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(54) **Pliant electrical heating panel and method and device for the fabrication thereof.**

(57) Electrical heating blanket with layers of material (1,2,8) which are stitched together with stitching seams (9) and with a heating wire (3) laying between the layers of material (1,2,8) in a zig-zag pattern, whereby the stitching seams across the heating wire (3) in order to keep the wire (3) in its desired position. Such a heating blanket is fabricated by again and again, feed a piece of heating wire in the transverse direction between the layers of material coming together and thereafter stitching together these layers of material in the transporting direction of the material.

A device intended therefore comprises a list moveable to and fro for pressing that piece of heating wire again and again between the layers of materials in front of the stitching place.

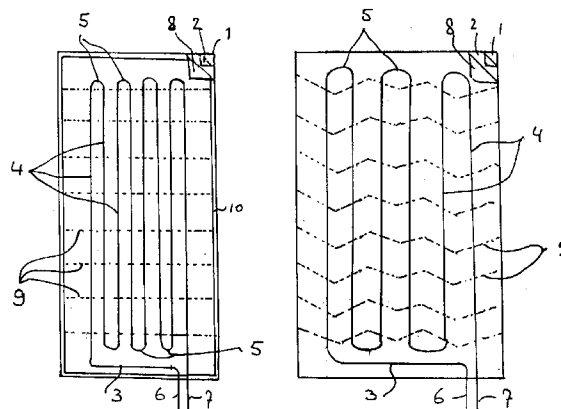


Fig. 1a.

Fig. 1b.

The invention relates to a pliant electrical heating panel comprising at least one panel part and a heating wire which lies in a desired pattern thereon and is held on his position by at least one line-shaped seam. The invention further relates to a method and device for the fabrication of such a heating panel. The term heating panel not only comprises a elektrical blanket, but each in substance pliant flat heating means, for example a pillow or a mat serving as a heated substratum for a carpet, which heating means is composited of layers which are compounded with a heating wire therebetween. Such an electrical heating panel is known from the Dutch patent specifications 121671 and 143401. In these patent specifications an electrical heating blanket is described, whereby an electrical heating wire passes therein in a zig zag fashion and is kept in position by attaching to each other two blanket halves laying onto each ohter with seams, along lines which extend between the parts of the electrical heating wire laying next to each other and parallel thereto. By this known electrical blanket the electrical heating wire can freely move through sockets formed by two connecting seams laying next to each other, as a result thereof parts of the wire can be lie close to each other, only separated by a seam, or at a distance from each other which nearly corresponds with the width of two sockets. A disadvantage thereof is that the heat-release of the electrical blanket per unity of area can show undesirable great differences, depending on parts of the electrical heating wire lie closer to each other or farther from each other. Another disadvantage is that the flexibility of the known electrical blanket can show undesirable differences when the electrical heating wires are shifted in the sockets. Furthermore, an electrical blanket in which the electrical heating wire passes through the sockets formed in the blanket in a meandering way does not look out attractive. The invention has the object to provide an electrical heating panel of the type mentioned in the beginning which does not show these disadvantages. According to the invention this object is attained with a pliant electrical heating panel in that a line at which the seam lies intersects the electrical heating wire and in that the seam at the intersection between said line and the electrical heating wire is intersected. By this in a simple way it is reached that the electrical heating wire is locked at the panel part in its corrects position. In an attractive embodiment of an electrical heating panel having a zig-zag extending wire-pattern with parallel wire-parts, according to the invention each of a number of seam-lines intersects these parallel wire-parts. By this it is attained that the electrical heating wire is locked good in its correct position with a small number of seam-lines, especially with short wire-parts between successive bends in the wire whereby further the distance between the seams is independent from

the distance between parts of the zig zag patterned wire lying next to each other, so that the seams and the electrical heating wire can form each desired pattern unless seam and wire remain forming an angle with each other.

The invention further has the object to provide a method for the fabrication of a pliant electrical heating panel whereby at least a layer of web-like material is sewed by means of needles being on a line which extends in a direction transverse to the feeding direction of the material, thereby fixing an electrical heating wire formed in a zigzag pattern onto the web-like material, which method does not show the drawback of a such method known the Dutch patent application 8400410. By this known method the electrical heating wire glued as a whole onto one of the web-like materials in a zigzag pattern, before two materials webs fed onto each other are sewed together thereby enclosing the electrical heating wire. Indeed the heating wire is thereby locked against shifting, but by lacking of any moveability of the heating wire with respect to one of the materialwebs the finished blanked can not be easily beneded and folded without causing in the long run that the wire becomes loose in the blanket and then shows the same disadvantages as the blankets known from the patent specifications mentioned hereibefore. With the method according to the invention this drawback is obriated by, again and again, first forming a new part of the zig zag pattern on stationary of slowly moving web-like materials by, seen in the material feed direction, pressing a straight part of the wire to beyond the line of the needles and thereafter feed the web-like materials further and sewing over a distance which corresponds to the distance between straight parts of the zigzag pattern to be formed. By this it is attained that electrical heating panels can be made with a dimension which is random in one direction. A further object of the invention is to provide a simple, compart and cheap device for carrying out the method according to the invention automatically. According to the invention this object is attained in a device comprising at least a holder for a roll of web material and a roll of electrical heating wire, as well as a table onto which the unrolled web of material can be fed and, by means of a multiple-needle sewing machine can be stitched, whereby the needles lie on a line extending transverse to the web transporting direction and a wire lay out device for the lay-out of the electrical heating wire onto the web material, in that space between the webs coming together a strip is present which is moveable between a first position in which an alyning edge of the strip which is faced to the line of the needles seen in the web transporting direction, lies before the line of the needles and a second position in which this alyning edge, seen in the same direction, lies beyond the line of the needles. By this it is attained that in the first position of the strip the wire lay out can put a part of the elec-

trical heating wire against the alying edge and sub-
segmently during the movement of the strip to its sec-
ond position the strip presses that part of the wire to
the desired position onto the web material. In an at-
tractive embodiment of a device according to the in-
vention the alying edge of the strip is provided with
notlikes which, seen in the web transporting direc-
tion, each lie on a line with the stitching seam to be
formed.

By this it is attained that before the strip moves
back from its second position to its first position, the
web material can be moved further with activated
sewing device, because the needles pass through the
notches, so that, during continuing backwards move-
ment of the strip and activated sewing and webtran-
sport, the part of the wire remains positioned.

The invention will be explained hereinafter on the
basis of accompanying drawings wherein: Fig 1a and
1b show embodiments of an electrical heating blan-
ket according to the invention, Fig 2 shows a blanket-
web from which blankets according to Fig 1 of varying
length can be formed, Fig 3 schematically show a side
view of a device according to the invention with which
the blanket-web shown in Fig 2 can be made, Fig 4a
to 4d show top views of a detail of the device repre-
sented in Fig 3 and Fig 5 shows a circuit of the elec-
trical connention of the heating blanket. The single
blanket shown in Fig 1a has a length of about 1700
mm and a width of about 800 mm. The blanket is
formed by a formfixed cotton under-layer 1 and there-
upon a non-formfixed intermediate layer 2 of foamed-
material being about 5 mm thick. On the foam layer 2
an electrical heating wire 3 is present in a zig zag pat-
tern with straight parts 4 at a mutual distance of 50
mm for example alternated with bends 5. The wire 3
has ends 6 and 7 which protrude outside the blanket
in order to be connected with a electrical power
source, as is show particularly in Fig 5 and on the ba-
sis thereof will be explained further on. The whole of
dayers and wire connected to each other is covered
by a non formfixed woollen top layer having a thick-
ness of about 3 mm. The layers 1,2 and 8 are connect-
ed to each other by stitched seams, which extended
in a direction transverse to the straight parts 4 of the
wire, which stitched seams only are interrupted at the
intersections with the heating wire 3. Accordigly, the
wire 3 lies in a well defined position between the blan-
ket-layers without being fixed to the blanket-layers.
The blanket is finished with a band 10 along its bor-
ders. The electrical blanket shown in Fig 1b differs
only from the blanket shown in Fig 1a with regard
to the pattern of the wire 3 and the stitched seam 9. That
is, the straight parts 4 of the wire 3 are at a greater
mutual distance so as to create a blanket with a lower
heating power and the stitched seams run according
to an attractive pattern. Besides these embodiments
many other embodiments can be conceived with
other wire and stitch-patterns whereby these wires

and seams show points of intersection. So, for exam-
ple, two separate electrical heating wires can be ap-
plied in a zig zag pattern in two areas next to each
other as seen in the transporting direction of the web.
In Fig. 2 a parts of a continuons blanket-web 11 is
shown which web is made with the device described
hereinafter on the basis of Fig. 3. The shown part of
the blanket-web 11 is cut along partition lines
12,13,14 and 15 in a small one-persons blanket, a
two-persons blanket, a broad one-persons blanket
and a two persons blanket, respectively. Before this
cut off the electrical heating wire is cut at the places
16 to 19 and the resulting wire-ends for each of the
blankets are laid in the pattern shown in Fig. 1, which
pattern is indicated in Fig. 2 for the wire-ends 20 and
21 at cutting place 15. The device shown in Fig. 3
comprises a work table 30 onto which a multiple-nee-
dle sewing machine 31 is mounted said machine com-
prises a number of needles 32 situated in a row 33 ex-
tending in a direction transverse to the sewing direc-
tion and further comprises a stitching plate 34 extend-
ing at a short distance above the work table 30. Next
to the work-table 30 are installed, seen from below to
above, a supply roll 35 of cotton fabric, a supply roll
36 of foam material, a supply roll of electric heating
wire 37 and a supply roll 38 of woollen fabric. In stead
of rolls of fabric and wire the fabric and wire can of
cause also be on stock in another form, for example
the fabric as a zig-zag folded web on a pallet and the
wire as a loose wire in a box. The unrolled fabric webs
are fed in a superpositioned way over the work table
30 and under stitching plate 34 and are discharged by
transport rolls 39. The transport of the fabrics over the
work table 30 is provided for by the sewing machine
31. A wire layout device comprising a carriage 40
moving to and fro in transverse direction attends for
the lay-out of the wire unrolled from roll 37 in the de-
sired zigzag pattern. Further a strip 41 with an align-
ing edge 42 provided with notches is installed the
space where the fabric webs come together. With aid
of non-shown means the strip 41 moveable in hori-
zontal direction between the position shown in Fig. 3
with drawn lines, in which position the carriage 40 of
the wire lay out device can lie an unrolled part of heat-
ing wire against the aligning edge 42, and a position
in which this aligning edge 42 lies beyond the row of
needles 33 for positioning of that part of wire between
the fabric webs and to prevent that is stitched through
the electrical heating wire. The working of the device
shown in Fig. 3 will be explained hereinafter on the
basis of the top views of the stitching zone shown in
Figs 4a to 4d in successively occuring situations. In
Fig. 4a the strip 41 with its aligning edge 42 just has
pressed a piece of heating wire 37 beyond the nee-
dles-line 33, during which movement the needles are
tilted. Immediate after the positioning of that piece of
wire the sewing machine is activated for the stitching
together of the fabric webs in the areas formed by the

notches 43 and the strip 41. Thereafter the strip 41 is moved back to the position shown in Fig. 3 with drawn lines and the fabric webs are further moved forward and stitched together, whereby the in Fig. 4b shown position is reached. Thereafter, by continuing fabric transport, a following piece of electrical heating wire is laid against the aligning edge 42 (Fig. 4c), whereupon the fabric transport is interrupted and, with tilted needles and sewing foot, strip 41 presses that following piece of wire 37 beyond the row of needles 33 between the fabric webs and brings that piece in the desired position (Fig. 4d). Due to the stitching seams which are continuous in the transporting direction of the fabric there is no need to remove yarn-knots which would come about between such stitching seams when applying separate stitching seams in transverse direction.

For finishing of an electrical heating blanket fabricated according to the method described hereinbefore or to another method provision is made of a reliable, reusable protection of which the electrical circuit is shown in Fig. 5. Therein the ends 6 and 7 of a heating wire 3 are connectable to a mains voltage of 220 V. Parallel to the heating wire 3 a signal wire 45 is contained in the electrical blanket, which signal wire is connected to the mains voltage via a diode 46. Between the heating wire 3 and the signal wire 45 a layer of electrical insulating material 47 is present. Heating wire, insulating layer 47 and signal wire 45 can be intergrated in such a way that the wire 3 laid between the blanket-halves as shown in Figs 1-4 is a coax-cable wherein the insulating layer 47 surround the heating wire co-axially and the signal wire 45 is spirally around the insulating layer 47. By damage of the coax cable in the electrical blanket, for example due to excessive heat generation, the signal wire 45 will be come in conductive contact with the heating wire 3 as a result of which a short-cut current will flow triggering a thyristor 48 for bringing it in complete conduction for protection of the electrical heating blanket. By connecting thyristor 48 directly to 220 V. this would short-cut the thyristor 48 and lead to an irreparable damage thereof. According to an aspect of the present invention such a short-cut is prevented by connecting a neon-lamp 49 in series with thyristor 48. This neon-lamp, which is further connected in series with a resistor 50, functions normally as an indication lamp for an activated electrical blanket, but limits in case of a short-cut in the electrical heating blanket, the short-cut current which initially goes through thyristor 48. Thus the thyristor remains intact so as to blow out a safety fuse intended therefor.

According to another aspect of the invention there is provided for a price-favourable safety circuit combined with a simple multiple position heat control which can have up to 5 positions. The electrical heating wire 3 and the signal-heating wire 45 are each, at its ends where they come out of the heating blanket

together, connected to different phases of the public electric mains: So the lower ends c of wires 3 and 45, as shown in Fig. 5, are connected to connection 6 and connection 7 respectively and the upper ends a to connection 7 and connection 6, respectively. The triggering of thyristor 48 is branched off from the end a of the signal-heating wire 45. To the end c of the signal-heating wire 45 a switch S1 is present between signal-heating wire and connection 7 and to the end a of the heating wire 3 a switch S2 is present between heating wire 3 and connection 7. Further, parallel to switch S2 a switch S3 can be linked in series with a diode 52. The working of the multiple position control: The five heating-position are defined as follows. Position 1: only switch S1 is closed. Position 2: only switch S3 is closed. Position 3: only switch S2 is closed. Position 4: both switches S1 and S3 are closed. Position 5: both switches S1 and S2 are closed. By leave out of S3 comes about a three-position-control, which positions correspond to the positions 1,3 and 5 mentioned hereinbefore. In position 1 the signal wire 45 functions likewise as heating wire, whereby rectifying diode 46 provides for halving of the power to be delivered by the wire 45. In position 2 switches S1 and S2 are opened and switch S3 is closed. Rectifying diode 52 provides for halving of the power which can be maximally delivered by wire 3. Wire 45 thereby remains functioning as signal wire despite S1 is open. In position 3 switches S1 and S3 are opened and switch S2 is open, so that delivers the power which is maximal deliverably. Upon short-cutting between the wires 3 and 45 near point a the thyristor 48 will not trigger because the low trigger-voltage needed therefor is not present; Short-cutting takes place via diode 46 and the closed switch S2. In position 4 switches S1 and S3 are closed, so that both wire 3 and wire 45 deliver their halve-power owing to the working of diodes 46 and 52. In position 5 switches S1 and S2 are closed, so that wire 3 delivers its maximum power and wire 45 half of its power. Fuse 51 can also be embodied as a temperature-dependent fuse (a so called thermo-fuse) which contacts one of more resistors being in series with thyristor 48 and neon-lamp of gastube 49. The thyristor 48 can also function for protecting several electrical heating wires 3. Therefor, the signal wires at the extra heating wires, for example a heating wire at the foot-end of a blanket to deliver there extra heat, are connected to the gate of the thyristor.

Claims

1. Pliant electrical heating panel comprising at least one panel part (1,2) and an electrical heating wire (4) which lies in a desired pattern thereon and is held in its position by at least one line-shaped seam (9) characterised in that a line at which the

seam (9) lies intersects the electrical heating wire (3) and in that the seam (9) is interrupted at the intersection between said line and the electrical heating wire (3).

2. Heating panel according to claim 1, having at least two panel-parts(1,2,8) laying onto each other an wherebetween the electrical heating wire (3) lies, characterized in that the seam (9) connects the panel-parts (1,2,8,) laying onto each other thereby enclosing the electrical heating wire (3).
3. Heating panel according to claim 1 or 2, having a zig-zag extending wire-pattern with parallel wire-parts (4), characterized in that each of a number of lines whereupon the seam (9) lies intersects these parallel wire-parts (4).
4. Heating panel according to one of the claims 1-3, characterized in that the seam is formed by a stitching-seam.
5. Heating panel with an electrical heating wire (3) connectable to the public mains voltage and having a signal wire (45) separated from the heating wire (3) by a layer of electrical insulating material, characterized in that a neon-lamp (49) is connected in series with a thyristor (48) which can be triggered via a heating wire (3) short-cut via the signal wire (45).
6. Heating panel comprising a coaxcable wherein an electrical heating wire and a signal wire are contained characterized in that the electrical heating wire (3) and the signal wire (45) at their ends where they come out of the coaxcable are connected to different phases (6,7) of the public mains voltage and in that between the electrical heating wire (3) and the signal wire (45) on the one hand and the not-current supporting fase (7) on the other hand a first and a second switch (S1,S2) are present and between the signal wire (45) and the current supporting fase (6) a diode (46) is connected, with the trigger-connection for a current detection device, i.e.a. thyristor (48) between said diode (46) and the signal wire (45).
7. Heating panel according to claim 6, characterized in that parallel to said second switch (S2) in the heating wire (3) a third switch is present which is connected in series with a diode (52).
8. Method for the fabrication of a pliant electrical heating panel according to one of the claims 1-7, whereby at least one (35,36) layer of web-like material (36) is fed (33) and is sewed by means of needles (32) being on a line which extends in

a direction transverse to the feeding direction of the material thereby fixing an electrical heating wire (37) formed in a zig-zag pattern onto the web-like material (35,36),characterized in that, again and again, first forming a new part of the zig-zag pattern on stationary or slowly moving web-like materials by, seen in the material feed direction, pressing a straight part of the wire to beyond the line (33) of the needles and thereafter feed the web-like materials further and sewing over a distance which corresponds to the distance between straight parts of the zig-zag pattern to be formed.

9. Device for carrying out the method according to claim 8 automatically comprising at least a holder for a roll of web material (35,36,38) and a holder for a roll of electrical heating wire (37), as well as a table (30) onto which the web of material can be fed and, by means of a multiple-needle sewing-machine (31), can be stitched, whereby the needles (32) lie on a line (33) extending transverse to the web transporting direction and a wire lay out device (40) for the lay out of the electrical heating wire onto the web material (35) characterized in that in the space above the web material (35,36) a strip (41) is present which is moveable between a first position in which an aligning edge(42) of the strip(41) which is faced to the line (33) of needles, seen in the web transporting direction, lies before the line (33) and a second position in which said aligning edge (42) seen in the same direction, lies beyond this line (33) of the needles (32)
10. Device according to claim 9, characterized in that the aligning edge (42) of the strip (41) is provided with notches (43) which, seen in the web transporting direction, each lie on a line with the stitching seam to be formed.

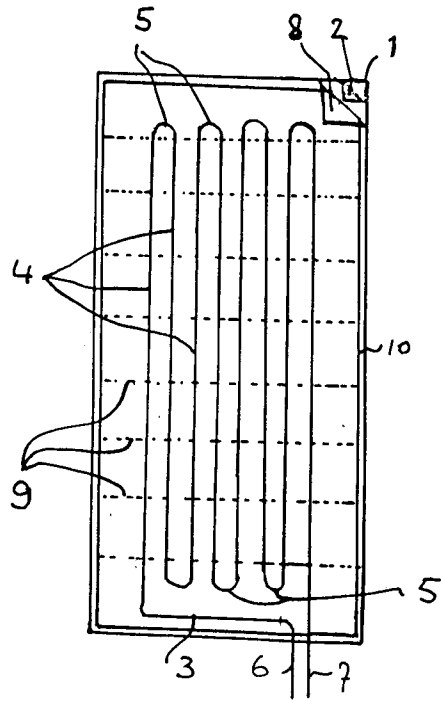


Fig. 1a.

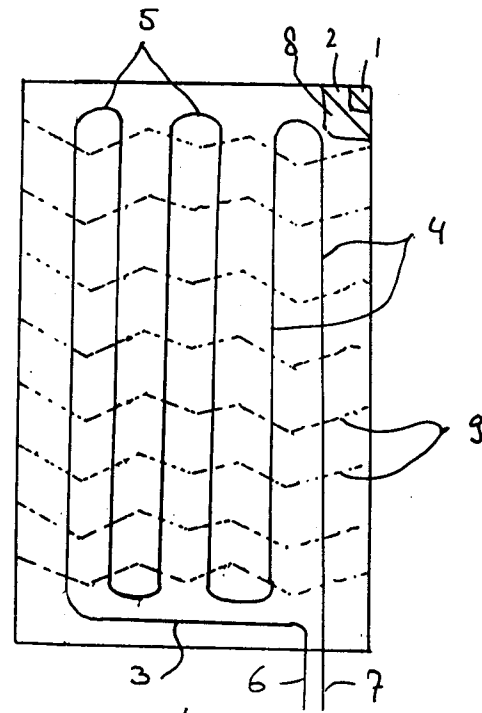


Fig. 1b.

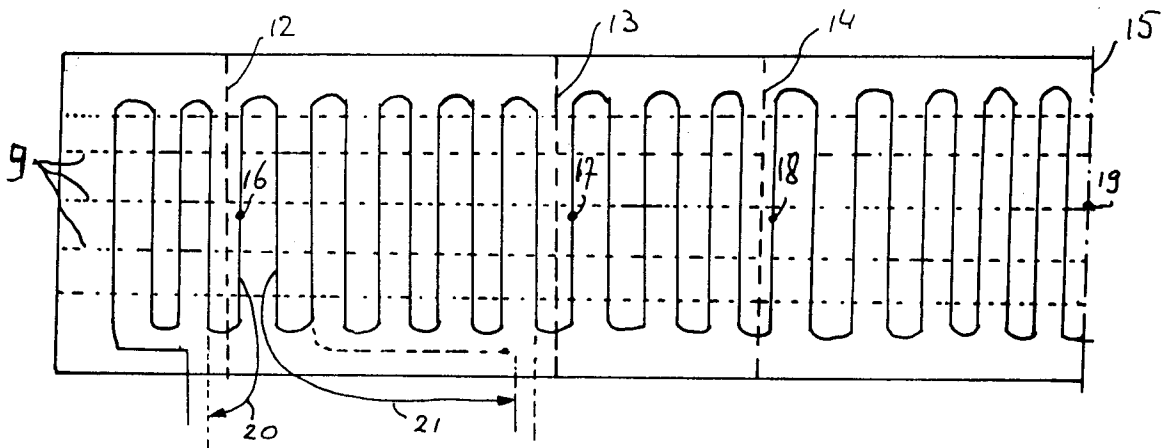


Fig. 2

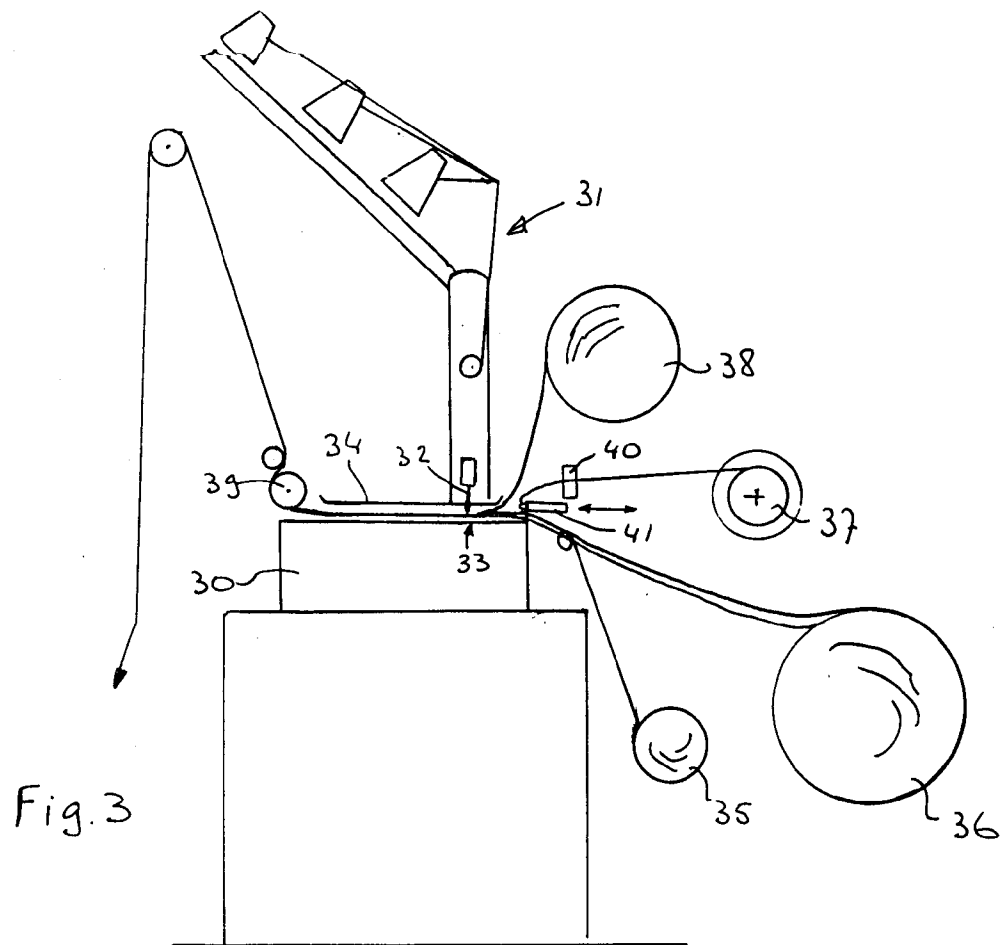
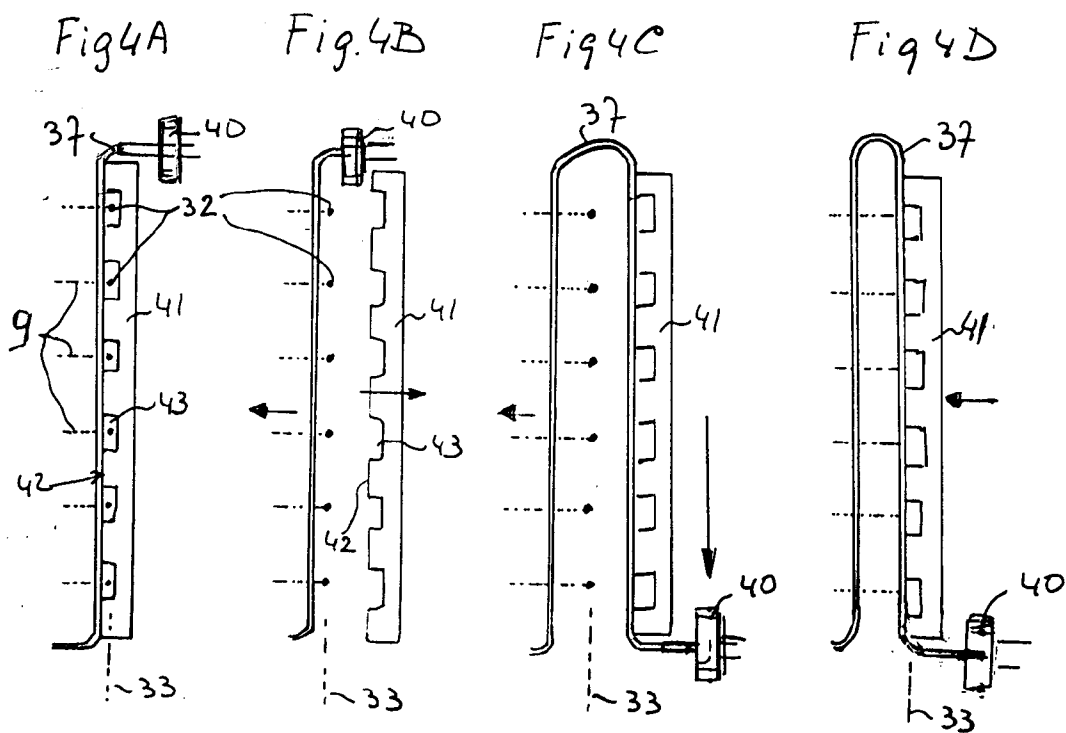


Fig. 3



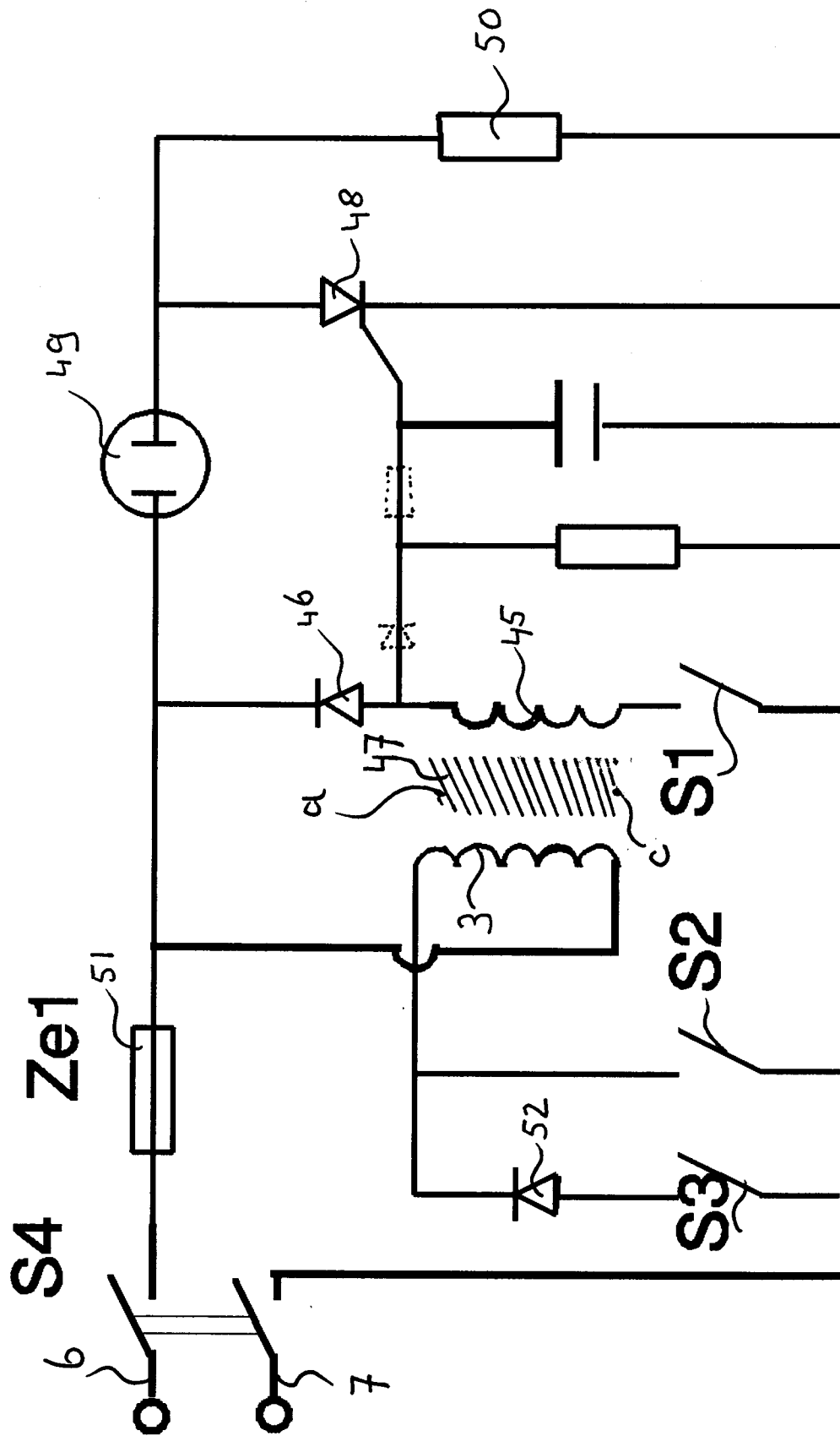


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 20 2571

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR-A-450 843 (MME. MOORE) * page 1, line 31 - line 41; figure 1 * ---	1-4	H05B3/34
X	US-A-3 114 825 (GENERAL ELECTRIC CO.) * column 2, line 26 - line 37; figure 1 * ---	1,4	
A	US-A-1 929 062 (J.J. GOLDMAN) * page 1, line 90 - line 97 * ---	1	
A	GB-A-2 157 514 (NORTHERN BLANKETS LTD.) * abstract * ---	5	
A	GB-A-701 304 (F. GRISLEY) ---		
A	US-A-4 658 119 (MATSUSHITA ELECTRIC INDUSTRIAL CO.) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H05B
Place of search THE HAGUE		Date of completion of the search 14 February 1995	Examiner De Smet, F
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