular even if not exclusive application in
7 the sector of the control of the printed circuit cards.

8 Background Art

9 In prior art machines for the control of the printed circuits are
10 known.

11 These machines generally consist of a board or bed bearing a
12 plurality of electrically conductive needles, on which must be
13 disposed the card with the printed circuit and by activating
14 properly the electric conductivity among the different needles and
15 by making the respective measurements it is possible to check whether
16 the printed circuit has defects.

17 Obviously for such control it is necessary for the needles to contact
18 the printed circuit in the proper position.

19 As the printed circuits are very different, it results necessary to
20 apply over the needle base board, an adaptation board that
21 comprises the same needles but displaced in a different way in
22 conformity with the printed circuit to be controlled.

23 The drawback of this solution is the limitation of the machine and
24 the possibility to control only the printed circuits that have at
25 disposal corresponding adapters or adaptation boards.

26 Needing as many adaptation boards as are the cards with different
27 printed circuits to be controlled.

28 Furthermore it is known that the layers of the circuits are not



1 always coplanar, wherefore a suitable electric conduction for an
2 effective contact is not always ensured.

3 Disclosure of Invention

4 The purpose of the present invention is that to obviate the above-
5 mentioned drawbacks, and in particular to allow the making of a
6 universal machine able to control the printed circuits, that is
7 having a system of conductive detection needles that can be adapted
8 to any type of circuit .

9 This and other purposes as claimed are obtained by means of
10 a machine for the control of printed circuits, of the type comprising
11 a board bearing a plurality of conductive needles that are
12 connectable on their reverse side to means for the analysis of the
13 electric parameters between one and the other needle, characterized
14 in that:

- 15 - are used two needle boards, one opposite to the other and in
16 between is positioned for the analysis the respective printed circuit
17 card, and,
18 - one board is made movable respect to the other.

19 In this way it is obtained the immediate advantage of
20 simplifying all the system by making universal the application of
21 the machine on different printed circuits without needing adapters.
22 In fact by this it is possible to activate a board needle in any leading
23 end circuit position and to activate an opposite needle of the opposite
24 board, which thanks to the movability of the same board will be able
25 to reach any definite circuit end point to be tested independently
26 from its position, place and shape.

27 In this way the universalization of the testing system for any card is
28 ensured.

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1 Advantageously the machine has also the characteristic that
2 the detection needles are axially movable.

3 In this way, among a plurality of needles it is possible to make
4 interact only some of them, centring more easily the desired
5 positions of the printed circuit.

6 Further advantage derives from that with the axial movability of the
7 needles it is possible to contact better the respective desired points
8 of the circuit even when the card or the layer of the circuit is not
9 perfectly on the same plane in all its points.

10 Advantageously the needles are made axially movable by
11 electromagnetic means.

12 In this way the desired needle is operated in a simple and safe way.

13 These and other advantages will be shown by the following
14 description of embodiment preferred solutions with the help of the
15 included drawings whose details are not to be considered limitative
16 but only given as an example.

17 Figure 1 is a perspective schematic view of a detection board (bed);

18 Figure 2 is a cross-sectional schematic view of an axially movable
19 detection needle.

20 Figure 3 is a cross-sectional view of the preferred embodiment with
21 two opposite detection boards movable one respect to the other and
22 with the card to be controlled placed between them.

23 In particular in the figures the two detection testing boards are
24 indicated with 1 and 1'.

25 Each board has a plurality of needles axially movable 10 by
26 electromagnet 11.

27 Each needle is electrically connected to a known art electric
28 parameters control system 12.

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1 The opposite boards as mentioned are movable one respect to the
2 other for the operative positioning.
3 The card positioned between these is indicated with 2.
4 The system provides a control by a net list "net-list" with relative
5 positions of single points.
6 The connection test is carried out from point to point, so that for
7 testing the connections of a net made of n points, are necessary n-1
8 tests between pairs of points selected in such a way to cover all the
9 connections.
10 The test on short circuits among different nets, is made by selecting
11 a point out of each pair of nets.
12 The maximum number for testing (testing) n nets in this way, is
13 calculated with the following formula:
14 $n*(n-1)/2$.
15 This number can be reduced by selecting only alongside nets, that is
16 the ones close to each other in a pre-determined distance.
17 The positions to be tested are underdivided in sectors corresponding
18 to the number of needles in the movable board (bed), so that the
19 point to be tested is reachable with the position and with one of the
20 testing needles.
21 After the points to be tested are reached, it is necessary to check the
22 connection or insulation.
23 To shorten the time used for the movements, it is possible to optimize
24 the paths of the axes, by modifying the frequency of the single tests.
25 The machine is made up of a frame on which are fixed two opposite
26 boards and independently, movable respect to the two orthogonal
27 axes.
28 On the boards are fixed the testing sounds (needles) directly

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- 1 operated by electromagnet in their axial movement.
- 2 At the beginning, the printed circuit is placed on a bearing frame
- 3 that transports it between the two boards.
- 4 In this position the card remains fixed.
- 5 The boards are put close to the card and the test begins.
- 6 Each board is independently controlled and operated, so that the
- 7 maximum stroke necessary is defined by the distance among the
- 8 sounds.
- 9 In correct position, the electromagnet operates the sound on the
- 10 surface to be contacted and thus by a pair of sounds simultaneously
- 11 operated is controlled the functionality of the circuit among the two
- 12 desired points, the respective continuity and eventual short circuits.
- 13 The process proceeds by points in repetitive way as desired.
- 14 Advantageously also the card bearing may be moved respect to one
- 15 or the other board.
- 16 In this way is obtained a wider universalization of use .

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1 Claims

- 2 1. Machine for the control of printed circuits, of the type
3 comprising a board bearing (1) a plurality of conductive needles
4 (10) that are connectable on their reverse side to analysis means of
5 the electric parameters (12) between one and the other needle,
6 characterized in that:
7 - are used two needle boards (1,1'), one opposing the other and
8 between them is placed for the analysis the respective printed
9 circuit board to be controlled (2), and,
10 - one board is made movable respect to the other at least on the
11 respective planes.
12 2. Machine according to claim 1, characterized in that the respective
13 card bearing (2) is movable respect to one or the other board.
14 3. Machine according to anyone of the previous claims,
15 characterized in that said needles (10) are made axially movable.
16 4. Machine according to previous claim, characterized in that the
17 movability of said needles is obtained by electromagnetic means
18 (11).
19 5. Machine according to any of the previous claims, characterized in
20 that it is made in such a way to operate in the testing between two
21 points of a circuit acting on one side with a needle of one board and
22 on the other side with a needle of the opposite board, after having
23 carried out a respective centring movement of the one respect to the
24 other and/or of both respect to the card circuit.

