628483

COMMONWEALTH of AUSTRALIA
Patents Act 1952

APPLICATION FOR A STANDARD PATENT

I/We

Krone Aktiengesellschaft

of

Beeskowdamm 3-11, D-1000 Berlin 37, Federal Republic of Germany

hereby apply for the grant of a Standard Patent for an invention entitled:

Protective plug for connector banks of telecommunication and data systems

which is described in the accompanying complete specification.

Details of basic application(s):-

Number	Convention Country	Date
P39 09 783.8-34	Federal Republic of Germany	22 March 1989

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

DATED this FIFTH day of MARCH 1990

To: THE COMMISSIONER OF PATENTS

.....
a member of the firm of
DAVIES & COLLISON for
and on behalf of the
applicant(s)

Davies & Collison, Melbourne

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention

In support of the Application made for a patent for an invention entitled: Protective plug for connector banks of telecommunication and data systems

Insert full name(s) and address(es) of declarant(s) being the applicant(s) or person(s) authorized to sign on behalf of an applicant company.

I
We Keith Leslie
of 1 Little Collins Street
Melbourne 3000
Victoria
AUSTRALIA

do solemnly and sincerely declare as follows: -

Cross out whichever of paragraphs 1(a) or 1(b) does not apply

1(a) relates to application made by individual(s)
1(b) relates to application made by company; insert name of applicant company.

1 I am / We are [illegible]

or(b) I am authorized by

Krone Aktiengesellschaft

the applicant for the patent to make this declaration on its behalf.

Cross out whichever of paragraphs 2(a) or 2(b) does not apply

2(a) relates to application made by inventor(s)
2(b) relates to application made by company(s) or person(s) who are not inventor(s), insert full name(s) and address(es) of inventors.

2 I am / We are [illegible]

or(b) Gunter HEGNER, of Moranenweg 22, 1000 Berlin 27; and Klaus-Peter ACHTNIG, of Ostpreussendamm 106A, 1000 Berlin 45; both of Federal Republic of Germany

State manner in which applicant(s) derive title from inventor(s)

are / is the actual inventors of the invention and the facts upon which the applicant is entitled to make the application are as follows: -

The applicant would if a patent were granted on an application made by the said inventors, be entitled to have the patent assigned to it.

Cross out paragraphs 3 and 4 for non-convention applications. For convention applications, insert basic country(s) followed by date(s) and basic applicant(s).

3. The basic application as defined by Section 141 of the Act was made

in Federal Republic of Germany on the 22 March 1989

by Krone Aktiengesellschaft

in ..... on the .....

by .....

in ..... on the .....

by .....

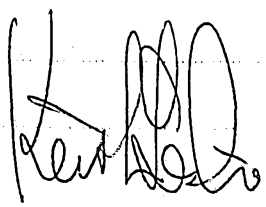
4 The basic application referred to in paragraph 3 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature

Declared at Melbourne this 5th day of March 1990

Signature of declarant(s) (no attestation required)

Note Initial all alterations.



DAVIES & COLLISON, MELBOURNE and CANBERRA.

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(54) Title
PROTECTIVE PLUG FOR CONNECTOR BANKS OF TELECOMMUNICATION AND DATA SYSTEMS

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H02H 009/00 H04Q 001/14 H05K 001/18

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(71) Applicant(s)
KRONE AKTIENGESELLSCHAFT

(72) Inventor(s)
GUNTER HEGNER; KLAUS-PETER ACHTNIG

(74) Attorney or Agent
DAVIES COLLISON CAVE , 1 Little Collins Street, MELBOURNE VIC 3000

(56) Prior Art Documents
AU 610845 83187/87 H01R 9/09 H01R 13/187
AU 588342 60126/86 H01H 85/48 H01R 13/68
UA 4113340

(57) Claim

1. A protective plug for a connector bank, comprising:

a housing having protective elements arranged therein;

a plug tongue electrically connected to said protective elements and extending to the exterior of said housing to, in use, engage a disconnector contact; and

a bifurcated contact extending from the interior of the housing to the exterior thereof to, in use, engage an earth rail; wherein

one of said protective elements is electrically connected between said plug tongue and said bifurcated contact, and the plug tongue is a printed-circuit board which includes terminal positions, and the protective elements are disposed to either side of the circuit board, said protective elements being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board are electrically connected via circuit tracks of said circuit board.

9. A protective plug for a connector bank of a telecommunication or data system, comprising a housing for receiving protective elements and electrical contact means for, in use, electrically connecting the plug between an incoming and an outgoing cable at said connector bank,

wherein said electrical contact means comprises a printed circuit board

.../2

which includes terminal positions, said circuit board extends into the housing to divide it into two compartments, protective elements being provided in more than one of said compartments and being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board being electrically connected by means of circuit tracks of said board.

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COMPLETE SPECIFICATION

NAME & ADDRESS
OF APPLICANT:

Krone Aktiengesellschaft
Beeskowdamm 3–11
D–1000 Berlin 37
Federal Republic of Germany

NAME(S) OF INVENTOR(S):

Gunter HEGNER
Klaus–Peter ACHTNIG

ADDRESS FOR SERVICE:

DAVIES & COLLISON
Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

Protective plug for connector banks of telecommunication and data systems

The following statement is a full description of this invention, including the best method of performing it known to me/us:–

The invention relates to a protective plug for connector banks of telecommunication and data systems.

A protective plug for connector banks of said species is known in the art from Australian Patent Number 595464. In said connector bank, insulation displacement contacts are provided one behind the other in close fit, said insulation displacement contacts serving for connection of insulated cable conductors. For protection aginst overvoltages, one protective plug for each double conductor is insertable between the two lines of insulation displacement connecting contacts. For this purpose, the protective plug comprises a plug tongue projecting from the housing, said plug tongue being inserted into a terminal being connected with one insulation displacement contact each of the two lines. Thus, an electrical connection of the insulation displacement contacts to a voltage surge arrester disposed in the housing of the protective plug is established. The earth connection from the voltage surge arrester to an earth rail extending outside the connector bank is effected over a bifurcated contact. Because of the tight space conditions, with such an arrangement of protective plugs arranged in close fit, only protection against overvoltages is possible.

In accordance with the present invention there is provided a protective plug for a connector bank, comprising:

a housing having protective elements arranged therein;

a plug tongue electrically connected to said protective elements and extending to the exterior of said housing to, in use, engage a disconnector contact; and

a bifurcated contact extending from the interior of the housing to the exterior thereof to, in use, engage an earth rail; wherein

one of said protective elements is electrically connected between said plug tongue and said bifurcated contact, and the plug tongue is a printed-circuit board which includes terminal positions, and the protective elements are disposed to either side of the circuit board, said protective elements being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board are electrically connected via circuit tracks of said circuit board.

In another aspect, there is provided a protective plug for a connector bank of a telecommunication or data system, comprising a housing for receiving protective elements and electrical contact means for, in use, electrically connecting the plug between an incoming and an outgoing cable at said connector bank,

wherein said electrical contact means comprises a printed circuit board

which includes terminal positions, said circuit board extends into the housing to divide it into two compartments, protective elements being provided in more than one of said compartments and being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board being electrically connected by means of circuit tracks of said board.

In preferred embodiments of the invention, the printed-circuit board is so arranged in the housing that, on either side of the printed-circuit board, there can be inserted protective elements having different protecting functions, without the dimensions, in particular not the height of the protective plug, being increased. Thus, it is achieved that in spite of the protective plug arranged in close fit and of the tight space conditions, a protection against overvoltages and a fuse to protect against overcurrents can be received inside a housing.

The use of a voltage limiting device according to a preferred embodiment of the present invention further offers the advantages of a compact form of protective device which provides not only over voltage protection but also thermal protection in an electrical plug.

In the following, embodiments of the invention are

described in more detail, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 a cross section through the connector bank and the plugged-on protective plug,

Fig. 2 a top view of several connector banks arranged in two lines and of plugged-on protective plugs,

Fig. 3 an enlarged cross-section through the protective plug,

Fig. 4 a longitudinal section through the protective plug according to line IV-IV of Fig. 3,

Fig. 5 the top view of the protective plug,

Fig. 6 the front view of a printed-circuit board of the protective plug in a first embodiment,

Fig. 7 the rear view of the printed-circuit board according to Fig. 6,

Fig. 8 the front view of a printed-circuit board of the protective plug in a first embodiment,

Fig. 9 the rear view of the printed-circuit board according to Fig. 8,

Fig. 10 the circuit diagramme of the printed-circuit board according to Figs. 6 and 7,

Fig. 11 the circuit diagramme of the printed-circuit board according to Figs. 8 and 9,

Fig. 12 a side view of the voltage-limiting device,

Fig. 13 the front view according to Fig. 12, and

Fig. 14 the rear view according to Fig. 12.

The protective plug 1 is composed of a housing 2 being formed of two housing halves 3 latched to one another, of a printed-circuit board 4 disposed in the housing 2 and forming a plug tongue 5, of a voltage limiting device 7, two current fuses 8, 9 and an earth contact 40. The housing 2 made of plastic is substantially a square-shaped housing body and comprises two housing openings 16, 17 at its bottom side 15.

The slot-type housing opening 16 serves for passing-through the printed-circuit board 4 fixed inside the housing 2, the free end of said printed-circuit board extending outwardly and in free-standing manner from the housing 2 and forming the plug tongue 5. The slot-type housing opening 16 is provided approximately in the central section of the bottom side 15 of the housing 2, and comprises at the slotted edge 18 two latching hooks 19 provided for a latch connection of the protective plug 1 to a connector bank 20. The printed-circuit board 4 is, further, guided and supported between the latching hooks 19 abutting on either side. At the other end 52 of the printed-circuit board 4, support hooks 45 are provided in the housing 2, said support hooks supporting and fixing the printed-circuit board 4 on either side. The printed-circuit board 4 is, thus, disposed substantially in the centre of the housing 2 and divides the interior space of the housing 2 into two housing compartments 21 and 22. In the first housing compartment 21, two current fuses 8, 9 are arranged, which are inserted over their terminal legs 23, 24 into terminal positions A, F and C, E. In the second housing compartment 22, there is provided a voltage limiting device 7, which is inserted over its terminal legs 25, 26 into the terminal positions B, D of the printed-circuit board 4. As the

current fuses 8, 9 have their two terminal legs 23, 24 on two opposed side faces 28, the terminal legs 23 of the current fuses 8, 9 are longer and are bent off twice by 90°, such that the ends of all terminal legs 23, 24 of the current fuses 8, 9 show in the same direction. The voltage limiting device 7 received in the second housing half 22 and represented in Figs. 12, 13 and 14, e.g. a so-called solid state protector, comprises a plate-type housing body and has on one housing side three terminal legs 25, 26, 27 arranged in a line. The central terminal leg 27 is shortened, here, such that a spacing a of the end of the terminal leg 27 from the printed-circuit board 4 will result, as shown in particular in Fig. 3. Over the voltage limiting device 7, a metal clamp 30 is attached as thermal protector. The clamp 30 has a substantially U-shaped cross section and comprises several lateral sheet-metal lugs 29 bent off by 90° and resting against the side faces 31 of the voltage limiting device 7. The legs 32, 33 of the U-shaped clamp 30 abut the front and rear sides 34, 35 of the voltage limiting device 7. The ends of the legs 32, 33 are bent off by approx. 90°, and form resilient contact elements 37, 38 serving for connection to the terminal legs 25, 26, 27. The leg 33 resting against the rear side 35 is of trapezoidal shape, such that the resilient contact element 38 contacts the central terminal leg 27, without contacting the terminal legs 25, 26. The leg 32 of the clamp 30 is, however, held spaced from the front side 34 by a melt element 36 fastened thereto, such that the contact elements 37, too, are spaced from the terminal legs 25, 26. At the clamp 30 is provided a contact tongue 39 being inserted into a bifurcated contact 41 of the earth contact 40. The earth contact 40 is built up of a sheet-metal strip, at the ends of which one bifurcated contact 41, 42 is formed. The bifurcated contact 41 is arranged inside the housing 2, and the bifurcated contact 42 outside, the earth contact 40 being received and held in the slot-type housing opening 17.

For different protecting functions, either a first printed-circuit board 4 or a second printed-circuit board 4a is provided in the housing 2. Both printed-circuit boards 4, 4a comprise identical terminal positions A to F. They differ, however, in different layouts on the printed-circuit board. The printed-circuit board 4 is shown in Figs. 6 and 7, the respective circuit diagramme in Fig. 10. The printed-circuit board 4a is shown in Figs. 8 and 9, the respective circuit diagramme in Fig. 11.

In order to employ the current protection ahead of the overvoltage protection (protection of the line side), the printed-circuit board 4 according to Figs 6, 7, 10 is to be used. The circuit diagramme according to Fig. 10 shows on the left-hand side the line-side terminals a and b of the cable conductors, and on the right-hand side the office-side terminals a' and b'. Further is shown in the circuit diagramme that the current fuse 9 is connected to the terminal positions A and F. The voltage limiting device 7 is connected to the terminal positions D and B. In this circuit diagramme, the a conductor is connected to terminal position E, the b conductor to terminal position F, the a' conductor to terminal position D, and the b' conductor to terminal position B.

In case a current protection is required at the rear of the overvoltage protection (protection of the office side), the printed-circuit board 4a according to Figs. 8, 9 and 11 is to be employed. As the circuit diagramme according to Fig. 11 shows, on the left-hand side are arranged the line-side terminals a and b, and on the right-hand side the office-side terminals a', b' for the cable conductors. Here, too, the current fuse 9 is connected to terminal positions C and E, and the current fuse 9 to terminal positions A and F. The voltage limiting device 7 is also connected to terminal positions B and D. In contrast to the first-mentioned printed-cir-

cuit board 4, there are connected, however, on the printed-circuit board 4a the cable conductor a to terminal position D, the cable conductor b to terminal position B, the cable conductor a' to terminal position E, and the cable conductor b' to terminal position F.

The various circuitries of the protective elements 6 result from the various layouts of the circuit tracks 10 according to Figs. 6, 7, 8 and 9.

For the suppression of overvoltages and for the protection against overcurrents, the protective plug 1 is inserted between the cable conductors a, b and a', b' into the disconnector contact 43 of a connector bank 20. Instead of disconnector contacts 43, non-shown operating contacts can also be inserted into the connector bank 20. The connector bank 20 comprises two lines of insulation displacement contacts 42, two opposed insulation displacement contacts 53 being connected over the disconnector contact 43 and being separated by inserting the protective plug 1. Outside the connector bank 20 is, as shown in Fig. 1, arranged an earth rail 44 extending longitudinally adjacent to the connector bank 20. The protective plug 1 is inserted centrally from above into the connector bank 20, the plug tongue 5 of the protective plug 1 being inserted into the disconnector contact 43. The circuit tracks 10 arranged on either side on the plug tongue 5 are, thus, electrically connected to the disconnector contact 43. The plug tongue 5 comprises, further, on either side two adjacent circuit tracks 10, such that a double conductor a, b is protected by a protective plug 1. After inserting the protective plug 1 into the connector bank 20, the bifurcated contact 42, too, of the earth contact 40 of the protective plug 1 is connected to the earth rail 44, as the earth rail 44 is inserted into the bifurcated contact 42.

In the following, the overvoltage case is explained in more detail, based on the figures. In case of an over-

voltage, the current will flow from the cable conductor a over the insulation displacement contact 53 to the disconnector contact 43, and over the circuit tracks 10 of the plug tongue 5 to terminal position E, if the printed-circuit board 4 according to Fig. 10 is employed. From terminal position E, the current will flow through the terminal leg 23, through the current fuse 8, the terminal leg 24 to terminal position C.

From terminal position C over the circuit track 10 to terminal position D, to which is connected the terminal leg 26 of the voltage limiting device 7. The current will then flow through the voltage limiting device 7 to the terminal leg 27, and from there, over the clamp 33 and the contact tongue 39 to the earth contact 40, the bifurcated contact 42 of which is electrically connected to the earth rail 44. The current is led away over the earth rail 44 to earth.

During this process of continuous flow of current through the voltage limiting device 7, heat is developed leading to melt the melt element 36. After the melt element 36 being molten, the resilient contact elements 37 of the clamp 30 will contact the terminal legs 25 and 26 of the voltage limiting device 7, and will, thus, short-circuit the voltage limiting device 7, as is represented in the circuit diagramme according to Fig. 10. The overvoltage is, thus, led away over terminal position C directly to earth. The melt element 36 serves, therefore, as thermal protector. For the cable conductor b, the current flow will proceed in similar way over the insulation displacement contact 53 to the disconnector contact 43, over the circuit track 10 of the plug tongue 5 to terminal position F, through the current fuse 9 to terminal position A, over the circuit track 10 to terminal position B being connected to the terminal leg 25 of the voltage limiting device 7. Here, too, the current will flow through the voltage limiting device 7 to terminal

leg 27 and from there, over the clamp 30 and the contact tongue 39 to the earth contact 40 and to the earth rail 44.

In case the second printed-circuit board 4a is employed, on which the current protection is arranged on the office side, the flow of current of the current fuses 8, 9 is interrupted for high currents and for low voltages; in this case, the voltage limiting device 7 will not be tripped.

As shown in Fig. 2, is the housing 2 of the protective plug 1 on one narrow side 11 on either side provided with recesses 13, and on the other narrow side 14 with step-type cutouts 14. After pulling a protective plug 1 out from a line of several protective plugs 1 arranged side-by-side in a close fit, the cable conductors a, b connected to the insulation displacement contacts 53 are accessible by the recesses 13. The free space 6 existing after pulling the protective plug 1 out is so large that a non-shown tool may connect the cable conductors a, b without impeding. By the step-type cutouts 14, a space-saving arrangement of two protective plugs 1 inserted into the connector bank 20 in opposed order is achieved.

On the top side 46 of the housing 2, in total five housing openings 47 to 51 are provided serving for inserting a non-shown test tip of a test plug.

The housing opening 47 serves for access of the a conductor, the housing opening 48 of the a' conductor, the housing opening 49 of the b conductor, the housing opening 50 for the b'conductor, and the housing opening 51 serves as access to earth potential.

LIST OF REFERENCES

1	protective plug	30	clamp
2	housing	31	side face
3	housing half	32,33	legs
4,4a	printed- circuit board	34	front side
5	plug tongue	35	rear side
6	free space	36	melt element
7	voltage limiting device	37,38	contact element
8,9	current fuse	39	contact tongue
10	circuit track	40	earth contact
11,12	narrow side	41,42	bifurcated contact
13	recess	43	disconnector contact
14	cutout	44	earth rail
15	bottom side	45	support hook
16,17	housing opening	46	top side
18	slotted edge	47 to 51	housing openings
19	latching hook	52	earth
20	connector bank	53	insulation displacement contact
21,22	housing compartment		
23 to 27	terminal leg	A to F	terminal positions
28	side face		
29	sheet-metal lug		

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A protective plug for a connector bank, comprising:

a housing having protective elements arranged therein;

a plug tongue electrically connected to said protective elements and extending to the exterior of said housing to, in use, engage a disconnector contact; and

a bifurcated contact extending from the interior of the housing to the exterior thereof to, in use, engage an earth rail; wherein

one of said protective elements is electrically connected between said plug tongue and said bifurcated contact, and the plug tongue is a printed-circuit board which includes terminal positions, and the protective elements are disposed to either side of the circuit board, said protective elements being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board are electrically connected via circuit tracks of said circuit board.

2. A protective plug as claimed in claim 1, wherein said protective elements comprise at least one current fuse arranged to one side of said circuit board and a voltage-limiting device arranged to the other side of said circuit board, said voltage-limiting device comprising said one of said protective elements.

3. A protective plug as claimed in claim 1 or 2, wherein said terminal positions are arranged to extend through said circuit board in electrically connected relationship with selected ones of said circuit tracks.

4. A protective plug as claimed in claims 2 or 3,

characterised in that a first terminal position is connected to a second terminal position, and that a third terminal position is connected to a fourth terminal position via said circuit tracks.

5. A protective plug as claimed in claim 4, characterised in that a first current fuse is connected to the third and a fifth terminal position, and a second current fuse is connected to the first and sixth terminal position, and the voltage limiting device is connected to the second and fourth terminal positions.

6. A protective plug as claimed in claim 5, wherein the circuit board has two circuit tracks for electrical connection to respective input contacts of said connector banks, said circuit tracks being arranged whereby one of said circuit tracks is connected to the fifth terminal position and the other is connected to the sixth terminal position, and two further circuit tracks for electrical connection to respective output contacts of said connector bank, one of said further circuit tracks being connected to the fourth terminal position and the other being connected to the second terminal position.

7. A protective plug as claimed in claim 5, wherein the circuit board has two circuit tracks for electrical connection to respective input contacts of said connector banks, said circuit tracks being arranged whereby one of said circuit tracks is connected to the fourth terminal position and the other is connected to the second terminal position, and two further circuit tracks for electrical connection to respective output contacts of said connector bank, one of said further circuit tracks being connected to the fifth terminal position and the other being connected to the sixth terminal position.

8. A protective plug as claimed in claim 1, characterised in that the housing has one end provided with recesses which extend along lateral edges of the housing, the other end of the housing having a step-type configuration.

9. A protective plug for a connector bank of a telecommunication or data system, comprising a housing for receiving protective elements and electrical contact means for, in use, electrically connecting the plug between an incoming and an outgoing cable at said connector bank,

wherein said electrical contact means comprises a printed circuit board

which includes terminal positions, said circuit board extends into the housing to divide it into two compartments, protective elements being provided in more than one of said compartments and being electrically connected to the circuit board at respective terminal positions, and selected terminal positions of said circuit board being electrically connected by means of circuit tracks of said board.

10. A protective plug substantially as described hereinbefore with reference to the accompanying drawings.

Dated this 16th day of July, 1992.
KRONE AKTIENGESELLSCHAFT
By its Patent Attorneys
DAVIES COLLISON CAVE

FIG.1

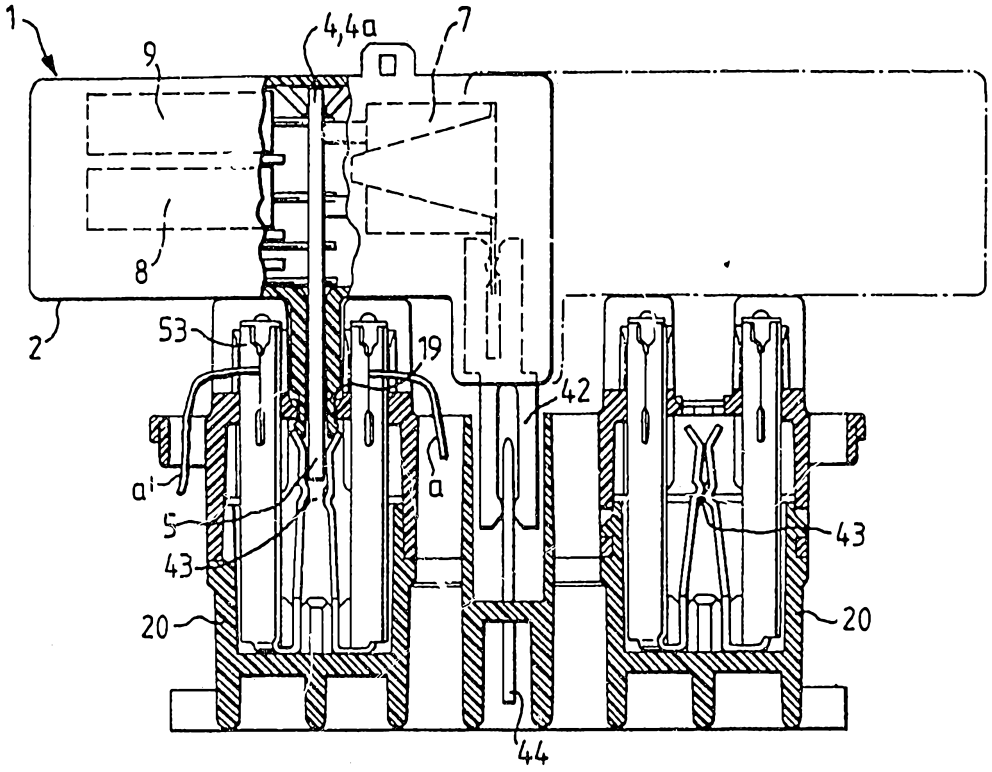
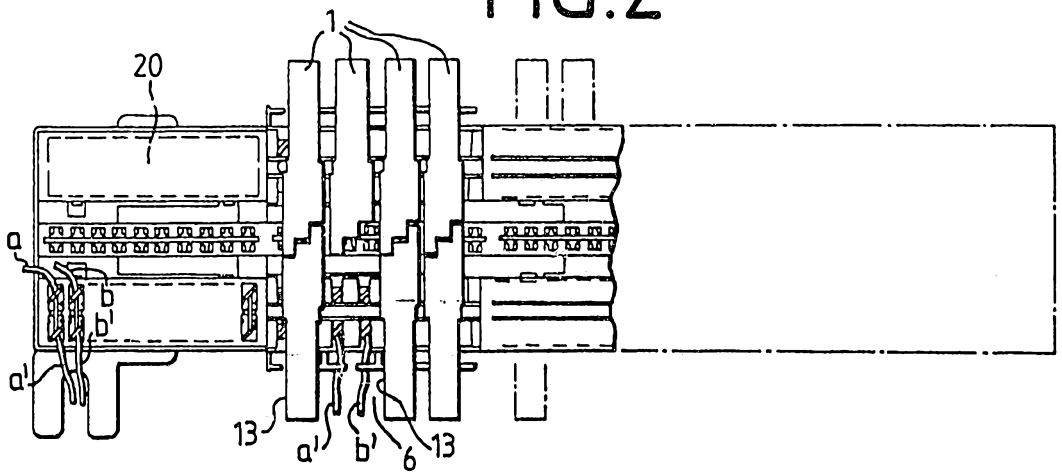


FIG.2



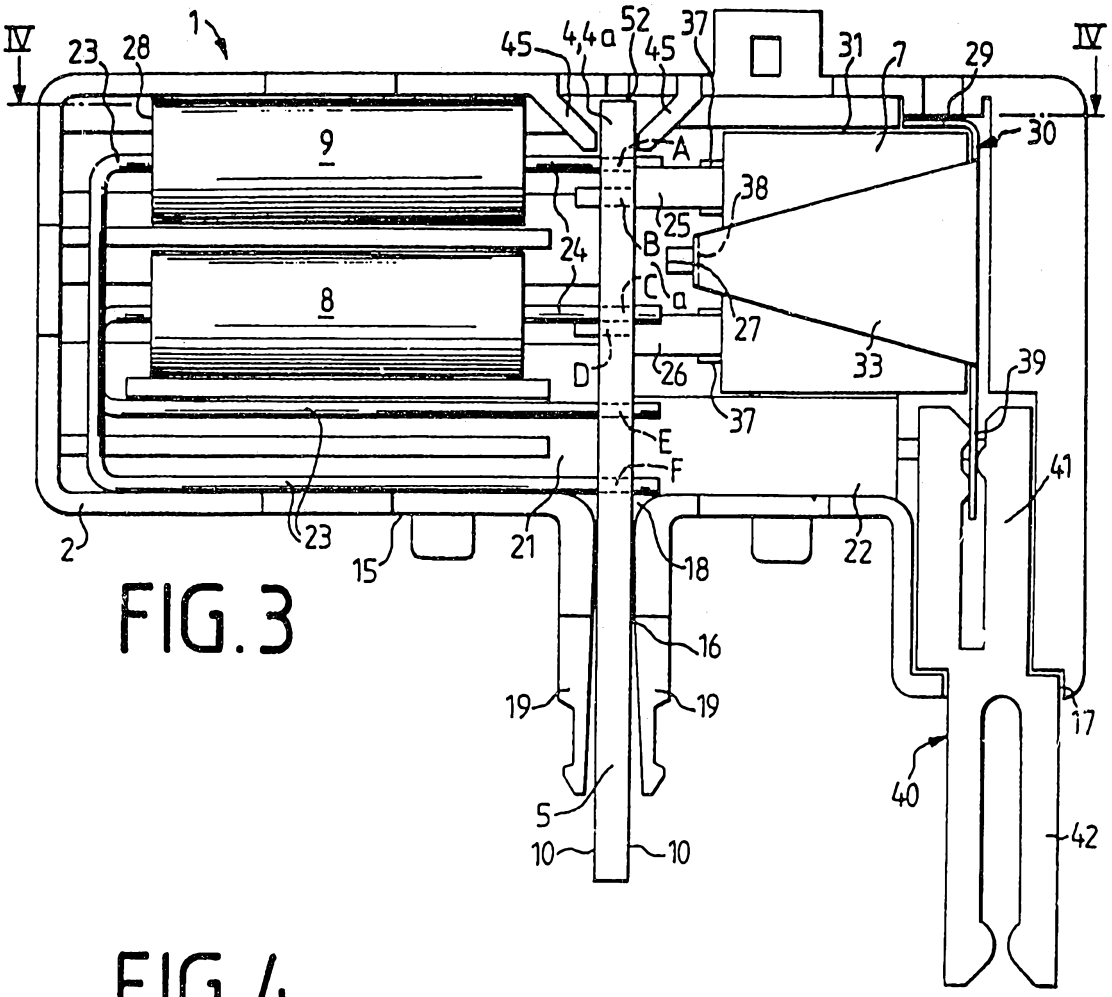


FIG.3

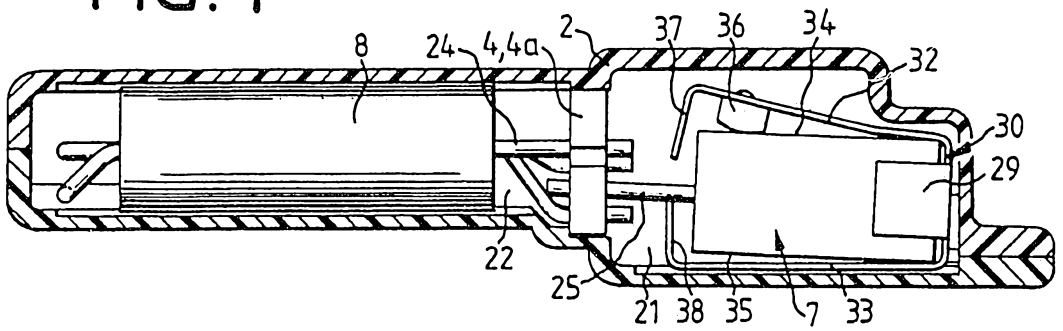


FIG.4

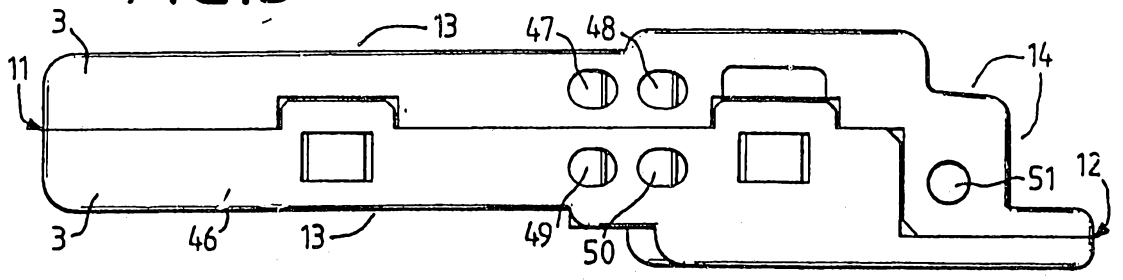


FIG.5

FIG.6

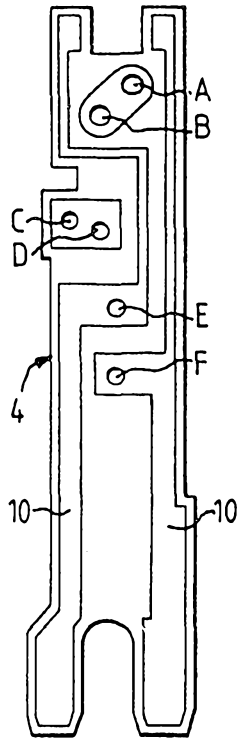


FIG.7

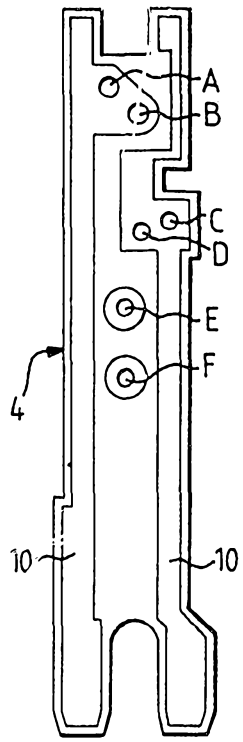


FIG.8

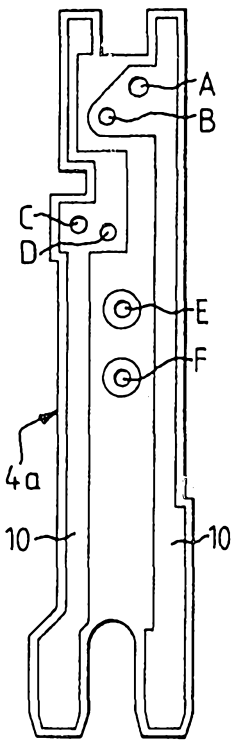


FIG.9

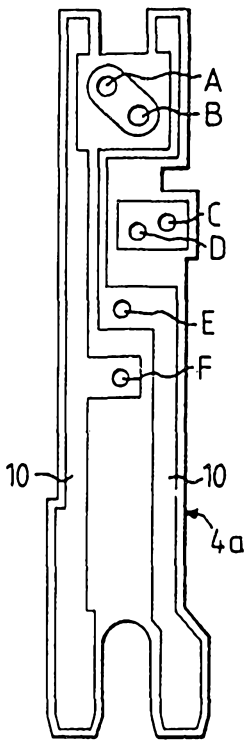


FIG.10

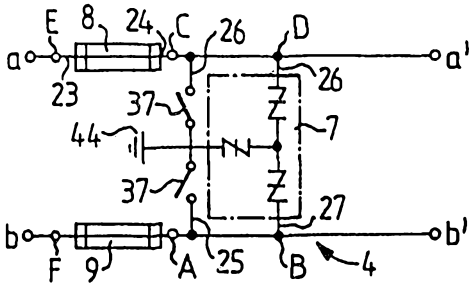


FIG.11

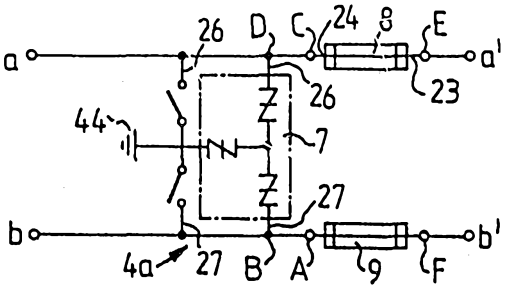


FIG.12

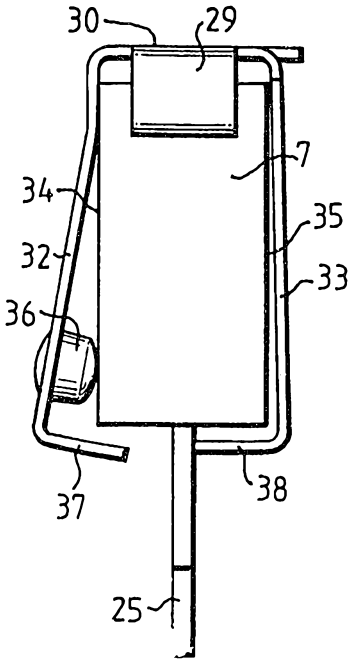


FIG.13

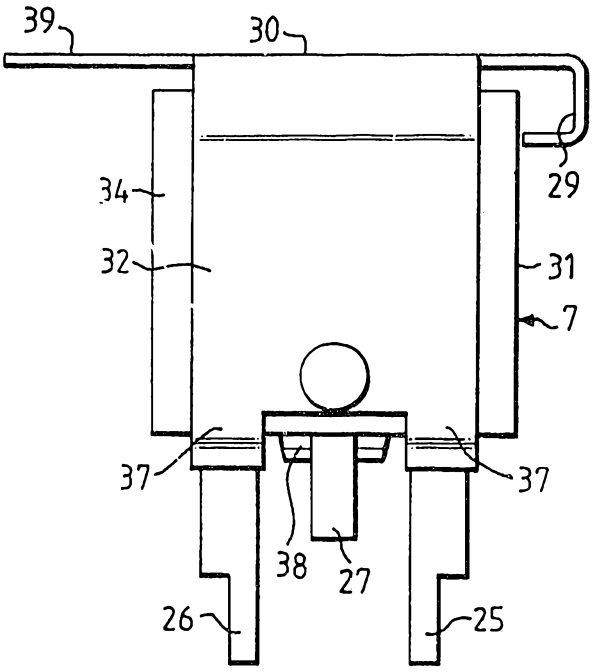


FIG.14