Claims

1. An overvoltage-protection device for protecting a high-frequency terminal (22) from overvoltage, which provides a coil arrangement (1),
characterised in that
the coil arrangement (1) comprises several separate coils (L_1, L_2, ..., L_n), which are electrically connected in series with different, increasing inductances.

2. The overvoltage-protection device according to claim 1,
characterised in that
the coil (L_1) with the lowest inductance is connected electromechanically via a first connecting element (4) to the high-frequency terminal (12), and the coil (L_n) with the highest inductance is connected either directly via a second connecting element (5) or via a current source or voltage source (11) to a ground potential (28).

3. The overvoltage-protection device according to any one of the preceding claims,
characterised in that
the cross-sectional areas (A_1, A_2, ..., A_{n-1}) of the coils with the relatively lower inductance (L_1, L_2, ..., L_{n-1}) is smaller than or equal to the cross-sectional areas (A_2, ..., A_n) of the directly adjacent or directly contacted coils with the relatively larger inductance (L_2, ..., L_n).

4. The overvoltage-protection device according to any one of the preceding claims,
characterised in that

the coil arrangement (1) comprises several separate coils (L_1, L_2, ..., L_n), which are connected electromechanically to one another in each case via a soldered connection.

5. The overvoltage-protection device according to claim 4, **characterised in that** the electromechanical connection of the separate coils (L_1, L_2, ..., L_n) is embodied through solder pads (18), which are contacted with legs (19) of the coils (L_1, L_2, ..., L_n).

6. The overvoltage-protection device according to any one of the preceding claims, **characterised in that** the wire diameter of the coils (L_1, L_2, ..., L_{n-1}) with the relatively lower inductance is smaller than or equal to the wire diameter of the coil with the relatively larger inductance (L_2, L_3, ..., L_n) directly electrically contacted with or adjacent to this coil (L_1, L_2, ..., L_{n-1}).

7. The overvoltage-protection device according to any one of the preceding claims, **characterised in that** the ratio of the inductances of two coils (L_k, L_{k+1}) directly electrically contacted with or directly adjacent to one another is disposed between 4 to 1 and 16 to 1, preferably at approximately 8 to 1.

8. The overvoltage-protection device according to any one of the preceding claims, **characterised in that** the overvoltage-protection device is disposed on a metallised printed circuit board (25).

9. The overvoltage-protection device according to claim 8, **characterised in that** a cut-out (10) in the metallisation (16) of the printed circuit board (25) is disposed under the coils (L_1, L_2, ..., L_n).

10. The overvoltage-protection device according to any one of the preceding claims, **characterised in that** the external dimensions of the coil arrangement (1) are disposed between 3 mm and 10 mm, preferably 5 mm, away from a housing (21) and/or from electrically conductive parts.

11. The overvoltage-protection device according to any one of the preceding claims, **characterised in that** the coils (L_1, L_2, ..., L_n) directly electromechanically connected or directly adjacent to one another are arranged orthogonally relative to one another.

12. The overvoltage-protection device according to any one of the preceding claims, **characterised in that,** metallic and/or non-magnetisable but electrically conductive plates (9) which are electrically connected to the ground potential (28) are arranged between the coils (L_1, L_2, ..., L_n) directly electromechanically connected or directly adjacent to one another.

13. The overvoltage-protection device according to any one of the preceding claims, **characterised in that**

the cross-sectional area (A_1, A_2, ..., A_n) of the coils (L_1, L_2, ..., L_n) has the shape of a circle, a rectangle or an oval.

14. The overvoltage-protection device according to any one of the preceding claims,
characterised in that
the cross-sectional area of the coil wire is rectangular and/or that the coils (L_1, L_2, ..., L_n) are manufactured by separating a long rectangle from a metal sheet.

15. The overvoltage-protection device according to any one of the preceding claims,
characterised in that
the coils (L_1, L_2, ..., L_n) with low inductance are wound in such a manner that the thickness of the coil wire determines the capacitance between the individual windings of the coils (L_1, L_2, ..., L_n), in that the relatively smaller surfaces of the coil wire face towards one another, and/or that coils (L_1, L_2, ..., L_n) with high inductance are wound in such a manner that the width (b) of the coil wire determines the capacitance between the individual windings of the coils (L_1, L_2, ..., L_n), in that the relatively larger surfaces of the coil wire face towards one another.

Claims

1. An overvoltage-protection device for protecting a high-frequency terminal from overvoltage, comprising:

a coil arrangement including several separate coils, which are electrically connected in series with different, increasing inductances,

wherein a coil with the lowest inductance is connected electromechanically via a first connecting element to the high-frequency terminal, and a coil with the highest inductance is connected either directly via a second connecting element or via a current source or voltage source to a ground potential.

2. The overvoltage-protection device according to claim 1, wherein cross-sectional areas of the coils with relatively lower inductance is smaller than or equal to cross-sectional areas of directly adjacent or directly contacted coils with relatively larger inductance.

3. The overvoltage-protection device according to claim 1, wherein the coil arrangement includes several separate coils, which are connected electromechanically to one another in each case via a soldered connection.

4. The overvoltage-protection device according to claim 3, wherein the electromechanical connection of the separate coils is embodied through solder pads, which are contacted with legs of the coils.

5. The overvoltage-protection device according to claim 1, wherein a wire diameter of the coils with the relatively lower inductance is smaller than or equal to a wire diameter of the coil with the relatively larger inductance directly electrically contacted with or adjacent to the coils with the relatively lower inductance.

6. The overvoltage-protection device according to claim 5, wherein a ratio of the inductances of two coils directly electrically contacted with or directly adjacent to one another is between 4 to 1 and 16 to 1.

7. The overvoltage-protection device according to claim 1, wherein the overvoltage-protection device is disposed on a metallised printed circuit board.

8. The overvoltage-protection device according to claim 7, wherein a cut-out in the metallisation of the printed circuit board is disposed under the coils.

9. The overvoltage-protection device according to claim 1, wherein external dimensions of the coil arrangement are between 3 mm and 10 mm, away from a housing and/or from electrically conductive parts.

10. The overvoltage-protection device according to claim 5, wherein the coils directly electromechanically connected or directly adjacent to one another are arranged orthogonally relative to one another.

11. The overvoltage-protection device according to claim 10, wherein metallic and/or non-magnetisable but electrically conductive plates which are electrically connected to the ground potential are arranged between the coils directly electromechanically connected or directly adjacent to one another.

12. The overvoltage-protection device according to claim 2, wherein the cross-sectional area of the coils has a shape of a circle, a rectangle or an oval.

13. The overvoltage-protection device according to claim 2, wherein the cross-sectional area of the coil wire is rectangular and/or that the coils are manufactured by separating a long rectangle from a metal sheet.

14. The overvoltage-protection device according to claim 1, wherein the coils with low inductance are wound in such a manner that a thickness of a coil wire determines a capacitance between individual windings of the coils, in that relatively smaller surfaces of the coil wire face towards one another, and/or that coils with high inductance are wound in such a manner that a width of the coil

wire determines a capacitance between individual windings of the coils, in that relatively larger surfaces of the coil wire face towards one another.

15. The overvoltage-protection device according to claim 5, wherein the ratio of the inductances of the two coils directly electrically contacted with or directly adjacent to one another is approximately 8 to 1.

16. The overvoltage-protection device according to claim 1, wherein the external dimensions of the coil arrangement are 5 mm away from a housing and/or from electrically conductive parts.

17. An overvoltage-protection device for protecting a high-frequency terminal from overvoltage, comprising:

a coil arrangement including several separate coils, which are electrically connected in series with different, increasing inductances,

wherein cross-sectional areas of the coils with relatively lower inductance is smaller than or equal to cross-sectional areas of directly adjacent or directly contacted coils with relatively larger inductance.

18. An overvoltage-protection device for protecting a high-frequency terminal from overvoltage, comprising:

a coil arrangement including several separate coils, which are electrically connected in series with different, increasing inductances,

wherein the overvoltage-protection device is disposed on a metallised printed circuit board.