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Procedure for the Manufacture of Track Patterns

Description

The present invention relates to a procedure for the manufacture of track patterns in an elongated material tape, in which the individual track pattern is formed from a first punching pattern and a second punching pattern, with the first punching pattern being generated through at least a first punching step at at least a first punching station and the second punching pattern being generated through at least an additional punching step at at least one additional punching station. Moreover, the present invention also relates to the use of a track pattern thus generated, and the use of a multistage operation die.

Accordingly, DE 37 03 649 A1 discloses a modular tool for punching complex punching patterns from a metal tape, said tool being used for manufacturing the punching patterns in several consecutive punching steps. Due to the modular design, individual modules can be rapidly replaced during maintenance work or repair after malfunction in order to adjust to changes in the punching pattern or if punching patterns are susceptible to failure.

DE 195 21 022 A1 describes a procedure for manufacture of a laminate of at least two tapes, in which each tape provided in a punching device with repetitive, even-spaced punching structures before the tapes are glued together. Identical positioning markers are punched into the tapes in order to provide for accurate positioning of the two tapes with respect to each other. After the tapes are aligned through the use of these positioning markers, but before the whole surfaces of the tapes are glued to each other, basting points are applied to the tapes in order to prevent cumulative errors arising from the differential heat expansion of the tapes.

SU 1438886 discloses a punching procedure for metal tapes in which rows of orifices are punched into a metal tape first before two adjacent orifices each are connected by a cut. The

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parts of the metal tape located between the thus connected orifices and shaped like flaps or wings are deformed by kinking or bending, which effectively increases the size of the orifices.

The problem of the present invention is to provide a further punching procedure for manufacture of track patterns or punching patterns, and provide a use for said punching procedure and provide a use for a multistage operation die that can be controlled by a program input device.

This problem is solved in the present invention by the first and the second punching patterns being partially overlapping. In this context, a punching pattern shall be defined as all orifices in a material tape that are generated in at least one punching step, but do not contact each other or overlap. This provides for the first and the second punching patterns being generated in several consecutive punching steps.

In the context of the present invention, partial overlapping of the first and second punching patterns shall mean that orifices of the first punching pattern are in some way extended by orifices of the second punching pattern or that orifices of the first punching pattern are being enlarged by orifices of the second punching pattern.

A procedure of the kind described above provides for the manufacture of a so-called "product family" of track patterns, characterized in that a track pattern is provided with identical orifices within a certain area (= identifying mark of the family) and with non-identical orifices in the adjacent areas.

This multiple punching process, in which the track pattern is generated in at least two consecutive, and thus timely separate, strokes of different punching dies, can be implemented by the use of so-called multistage operation dies of a modular or compact design. A compact multistage operation die consists of several plates in a stacked arrangement: die bed, die-plate, spring stripper, punch plate and top plate. These plates are arranged into a tool by means of a subpress. Positioning dies, cutting inserts, and punching dies are guided and supported by the plates and the subpress.

A modular multistage operation die consists of several compact multistage operation dies of the described kind, which are fixed into position in a base stand with separate guiding columns.

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In this context, a punching station shall be defined as a section of the multistage operation die bearing a punching die or group of punching dies. The punching dies of the preferred multistage operation die of the invention can be separately controlled and/or actuated by a program input device.

This procedure provides special advantages especially in the manufacture of track patterns for chip modules of "smart cards" (credit cards, phone cards, money cards, etc.), in which similar track patterns with only small changes for adjustment to the respective chip must be manufactured. The manufacture of an ultimately homogeneous track pattern by means of two partially overlapping punching patterns provides for a high degree of flexibility and low tool costs, because new punching dies must be manufactured and assembled to form the multistage operation die only for the part of the track pattern bearing the slight change. This procedure provides for a similar advantage in the manufacture of mobile phone antennae.

The elongated material tape may consist of metal, plastic or a metal-plastic laminate. In this context, a metal-plastic laminate shall be defined as a stacked arrangement of an undefined number of elongated metal foils and plastic strips that are firmly attached to each other. Usually, the attachment between the foils and strips is provided by an adhesive, which, for the purposes of the present invention, has to be regarded as a plastic material.

It is advantageous to have the thickness of the elongated material tape be in the range from 0.025 mm to 0.6 mm. Track patterns made from a material tape of the stated thickness are particularly well-suited for use in recesses of chip cards, because the thickness of these recesses usually is 0.8 mm.

In order to ensure that the first and the second punching patterns overlap, an enlargement in the first and/or second punching pattern(s) should be generated during the punching step in the overlapping area of the first and the second punching pattern. If, for instance, a rectangular orifice is punched as part of the first punching pattern, at one end of which the second punching pattern is to overlap the first punching pattern, then an enlargement is to be provided at the rectangular orifice. The enlargement is to be formed such that the width of the orifice is larger at the overlap. This can be implemented by designing the end of the orifice to have a circular or square edge with the diameter of the circular orifice forming the edge or the edge length of the square forming the edge being larger than the width of the rectangular orifice.

This is an effective means of preventing that thin fins or residual material of the material tape remain in the areas of overlap and possibly cause inadvertent electrical connection or short-circuiting.

The procedure can be implemented at favorable costs when after punching of the first punching pattern at at least the first punching station, said first punching station comprising a first punching die or a first group of punching dies, and after punching the second punching pattern at at least the one additional punching station, said additional punching station comprising an additional punching die or an additional group of punching dies, the at least one additional punching station is replaced by a different punching station with a different punching die or a different group of punching dies, and that after the replacement a second material tape being punched at at least the first punching station, said first punching station comprising of the first punching die or the first group of punching dies, and at at least the different punching station, said different punching station comprising the different punching die or the different group of punching dies.

In this context, "replacement" of a punching station shall be defined either as the replacement of a part of the multistage operation die by a different part or – in the preferred multistage operation die of the procedure according to the present invention, which comprises punching dies that can be separately controlled or actuated by means of a program input device - as the controlling and, actuating of the at least one different punching station, which was not previously actuated albeit it was present in the tool, instead of the at least one additional punching station. It must be noted that the different group of punching dies may in part consist of punching dies of the additional punching station.

The problem is further solved by the use of this procedure for manufacture of a track pattern for a chip card module and/or IC card module in compliance with ISO 7816-2 or for a mobile phone antenna. In this context, ISO 7816-2 defines the standard for the arrangement of the contacts for IC cards as well as the minimal dimensions of the contacts. Track patterns of the described kind, manufactured with space between holes which may be as small as 0.15 mm in width depending on the identity of the material, or with fine slits with a width of approx. 0.12 mm, are mass production articles that must be manufactured with the shortest possible production and assembly times and at the lowest tool costs in order to be competitive in terms of pricing. Due to the fine nature of the track patterns, it is particularly important in this application to make sure that the overlapping areas of the punching patterns are formed both very exact and to the full extent.

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Moreover, the problem is further solved by the use of a multistage operation die, the punching dies of which are separately controlled and/or actuated by a program input device, for manufacture of a track pattern for a chip card module and/or IC card module in compliance with ISO 7816-2 or for the antenna of a mobile phone.

The following Figures 1a through 2b serve to illustrate the procedure of the present invention in an exemplary fashion, wherein

Fig. 1a shows track patterns for chip card modules (product family A);

Fig. 1b shows additional track patterns for chip card modules (product family A);

Fig. 2a shows track patterns for mobile phone antennas (product family B); and

Fig. 2b shows additional track patterns for mobile phone antennas (product family B).

Figures 1a and 1b both show a section of a material tape with only a first punching pattern as well as a first punching pattern in combination with a second punching pattern being depicted.

Fig. 1a shows an elongated material tape 1a made of metal, said metal preferably being copper. First punching patterns 2 are being generated at at least one first punching station proceeding in longitudinal direction along the material tape 1a. Subsequently, second punching patterns 3 (shown as a cross-hatched pattern) are generated at at least one additional punching station, said second punching patterns 3 each being partially overlapping with one of the first punching patterns 2. In the overlapping areas, first punching patterns 2 were generated to have circular enlargements 4 such that the probability of these areas being punched at the at least one additional punching station is 100%.

Fig. 1b also shows an elongated material tape 1b made of metal. First punching patterns 2 are being generated at at least one first punching station, said punching station being identical to the first punching station of Fig. 1a, proceeding in longitudinal direction along the material tape 1b. Subsequently, second punching patterns 5 (shown as a cross-hatched pattern) are generated at at least one different punching station having different punching dies than the additional punching station of Fig. 1a, said second punching patterns 5 each being partially overlapping

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with one of the first punching patterns 2. In the overlapping areas, first punching patterns 2 were generated to have enlargements 4 such that the probability of these areas also being punched at the other punching station is 100%.

A comparison of Figs. 1a and 1b shows that different track patterns were generated through the replacement of the additional punching station, despite first punching pattern 2 being identical in both Figures. Thus, Figures 1a and 1b depict track patterns belonging to the same product family A.

Figures 2a and 2b both show a section of a material tape, wherein only a single first punching pattern and only a single first punching pattern in combination with a second punching pattern are shown.

Fig. 2a shows an elongated material tape 6a made of a metal-plastic laminate. First punching patterns 7 are being generated at at least one first punching station proceeding in longitudinal direction along the material tape 6a. Subsequently, second punching patterns 8 (shown as a cross-hatched pattern) are generated at an additional punching station, said second punching patterns 8 each being partially overlapping with one of the first punching patterns 7. In the overlapping areas, first punching patterns 7 were generated to have circular enlargements 9 such that the probability of these areas being punched at the additional punching station is 100%.

Fig. 2b also shows an elongated material tape 6b. First punching patterns 7 are being generated at at least the first punching station, said punching station being identical to the first punching station of Fig. 2a, proceeding in longitudinal direction along the material tape 6b. Subsequently, second punching patterns 10 (shown as a cross-hatched pattern) are generated at a different punching station having different punching dies than the additional punching station of Fig. 2a, said second punching patterns 10 being partially overlapping with one of the first punching patterns 7. In the overlapping areas, first punching patterns 7 were generated to have enlargements 9 such that the probability of these areas also being punched at the other punching station is 100%.

A comparison of Figs. 2a and 2b shows that different track patterns were generated through the replacement of the additional punching station, despite first punching pattern 7 being identical in

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both Figures. Thus, Figures 2a and 2b depict track patterns belonging to the same product family B.

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Patent Claims**WE CLAIM:**

1. Procedure for the manufacture of track patterns in an elongated material tape with the individual track pattern being formed from a first punching pattern and a second punching pattern, in which said first punching pattern is generated in at least one first punching step at at least one first punching station and said second punching pattern is generated in at least one additional punching step at at least one additional punching station, the first and second punching patterns being partially overlapping, wherein the second punching pattern is generated in the same elongated material tape as the first punching pattern.
2. Procedure for the manufacture of track patterns in an elongated material tape with the individual track pattern being formed from a first punching pattern and a second punching pattern, in which said first punching pattern is generated in at least one first punching step at at least one first punching station and said second punching pattern is generated in at least one additional punching step at at least one additional punching station, the first and second punching patterns being partially overlapping, characterized in that during punching an enlargement is produced in the first and/or second punching pattern in the area, in which the first and the second punching patterns overlap.
3. Procedure for the manufacture of track patterns in an elongated material tape with the individual track pattern being formed from a first punching pattern and a second punching pattern, in which said first punching pattern is generated in at least one first punching step at at least one first punching station and said second punching pattern is generated in at least one additional punching step at at least one additional punching station, the first and second punching patterns being partially overlapping, characterized in that after punching of the first punching pattern at at least the first punching station, said first punching station consisting of a first punching die or a first group of punching dies, and of the second punching pattern at at least the one additional punching station, said one additional punching station comprising an additional punching die or an additional group of punching dies, at least the one additional punching station is replaced by a different punching station comprising a different punching die or a different group of punching dies, whereby, after this replacement is effected, a second material tape is punched at at least the first punching station comprising the first punching die or the first group of punching dies and at at least the different punching station comprising the different punching die or the different group of punching dies.

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4. Procedure according to any one of the Claims 1 through 3, characterized in that the elongated material tape is made of metal or plastic.
5. Procedure according to any one of the Claims 1 through 3, characterized in that the elongated material tape is made of a metal-plastic laminate material.
6. Procedure according to any one of the Claims 1 through 5, characterized in that the thickness of the elongated material tape is in the range between 0.025 mm to 0.6 mm.
7. Procedure according to any one of the Claims 1 or 3 through 6, characterized in that during punching an enlargement is produced in the first and/or second punching pattern in the area, in which the first and the second punching patterns overlap.
8. Procedure according to anyone of the Claims 1 through 2 or 4 through 7, characterized in that after punching of the first punching pattern at at least the first punching station, said first punching station consisting of a first punching die or a first group of punching dies, and of the second punching pattern at at least the one additional punching station, said one additional punching station comprising an additional punching die or an additional group of punching dies, at least the one additional punching station is replaced by a different punching station comprising a different punching die or a different group of punching dies, whereby, after this replacement is effected, a second material tape is punched at at least the first punching station comprising the first punching die or the first group of punching dies and at at least the different punching station comprising the different punching die or the different group of punching dies.
9. Use of the procedure according to any one of the Claims 1 through 8 for manufacture of a track pattern for a chip card module or an IC card module in compliance with ISO 7816-2.
10. Use of the procedure according to any one of the Claims 1 through 8 for manufacture of a track pattern for an antenna of a mobile phone.
11. Use of a multistage operation die with punching dies that can be separately controlled or actuated by a program input device in the manufacturing of a track pattern for a chip card module or IC card module in compliance with ISO 7816-2, said use being in accordance with the procedure according to any one of the Claims 1 through 8.

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12. Use of a multistage operation die with punching dies that can be separately controlled or actuated by a program input device in the manufacturing of a track pattern for a mobile phone antenna, said use being in accordance with the procedure according to any one of the Claims 1 through 8.