Oct. 8, 1968 J. E. FINCH 3,405,384

ELECTRICAL PINBOARD

Filed July 20, 1966 5 Sheets-Sheet 1

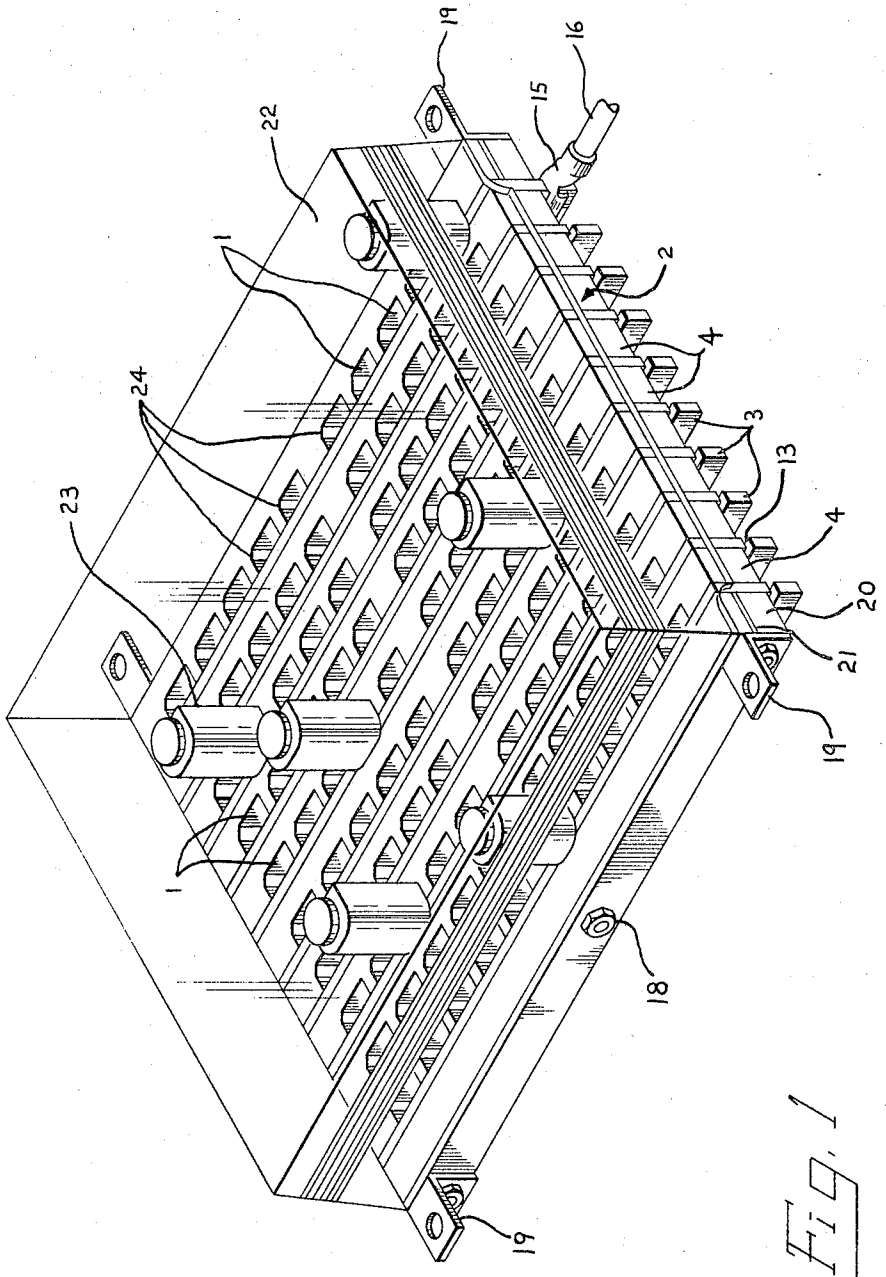

Fig. 1

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ELECTRICAL PINBOARD

Filed July 20, 1966 5 Sheets-Sheet 2

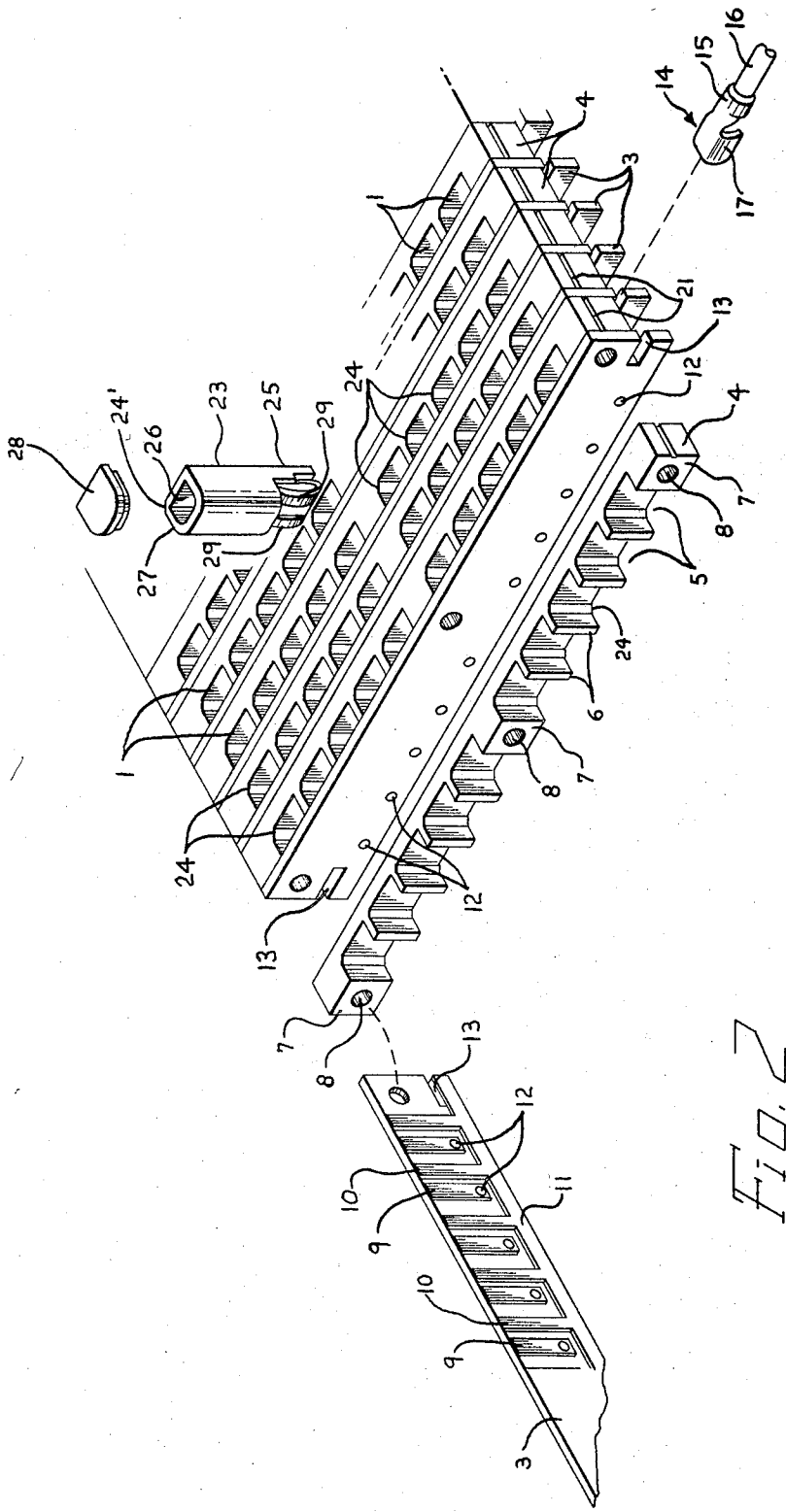

Fig. 2

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ELECTRICAL PINBOARD

Filed July 20, 1966 5 Sheets-Sheet 3

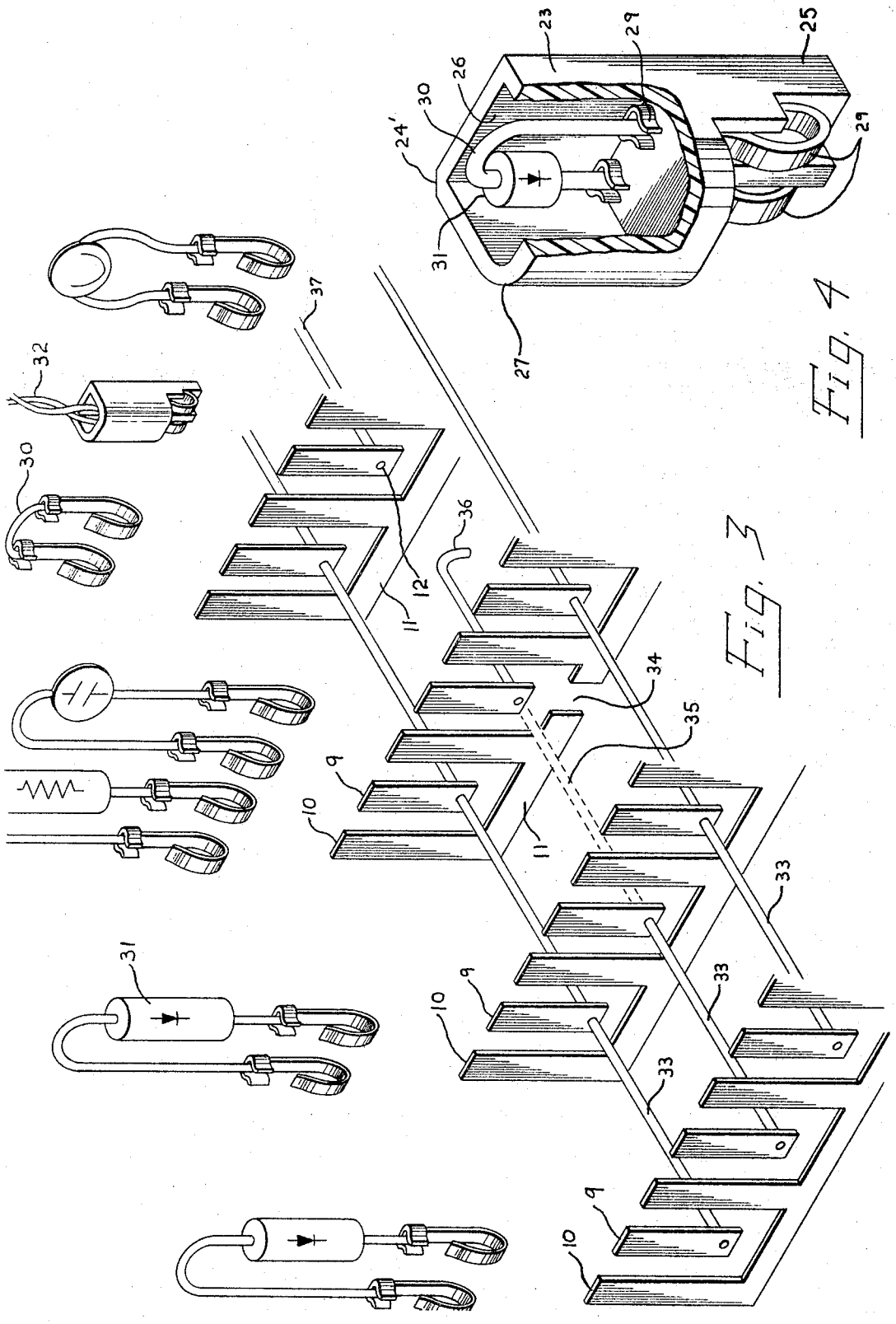

Fig. 4

Fig. 3

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ELECTRICAL PINBOARD

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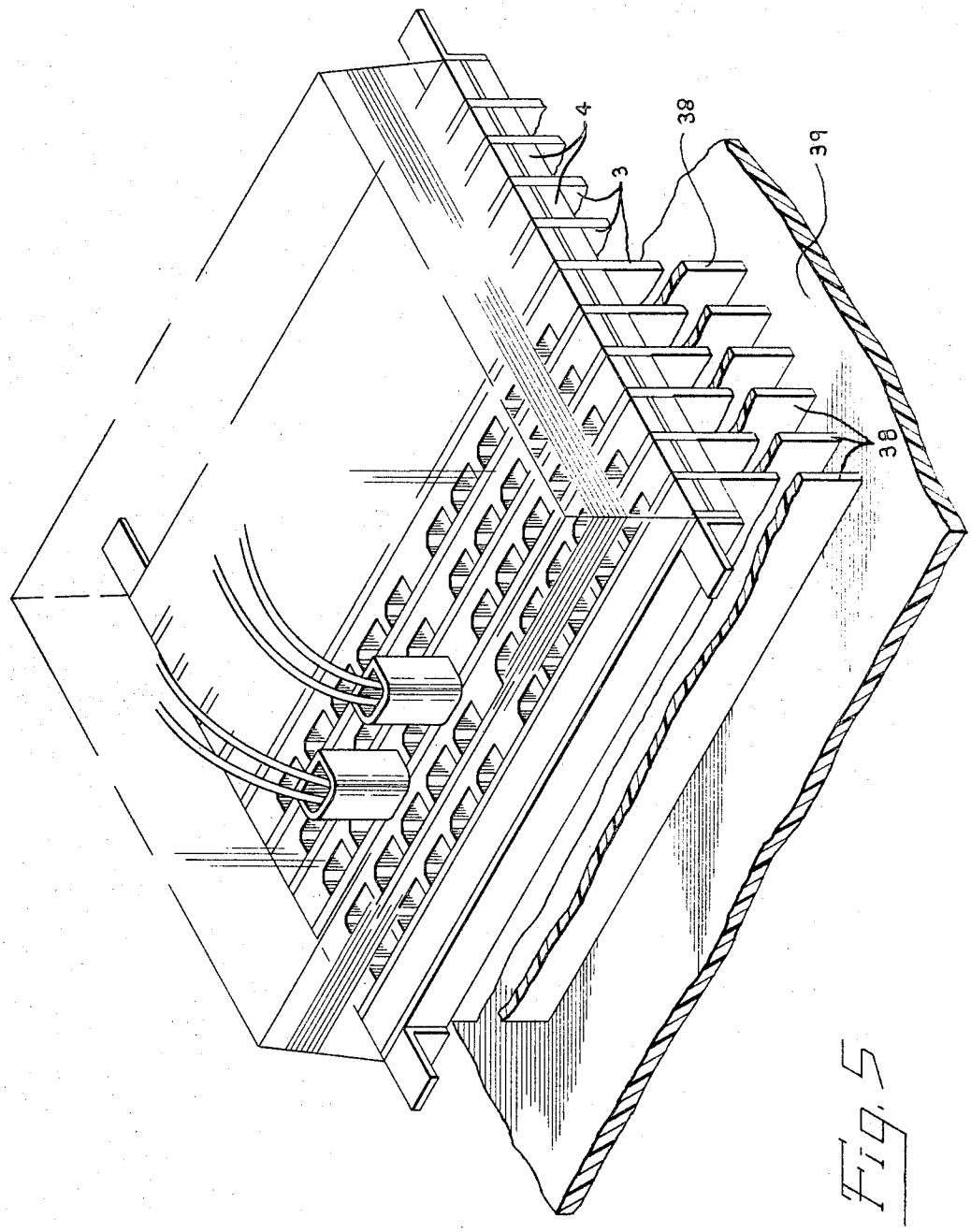

Fig. 5

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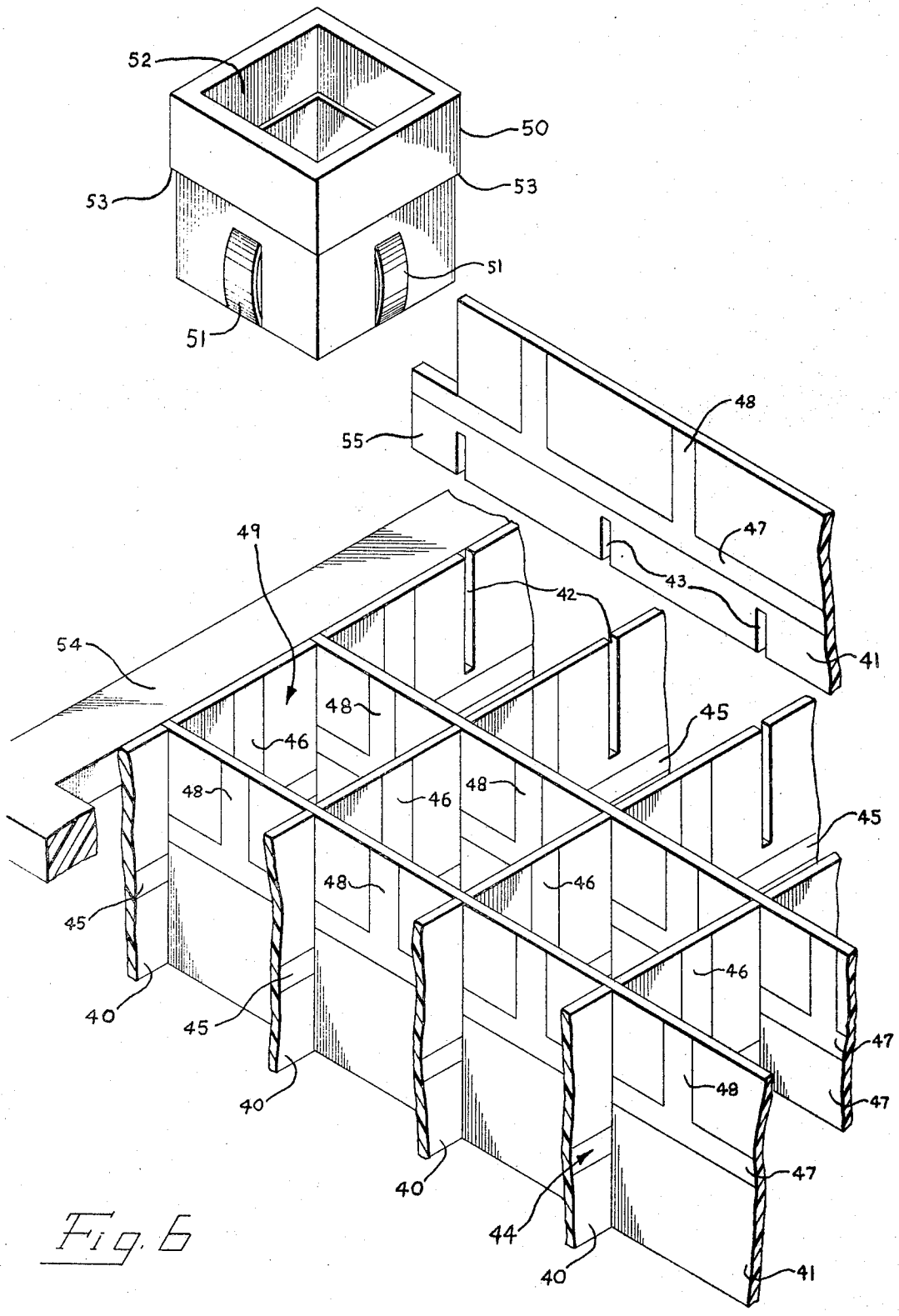

Fig. 6

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3,405,384

ELECTRICAL PINBOARD

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Claims priority, application Great Britain, July 31, 1965, 32,891/65
10 Claims. (Cl. 339—18)

ABSTRACT OF THE DISCLOSURE

An electrical pinboard assembly is disclosed featuring insulating lamina having printed conductors on one side thereof with the lamina arranged in a manner to define apertures adapted to receive contact pins to provide an interconnection of the printed conductors. The printed conductors on the lamina include portions extending longitudinally of the aperture joined by portions extending along the length of the lamina. The contact pin includes a contact spring engaging the printed conductor at a side of the aperture on one lamina and a contact spring engaging a further conductor within a given aperture to provide a circuit connection therebetween.

Background of the invention

This invention relates to electrical pinboards.

Pinboards generally comprise a grid array of contacts arranged in groups of two or more in an insulating matrix or board formed with pin apertures. Insertion of a pin into an aperture effects interconnection between contacts at the aperture. In some arrangements contacts at different apertures are interconnected by bus bars so that insertion of a pin effects interconnection between all the contacts of bus bars crossing at the aperture. It has been customary to employ pins of circular cylindrical form inserted in complementary apertures. In some proposals contacts have been spaced axially of the aperture and in other proposals they have been formed by opposed contact springs arranged side by side.

Summary of the invention

This invention relates to an electrical pinboard assembly.

It is an object to provide a pinboard device which has an improved construction with respect to assembly and wear of components relative to the manufacturing tolerances required to be carried.

It is a further object to provide a pinboard device which is more compact in terms of depth than devices heretofore available.

It is still a further object to provide a pinboard device which utilizes a contact engagement which facilitates the use of accessory devices such as diodes, lamps, resistors and the like in a non-axial construction.

It is another object to provide a pinboard device wherein the conductors are flat and of relatively broad contact area and the contacts are made to have spring characteristics providing an engagement over such area.

An electrical pinboard assembly according to the present invention comprises a plurality of insulating laminae arranged side by side in spaced parallel relationship, each lamina having a plurality of spaced printed conductors on a side of the lamina, spacing means between adjacent laminae serving with the laminae to define adjacent each lamina a series of apertures having open ends at a face of the board assembly for receiving contact pins, each aperture being open on at least one side to a lamina, at least one printed conductor on the lamina extending longitudinally of the aperture at the open side, an insulating

contact pin slidably disposed in an aperture, the pin having a contact spring engaging the printed conductor at the side of the aperture, and having a further contact spring engageable with a further printed conductor at the aperture.

In one embodiment the laminae are formed with pairs of parallel printed conductors extending longitudinally of each aperture, the spacing means comprising insulating blocks formed along a side with spaced slots, the slots with an adjacent lamina defining the apertures.

A pin for such a board comprises an insulating body formed with a lower portion of T-section and an upper portion containing a cavity open at its upper end, a pair of contact springs mounted one on each side of the stem of the T with resilient portions projecting outwards of the stem for engaging respective printed conductors at a pin aperture, upper ends of the contact springs having connecting portions disposed within the cavity for connection to a shorting strip or functional component within the cavity.

In an alternative embodiment the spacer means are defined by further laminae extending transversely of the first laminae, the two sets of laminae having complementary slots engaging in egg-crate fashion, printed conductors being formed between the slots and a contact pin having resilient contacts for engaging printed conductors on respective laminae at a pin aperture.

A pin for such a pinboard comprises an insulating body of generally rectangular section having an upper cavity open at its upper end, a lower portion of the pin having on each side a slot containing a contact spring having a resilient portion projecting outwardly of the pin, the contact springs having upper connecting portions disposed within the cavity which is adapted to receive shorting strips or functional components for interconnection of selected connecting portions.

The invention will now be described by way of example with reference to the accompanying partly diagrammatic drawings, in which:

FIGURE 1 is a perspective view of a pinboard assembly according to an embodiment of the invention;

FIGURE 2 is a fragmentary partly exploded view of part of the assembly of FIGURE 1;

FIGURE 3 is a schematic view in perspective of circuitry of the assembly of FIGURES 1 and 2;

FIGURE 4 is a perspective partly fragmented view of a plug pin of the assembly of FIGURE 1;

FIGURE 5 is a perspective view of an alternative embodiment to that of FIGURE 1, and

FIGURE 6 is a fragmentary view of a further embodiment.

The pinboard of FIGURES 1 to 3 comprises a grid array of pin apertures **1** of generally rectangular section formed in a board structure **2** comprising a series of printed circuit laminae **3** alternating with insulating spacer members **4**. As seen in FIGURE 2, each spacer member **4** comprises a block of insulating material of rectangular section formed along one side with a series of slots **5**, adjacent slots being separated by ribs **6**. Ribs **7** at the ends and the middle of each spacer **4** are enlarged and are formed with transverse apertures **8**.

The printed circuit laminae **3**, as seen in FIGURE 2, are each formed on one side with pairs of parallel printed conductor strips **9**, **10** disposed at intervals along the laminae corresponding to the slots **5** in the spacers **4**. One strip **9** of each pair extends downwards from an upper edge of the lamina and terminates at its lower end short of the lamina lower edge, whilst the other strip **10** of each pair extends from the upper to the lower edge of the lamina. All of the conductive strips **10** are commoned together by a conductive strip **11** which extends longitudinally of the lamina adjacent the lower edge.

Holes 12 are formed in the laminae and the strips 9, adjacent lower ends of the strips 9, and the laminae are of greater width than the spacers so that, with upper edges of the laminae 3 adjacent upper surfaces of the spacers 4, the laminae 3 project below the spacers 4 and the lower ends of strips 9 with holes 12 are exposed below the spacers 4.

Opposite ends of the laminae are formed with short slots 13 immediately above the commoning strips 11 to receive electrical contacts 14. A contact 14 comprises a crimping section 15 secured to a lead 16 and a contact portion 17 having a generally channel section formed with a web and inturned side walls arranged so that, with the web engaged in a slot 13, edges of the inturned side walls resiliently engage opposite sides of a lamina 3 and one edge engages the contact strip 11.

In the assembly of FIGURE 1, tie bars extend through the aligned apertures 8 in the spacers 4 and through corresponding apertures in the laminae 3, and at their ends the tie bars are secured by clamping nuts 18 and brackets 19 to hold the spacers and laminae in a compact assembly. The brackets 19 serve for mounting the pinboard in a supporting frame. The laminae 3 alternate with the spacer blocks 4 but at one end of the assembly a spacer block 20 devoid of slots 5 is provided as seen in FIGURE 1. Opposite ends of the blocks 4 and 20 are formed with grooves 21, some of which serve to engage projections formed internally of a transparent insulating cover 22 for the front face of the board assembly. The cover 22 is arranged to engage the assembly with a snap fit releasably to secure the cover as its internal projections engage the grooves 21.

The rectangular pin holes 1 defined by slots 5 of the spacer blocks are formed along one corner with a chamfered shoulder 24 which serves with a corresponding chamfer 24' on the plug pins 23 to polarize the pins 23 in relation to the apertures and ensure that the pins are inserted with the appropriate orientation in relation to the conductors 9, 10 of the laminae 3. Each plug pin 23 comprises an insulating body formed with a lower portion 25 of generally T-section adapted slidingly to fit an aperture 1 with the web of the T adjacent the base of a slot 5 and the stem of the T engaging the lamina 3 between the conductors 9 and 10. The body above the T-section 25 is formed internally with a cavity 26 open at its upper end 27 and closable by a cap 28. The pin has a pair of contact springs 29 disposed on opposite sides of the stem of the T-section 25 with upper wire-connecting portions of the springs disposed within the cavity. The contact springs 29 have resilient portions bowed forwardly of the stem of the T, so that on insertion of the T-section portion 25 into a board aperture, the contact springs 29 engage respective conductive strips 9, 10. The contact springs 29 may be short-circuited together by an element 30 disposed in the cavity 26, as indicated in FIGURE 4, or they may be interconnected through a functional component such as a diode indicated at 31 in FIGURE 4. The diode or other functional component is disposed within the pin body cavity as indicated in FIGURE 4. As a further alternative, external leads may be connected to the contact springs, as indicated at 32 in FIGURE 3.

Thus in operation, as indicated schematically in FIGURE 3, a pin serves to interconnect the conductive strips 9 and 10 at a pin aperture. The conductive strips 9 are suitably interconnected in rows perpendicular to the laminae 3 by wires 33 extending through rows of apertures 12 in the laminae 3 below the spacer blocks 4. The wires 33 are suitably soldered or otherwise connected to the conductive strips 9, and the wires 33 with the conductive strips 11 serve to interconnect the conductive strips 9 and 10 in a cross-bar pinboard arrangement. It is possible to cut out parts of the conductive strips 11 or wires 33 as indicated at 34 and 35 in FIGURE 3, so that the cross-bar arrangement is subdivided into independent groups of contacts, and the wires 33, as indicated at 36, may be bent rearwardly of the board assembly for connection to external circuitry. The wires 33 may alternatively be connected at ends 37 to external circuitry.

In the modification of FIGURE 5 the laminae 3 are extended rearwardly of the spacers 4 by a large extent to define lamina portions 38 for carrying desired printed circuitry and functional components comprising functional circuitry controlled by the pinboard. The lamina portions 38 are arranged as daughter boards perpendicular to a mother board 39 which also incorporates circuitry interconnected with the circuitry of the daughter boards 38. In this way circuitry controlled by the pinboard together with the pinboard comprises a unit.

In the modification of FIGURE 6 the insulating spacers 4 of the embodiment of FIGURES 1 to 3 are replaced by further printed circuit laminae. There are thus two sets of printed circuit laminae 40 and 41 arranged orthogonally. The laminae are all of rectangular strip form, the laminae 40 having along their upper edges a series of evenly spaced upright slots 42 and the laminae 41 a similar series of slots 43 along their lower edges. The slots 42 are greater than half the width of the lamina strips, whilst slots 43 are less, and the laminae 40 and 41 are assembled together in egg-crate fashion by engagement of slots 42 and 43 with complementary portions of the laminae. Each of the laminae 40 is formed on opposite sides with a printed circuit 44 comprising a printed conductor 45 extending longitudinally of the lamina below slots 42 and transverse printed conductors 46 extending upwardly from conductor 45 at intervals midway between adjacent slots 42. The laminae 41 have a similar arrangement with a longitudinal printed conductor 47 extending above slots 43 with upright branch conductors 48 disposed at intervals midway between adjacent slots 43.

Thus in the assembly of FIGURE 6 the egg-crate of the laminae 40 and 41 defines a grid array of open-ended square bosses 49 defining pin apertures formed on four sides with respective printed conductors 46 and 48. Pins are formed as rectangular insulating bodies 50 having at a lower end four contact springs 51, one on each side, arranged, on insertion of a pin into an aperture 49, to effect connection with a respective printed conductor 46 or 48. The body 50 is formed in its upper portion with a cavity 52 within which desired connection between upper ends of contact springs 51 may be effected, and if desired, functional components may be connected between selected contact springs 51 and disposed within the cavity. An external shoulder 53 around the body 50 faces downwardly and serves to engage upper edges of the laminae 40, 41 to limit insertion of the pin.

The egg-crate assembly of laminae 40, 41 is suitably disposed in a rectangular insulating frame 54 and ends 55 of strips 40 and 41 suitably project below the frame so that edge connection can be effected to conductors 47, 45.

What is claimed is:

1. An electrical pinboard assembly comprising a plurality of insulating laminae arranged side by side in spaced parallel relationship, each lamina having a plurality of spaced printed conductors on a side of the lamina, spacing means between adjacent laminae serving with the laminae to define adjacent each lamina a series of apertures having open ends at a face of the board assembly for receiving contact pins, each aperture being open on at least one side to a lamina, at least one printed conductor on the lamina extending longitudinally of the aperture at the open side, an insulating contact pin slidably disposed in an aperture, the pin having a contact spring engaging the printed conductor at the side of the aperture, and having a further contact spring engageable with a further printed conductor at the aperture.

2. A pinboard as claimed in claim 1, in which the laminae are formed with pairs of parallel printed conductors extending longitudinally of each aperture, the spacing

means comprising insulating blocks formed along a side with spaced slots, the slots with an adjacent lamina defining the apertures.

3. A pinboard as claimed in claim 2, in which one printed conductor of each pair on a lamina is connected with a printed conductor extending longitudinally of the lamina and the other conductor of each pair is connected with corresponding conductors of other laminae by a bus wire extending through the laminae transversely of the longitudinally extending printed conductor.

4. A pinboard as claimed in claim 3, in which ends of the laminae are formed adjacent ends of the longitudinally extending conductors with slits for receiving channel-shaped connectors for electrical connection to the longitudinally extending conductors.

5. A pinboard as claimed in claim 2, in which the slots in the blocks are of rectangular section channel form having at one corner an inclined chamfer to define a substantially rectangular pin aperture, the chamfer serving to polarize the aperture in relation to a complementary chamfer on a pin.

6. A pinboard as claimed in claim 1, in which the spacer means are defined by further laminae extending transversely of the first laminae, the two sets of laminae having complementary slots engaging in egg-crate fashion, printed conductors being formed between the slots and a contact pin having resilient contacts for engaging printed conductors on respective laminae at a pin aperture.

7. A pinboard as claimed in claim 6, in which each lamina is formed with a single conductor between adjacent slots and the printed conductors on each lamina are interconnected by a longitudinally extending conductor.

8. A pinboard as claimed in claim 7, in which each lamina is formed on opposite sides with printed conductors whereby at each pin aperture there are four printed conductors.

9. A pin in or for a pinboard as claimed in claim 2, the pin comprising an insulating body formed with a lower portion of T-section and an upper portion containing a cavity open at its upper end, a pair of contact springs mounted one on each side of the stem of the T with resilient portions projecting outwards of the stem for engaging respective printed conductors at a pin aperture, upper ends of the contact springs having connecting portions disposed within the cavity for connection to a shorting strip or functional component within the cavity.

10. A pin in or for a pinboard as claimed in claim 8, the pin comprising an insulating body of generally rectangular section having an upper cavity open at its upper end, a lower portion of the pin having on each side a slot containing a contact spring having a resilient portion projecting outwardly of the pin, the contact springs having upper connecting portions disposed within the cavity which is adapted to receive shorting strips or functional components for interconnection of selected connecting portions.

References Cited

UNITED STATES PATENTS

3,246,208 4/1966 Lex et al.

FOREIGN PATENTS

1,348,587 12/1963 France.
198,113 8/1965 Sweden.

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