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(54) **Composite roof covering plate comprising an insulating support layer and a covering layer suitable for walking on, and a roof covering formed by means of such a composite plate.**

(57) Composite sheet 1, particularly a tile consisting of a supporting layer 3 made of foam plastic, and a top layer 2 joined thereto, made of rubber or concrete.

The supporting layer 3 is provided with a layer 3a which is staggered relative to the periphery of the top layer 3. The projecting parts 4, 4' formed by layer 3a match opposite recess 5, 5'.

The layer 3a is integral with the layer 3b of the supporting layer 3 extending under the top layer.

The composite sheet 1 can also be designed with a supporting layer 3 with upright walls which form the extension of the upright walls of the top layer, while the top layer 2 is provided with peripheral edge parts 16 which extend under the top face 14 of the supporting layer 3 and which are provided in a matching edge recess which is designed as an undercut groove.

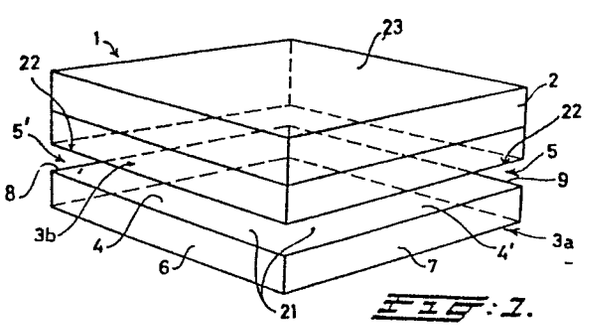

FIG. 1.

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Composite roof covering plate comprising an insulating support layer and a covering layer suitable for walking on and a roof covering formed by means of such a composite plate.

The invention relates to a composite sheet comprising a lower insulating supporting layer, particularly made of foam plastic material, and a top layer disposed thereon and joined thereto, particularly made of rubber and/or concrete.

Such a composite sheet, comprising a lower insulating bearing layer and a top layer made of rubber and/or concrete disposed thereon, is known.

These known composite sheets, in the form of tiles, have the disadvantage that at the transitions between successive tiles forming a roof covering a "cold bridge effect" occurs due to the splits between successive tiles, which means that there is an adverse effect on the insulation of the roof on which the composite tiles have been placed.

The object of the invention is now to provide a composite sheet of the above-mentioned type which does not or substantially does not present these disadvantages.

This object is achieved according to the invention in that the supporting layer has on at least one upright face a part projecting beyond the periphery of the top layer and on an opposite upright face has a recess extending within the periphery of the top layer and matching the projecting part.

Through the fact that the projecting part of one tile is located into the matching recess of another tile, there is no longer any direct vertical connection between the environment and the roof on which the composite sheet is placed, which means that the "cold bridge effect" has been practically eliminated.

It is particularly advantageous for a lower layer part of the supporting layer to be staggered relative to the face determined by the periphery of the top layer. This gives the great advantage that the projecting part of a composite sheet which is used for a roof covering extends completely over the surface of the roof on which the composite sheet has been places. In this way, optimum insulation of the roof is obtained with the use of a composite sheet of the type mentioned above.

The composite sheet comprises particularly preformed rigid foam plastic layer on which the top layer is disposed. If the top layer is made of concrete, a foam plastic supporting layer is placed in a mould and a mixture of a setting binder and fillers, such as granules, is then placed on the plastic layer, following which the desired top layer suitable for walking on is obtained once the binder has set. The binder can be a hydraulic binder such as cement, but can also be a thermosetting synthetic resin binder.

If concrete is used, a heavier top layer is obtained, which means that it is possible to use a thinner top layer in order to obtain the desired aggravation, but concrete has the disadvantage of having a greater coëfficient of expansion under the effect of heat radiation, such as through the sun, and exhibits the phenomenon of concrete resonance.

In some cases it is therefore preferable to make the top layer for walking upon of rubber, more particularly granulated rubber which has a low coefficient of expansion and exhibits very good sound absorption when it is walked upon.

According to another aspect of the invention, it provides a composite sheet of the above mentioned type, in which optimum joining of the lower insulating supporting layer and the top layer for walking upon disposed thereon is obtained, and even when there is damage to the insulating supporting layer at the transition to the top layer, a very good join between top layer and insulating supporting layer is ensured.

In order to achieve this object, a composite sheet comprising a lower insulating supporting layer, particularly made of foam plastic material, and a top layer for walking upon disposed thereon and joined thereto, particularly made of rubber and/or concrete, is therefore characterized in that the top layer is provided with edge parts extending under the top face of the insulating supporting layer and being anchored in matching edge recesses of the supporting layer.

In particular, such a composite sheet provided the great advantage that differences in expansion which occur between the insulating supporting layer and the top layer which can be affected by direct sunlight do not lead to cracks in the top layer or in the insulating supporting layer.

Providing the top layer with edge parts which are anchored in matching edge recesses of the insulating supporting layer being located under the top face of the insulating supporting layer means that a good attachment is ensured, while the edge parts also ensure that good cohesion of the insulating supporting layer is retained.

It is particularly advantageous for the edge parts to extend along the entire periphery of the top layer, which ensures optimum protection of the join between top layer and insulating supporting layer and also holds the insulating supporting layer clamped between the continuous edge parts.

The matching edge recess in the insulating supporting layer is very advantageously designed as an undercut groove which ensures very good anchoring between top layer and insulating supporting layer and, on the other hand the production of such a composite sheet is simple, since the mortar used for forming a top layer can penetrate well into said undercut groove.

It is recommended that the top face of the supporting layer and the opposite bottom side of the top layer are free from any adhesive binding these surfaces, so that when there are differences in expansion the top face of the insulating sheet and the opposite bottom side of the top layer can move freely relative to each other.

The invention will now be explained with reference to an example of an embodiment shown in the drawing, in which:

Fig.1
shows a composite sheet according to the invention in the form of a tile;

Fig.2
shows a top view of such a tile;

Fig.3
shows a cross section of a tile of the type shown in Fig.2, along the line III - III;

Fig.4 shows a cross section of a tile according to another aspect of the invention;

Fig.5 shows a top view of a tile whose cross section is shown in Fig.4.

Fig.1 shows a tile, for example with the dimensions 30 by 30 cm, comprising a top layer 2 and disposed thereunder an insulating supporting layer 3. The top layer is made of concrete and is applied by placing the insulating supporting layer 3 in a mould and then placing a fluid mortar made of a hydraulic binder 19 and gravel particles 17 on top of the insulating supporting layer 3.

The insulating supporting layer 3 comprises a top layer part 3b which is directly joined to the top layer 2. The upright wall parts 27 of this layer part 3b form the extension of the upright faces 9, 10, 11 and 12 of the top layer.

On the other hand, the insulating supporting layer 3 of rigid expanded plastic material has a lower layer part 3a which is staggered relative to the top layer 2. The bottom side of the composite sheet therefore exhibits projecting parts 4 and 4' and on the opposite side matching recesses 5, 5'.

In the embodiment shown in Fig.2 the lower layer part 3a of the supporting layer 2 (sic) is bounded by two successive upright walls 6, 7 which extend outwards and at a distance from the extension of the wall faces 10, 11 of the top layer which are situated above, thereby forming projecting parts 4, 4', and the opposite upright walls 8, 9 of the lower layer part extend inwards and at a distance from the extension of the wall faces 12, 13 of the top layer which are situated above, thereby forming recesses 5, 5' which match the projecting parts 4, 4'

It can be seen from Fig.3 that at the transition between two successive tiles there is a slit 20 which in the absence of projecting parts 4, 4' would extend from the outside to the roof surface on which such composite sheets in the form of tiles are placed. This "cold bridge effect", which adversely affects the insulation of the roof, is eliminated by the top face 21 of a projecting part 4 of a first tile being covered by the bottom face 22 of the recess 5 of another tile.

For a good union of the insulating supporting layer 3 and the covering layer 2 for walking on with a walking-on surface 23, the top layer 2 is provided with edge parts 16 which extend along the entire periphery of the top layer and which are anchored in edge recesses 15 of the insulating supporting layer which are designed as undercut grooves.

The undercut groove or edge recess 15 comprises a groove bottom part 15a and a slanting groove part 15b which intersect each other in edge 15'. If at the point of transition form the insulating supporting layer 3 in the form of a foam plastic sheet to groove bottom part 15a damage occurs to the foam plastic sheet 3, this does not lead to the ultimate breaking of the join between top layer 2 and insulating foam plastic sheet 3, since the actual join is ensured by the edge parts 16 and matching recesses 15 in the form of an undercut groove.

Where there are differences in expansion between the material of the insulating supporting layer 3, in the form of a foam plastic sheet, and the top layer 2, the edge parts 16 and recesses 15 also ensure good retention of cohesion of the foam plastic sheet 3.

As can be seen from Fig.4, the edge parts 16 extend under the top face 14 of the insulating sheet 3.

Figs. 4 and 5 show a tile according to a different aspect of the invention, in which case an optimum join between top layer and insulating supporting layer is ensured, said composite sheet is particularly suitable when using a top layer 2 of concrete and a foam plastic sheet as insulating supporting layer 3.

The join between top layer and insulating supporting layer 3 is achieved as described above.

In order to improve the join between top layer 2 and insulating supporting layer 3, it may be advisable to form in the foam plastic sheet 3 at least one swallow-tailed longitudinal groove 24, bounded by longitudinal groove bottom part 24b and from this bottom part 24b converging to upward-running walls 24a which end in the edges 24', 24" on the top face 14 of the insulating foam plastic sheet.

Of course, the insulating foam plastic sheet 3 can be provided with at least one other longitudinal groove 25 which extends perpendicular to the first longitudinal groove 24. This longitudinal groove 25 will end on the top face of the insulating foam plastic sheet 3 in the edges 25' and 25". The longitudinal groove 25 is bounded by longitudinal groove bottom 25a and longitudinal groove walls 25b converging upwards.

In the longitudinal grooves 25 and 24 are raised parts 26, 26a of the top layer which match said grooves. The top layer 2 as used is preferably a vapour-permeable layer.

As already stated, the layer can consist of concrete, but can also be made from fillers and a thermosetting resin, and it must, of course, be ensured that the material of the insulating sheet is not attacked by the synthetic resin.

The top layer can also be formed from rubber granules.

The surface bounded by the middle of a longitudinal groove 24 and 25 and the opposite outside of the top layer 2 is expediently smaller than 625 cm^2 and preferably smaller than 400 cm^2. In the case of a square tile measuring 40 x 40cm, the longitudinal grooves 24 and 25 running perpendicularly to each other are therefore provided in the centre as shown in Fig.4, and this means that there can certainly be no damage due to expansion.

Through the absence of a glue or adhesive between top face 14 of supporting layer 3 and bottom side 18 of top layer 2, these surfaces can move freely relative to each other, so that expansion does not lead to cracks in one of the two layers.

Claims:

1. Composite sheet (1) comprising a lower insulating supporting layer (3), particularly made of foam plastic material, and a top layer (2) disposed thereon and joined thereto, particularly made of rubber and/or concrete, characterized in that the supporting layer (3) has on at least one upright face a part (4) projecting beyond the periphery of the top layer (2) and on an opposite upright face has a recess (5) extending within the periphery of the top layer (2) and matching the projecting part (4).

2. Composite sheet according to Claim 1, characterized in that a lower layer part (3a) of the supporting layer (3) is staggered relative to the face determined by the periphery of the top layer (3).

3. Composite sheet according to Claim 1, characterized in that a lower layer part (3a) of the supporting layer (3) is bounded by two successive upright walls (6, 7) which extend outwards and at a distance from the wall faces (10, 11) of the top layer which are situated above them and the opposite upright walls (8, 9) of the lower layer part (3a) extend inwards and at a distance from the extension of the wall faces (12, 13) of the top layer (2) which are situated above them.

4. Composite sheet according to Claims 1 to 3, characterized in that between the bottom side (18) of the top layer (2) and the lower layer part (2) there is a layer part (3b) integral therewith and bounded by walls (19) which form the extension of the upright walls (10, 11, 12, 13) of the top layer (2).

5. Composite sheet (1), comprising a lower insulating supporting layer (3), particularly made of foam plastic material, and a top layer (2) for walking upon, disposed thereon and joined thereto, particularly made of rubber and/or concrete, characterized in that the top layer (2) is provided with edge parts (16) extending under the top face (14) of the insulating supporting layer (3) and being anchored in matching edge recesses (15) of the supporting layer (3).

6. Composite sheet according to Claim 4, characterized in that the edge parts (16) extend along the entire top layer (2).

7. Composite sheet according to Claims 4 or 5, characterized in that the matching recess (15) is designed as an undercut groove.

8. Composite sheet according to one or more of the preceding claims, characterized in that the top face (14) of the supporting layer (3) and the opposite underside (18) of the top layer (2) are free from an adhesive binding these surfaces.

9. Composite sheet according to one or more of the preceding claims, characterized in that the top layer (2), which may or may not be vapour-permeable, is made of fillers (17) and a hydraulic binding agent or a thermosetting synthetic resin binder (19).

10. Composite covering formed from composite sheets according to one or more of Claims 1 to 9.

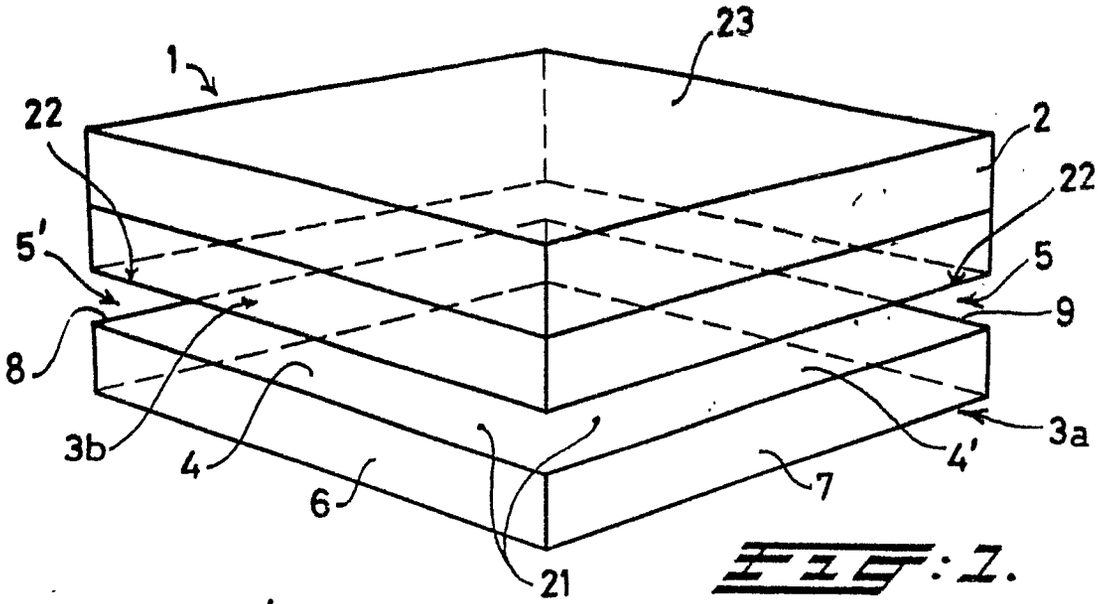


Fig: 1.

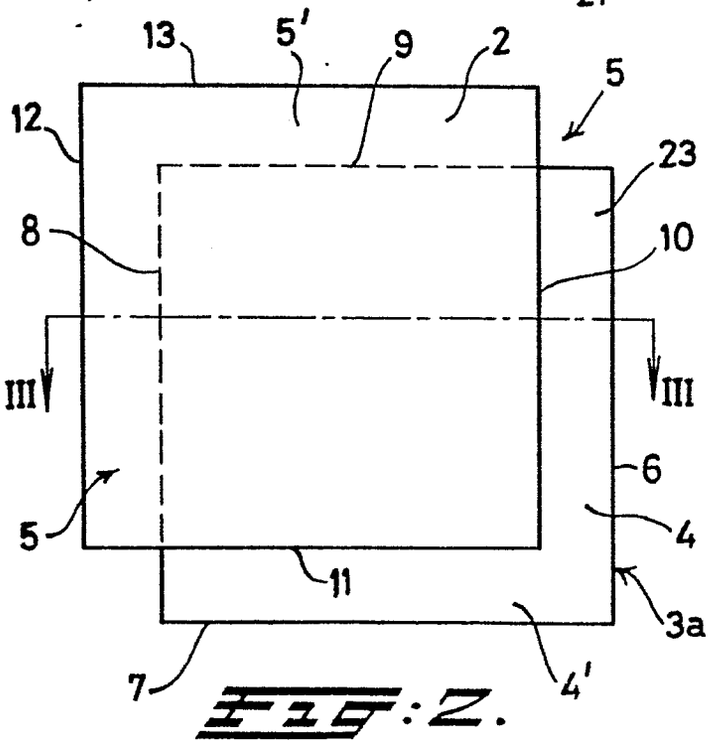


Fig: 2.

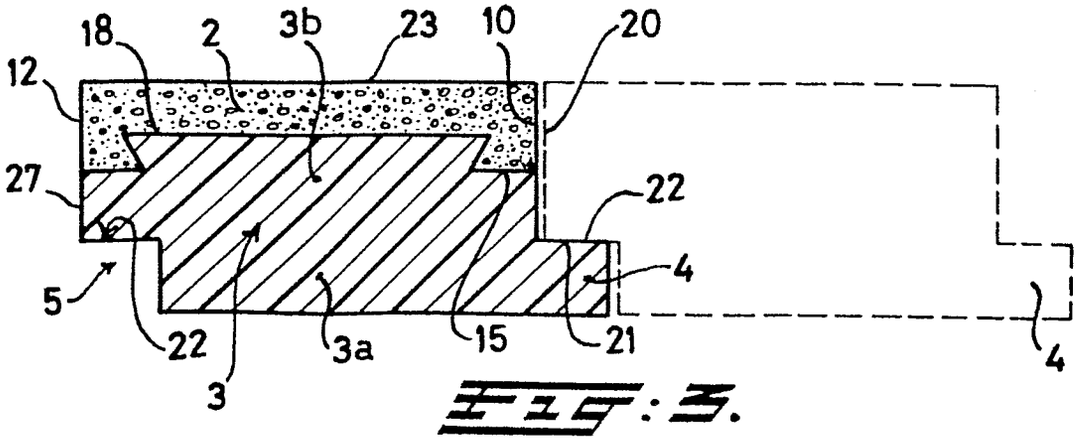


Fig: 3.

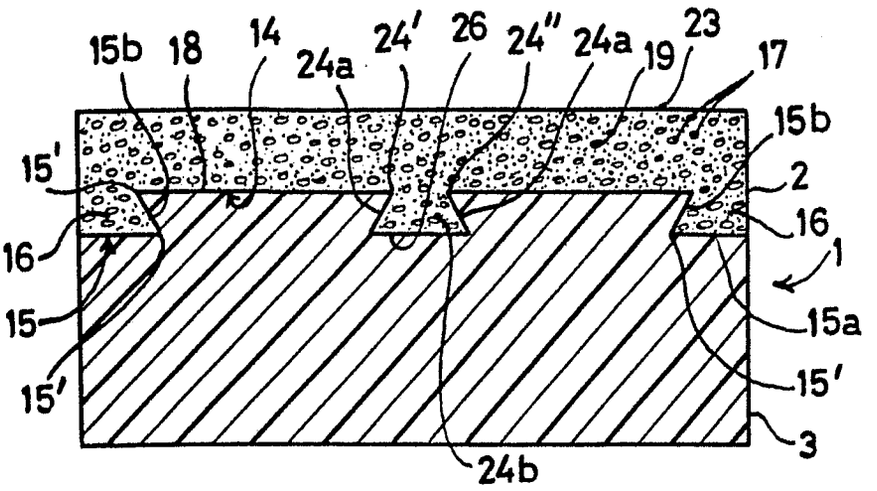
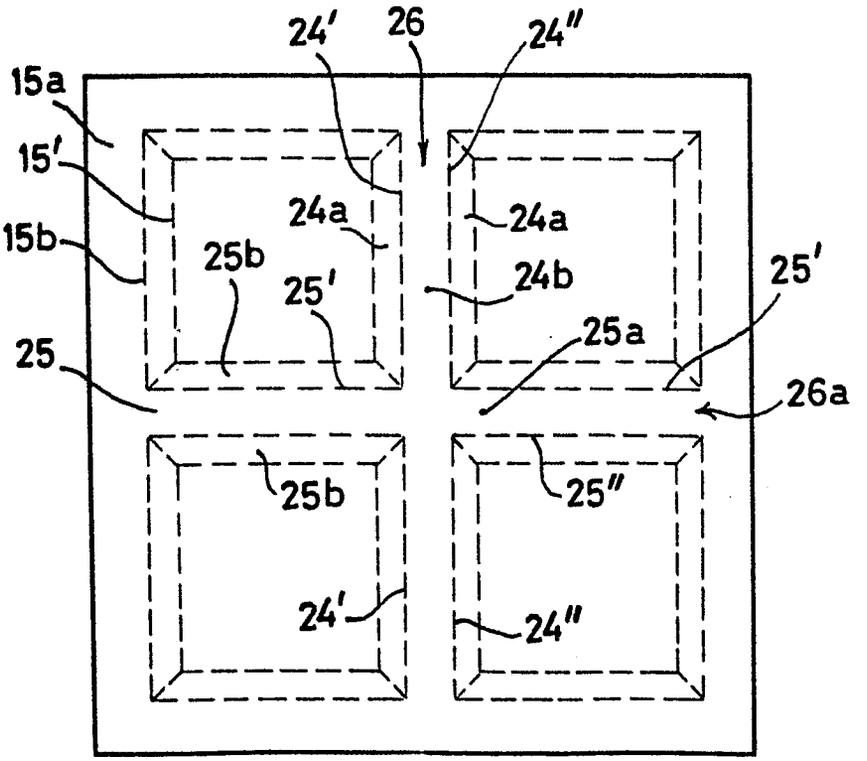

15b
18
14
24a
24'
26
24"
24a
19
23
17
15'
15b
2
16
16
1
15
15a
15'
15'
3
24b

Fig: 4.


24'
26
24"
15a
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25'
25
25a
26a
25b
25"
24'
24"

Fig: 5.

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EUROPEAN SEARCH REPORT

Application number 0236585

EP 86 20 0412

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 4)
X	GB-A-1 262 905 (WMB) * Page 1, lines 63-84; page 2, lines 1-32; figures 1,2 *	1-4,10	E 04 D 11/00 E 04 D 3/35
Y		5-9	
X	EP-A-0 088 198 (DEPPEN) * Page 7, paragraph 1; figures 3-6 *	1,2,9, 10	
Y		3	
A	FR-A-2 538 430 (ROALES) * Figures 1,2 *	1,2,5-7	
Y	US-A-4 469 731 (SARACINO) * Column 3, lines 28-68; column 4, lines 1-27; figures 1,2A,3 *	3	TECHNICAL FIELDS SEARCHED (Int Cl 4) E 04 D E 04 C
A		4	
Y	DE-A-2 405 949 (GROS) * Page 7, paragraph 3; page 8, paragraph 1; figures 1,2 *	5,7-9	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-11-1986	CHESNEAUX J.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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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.4)
Y	FR-A- 811 679 (ENGELS) * Page 2, lines 30-51; figures 1-3 *	6,7	
A	BE-A- 875 138 (TECHNISAB) * Page 3, lines 26-30; page 6, paragraph 2; claims 14-17; figures 7-9 *	5,6,9	
A	FR-A- 646 250 (YTHIER) * Page 2, column 1, lines 16-40; figures 2,10 *	1,5-7	
A	GB-A- 913 557 (ESSO) * Page 1, lines 34-58; figures *	9	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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