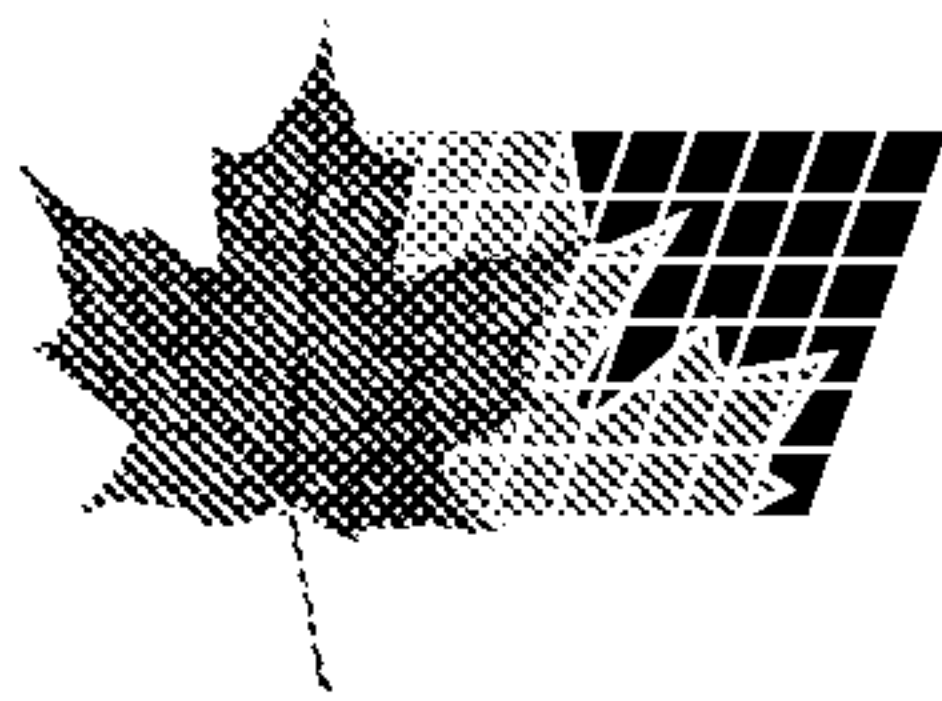




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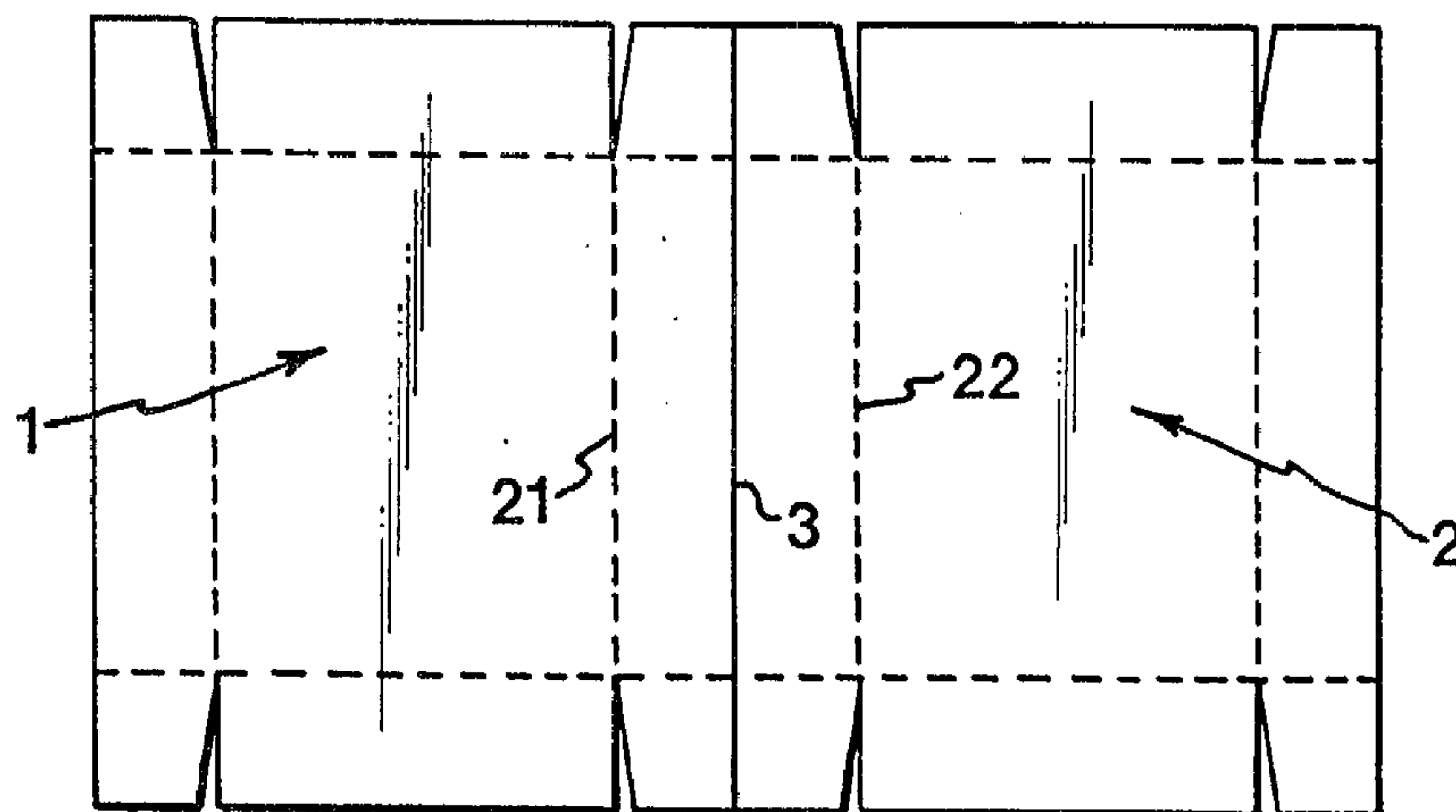
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(54) **APPAREIL POUR DECOUPAGE A L'EMPORTE-PIECE DE
MATERIAUX DE CONDITIONNEMENT**

(54) **PROCESS AND AN APPARATUS FOR DIE-CUTTING OF
PACKAGING MATERIAL**



(57) Le procédé et l'appareil décrits servent à empêcher un matériau d'emballage qui est découpé à l'emporte-pièce et entaillé de former des craquelures. Un matériau en feuille (17) de réduction des craquelures est disposé entre les outils de découpage/entaillage (9, 13) et le matériau d'emballage (5), de façon à absorber l'énergie d'impact provenant de ces outils et à soulager le matériau d'emballage des forces génératrices de craquelures, qui s'exercent dans la direction de son plan.

(57) A process and an apparatus for preventing a packaging material which is being die-cut and scored from developing cracks. A crack-reducing sheet material (17) is positioned between the cutting/scoring tools (9, 13) and the packaging material (5) to absorb impact energy from said tools and relieve the packaging material of crack-producing forces in the direction of its plane.

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(57) Abstract

A process and an apparatus for preventing a packaging material which is being die-cut and scored from developing cracks. A crack-reducing sheet material (17) is positioned between the cutting/scoring tools (9, 13) and the packaging material (5) to absorb impact energy from said tools and relieve the packaging material of crack-producing forces in the direction of its plane.

A PROCESS AND AN APPARATUS FOR DIE-CUTTING OF PACKAGING
MATERIAL

Technical area

5 The present invention relates to a process and an apparatus
for die-cutting and scoring by means of cutting knives and/or
scoring rules, of at least substantially flat packaging
material which, when being die-cut and scored, has a tendency
to crack in the direction of its plane at or near the places
10 where the cutting knives and/or the scoring rules are brought
into contact with the packaging material. In the context of
the present invention, the term "packaging material" should be
broadly interpreted to comprise also display material, for
instance, the invention is especially concerned with sheet or
15 strip material, preferably of the type corrugated paperboard or
cardboard, and especially laminated material.

Technical background

In conventional die-cutting and scoring of packaging
material, cutting knives and/or scoring rules disposed in a
20 punch are thrust at high speed directly against the unprotected
packaging material which is squeezed between the die-
cutting/scoring tools and an anvil consisting of either a flat
plate (planar die-cutting and scoring) or a rotating cylinder
(rotary cutting and scoring). In the latter case, also the
25 cutting/scoring tools are disposed on a rotating cylinder. The
cutting knives produce a complete penetration of the packaging
material, i.e. a division thereof, whereas the scoring rules
which do not penetrate the packaging material completely,
produce a permanent deformation and a weakening of the flexural
30 rigidity, i.e. fold lines. Crack-producing forces arise in the
packaging material in the direction of its plane, both where
complete and incomplete penetration occurs.

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With present-day technique, these forces often are the cause of an annoying formation of cracks, so that higher grammage, greater strength or thickness of the packaging material is

required than would otherwise be necessary. The risk of crack formation increases production costs and restricts the construction possibilities of the packages. In extreme cases, die-cutting and scoring techniques cannot be used at all.

Object of the Invention

The object of the present invention is to improve upon prior art technique in a simple and inexpensive fashion, such that crack formation, at least to a substantial degree, is prevented.

Summary of the Invention

10 The invention provides a process for die-cutting and scoring by means of cutting knives and/or scoring rules, of packaging material which, when being die-cut and scored, has a tendency to crack in the direction of its plane at the places where the cutting knives and/or scoring rules are brought into contact with the packaging material, characterized in that a crack-reducing sheet material capable of absorbing forces and impact energy in the direction of its plane is arranged between the packaging material to be die-cut and scored, and the cutting knives and/or scoring rules used for the die-cutting and scoring.

20 From another aspect, the invention provides an apparatus for die-cutting and scoring of packaging material, which has a tendency to crack in the direction of its plane when being die-cut and scored, comprising a punch with cutting knives and/or scoring rules, an anvil against which the packaging material is applied during operation, and means causing said punch and said anvil plate to cooperate for die-cutting and scoring of a packaging material therebetween, characterised in that a crack-reducing sheet material capable of absorbing forces

and impact energy in the direction of its plane is arranged such that when the die-cutting and scoring is carried out, said crack-reducing sheet material is situated between at least some cutting knives and/or scoring rules and the packaging material, and such that it covers the cutting knives and/or scoring rules and at least the adjacent areas, the crack-reducing material being arranged such that it is applied against the corresponding areas of the packaging material during operation.

10 The invention is based on the insight that crack-producing forces which arise to a critical degree the moment the cutting knives and/or the scoring rules come into contact with the packaging material, i.e. when the deformation begins, and in other words impact energy, can be absorbed by the intermediate sheet material, such that a crack-reducing effect is obtained in that the packaging material is relieved in the direction of its plane. The crack-reducing sheet material will have direct contact with the cutting knives and/or scoring rules and thus eliminate the risk that dangerous stress concentrations are produced in the packaging material. It has been found that practically all formation of cracks in the packaging material can be prevented in this way.

20 It has been found that the choice of crack-reducing material is not critical, the main thing being that the material has such properties that it can absorb impact energy and forces in the direction of its plane, i.e. take up impacts in this plane, and at the same time not adversely affect the requisite deformation. The material should be in sheet form and have a certain amount of tensile stiffness and flexural rigidity, and it may advantageously be comparatively thin (foil or film) and thus

inexpensive. Usable materials are, for example, paper, plastic and woven material.

Practical tests have now surprisingly shown that the crack-reducing effect is not to any substantial degree impaired if a cutting knife, when executing a cutting movement, passes through a slit in the material, made by a previous cutting movement. This means that one and the same crack-reducing material can be used repeatedly, which saves costs and also affords constructional advantages.

10 During the cutting and scoring operation, the crack-reducing material should be applied against the packaging material at least at the places where the cutting knives and/or scoring rules make contact with the material. The crack-reducing material should be kept at least substantially stretched over
15 the packaging material.

It is not necessary to arrange the crack-reducing material over the entire packaging material; it suffices that the material covers at least the areas adjoining the places where the cutting knives and/or scoring rules come into contact with
20 the material and where substantial crack formation can be expected. Thus, it is especially suitable to arrange the crack-reducing material at least over an area where a cutting knife and adjacent scoring rules situated on both sides thereof operate.

25 The crack-reducing material can be fixed to a punch, preferably to resilient fasteners provided on the punch. At least some of these fasteners can be conventional resilient ejectors.

It is also possible to apply the crack-reducing material
30 against the surface of the packaging material, and to fix or hold it thereagainst in some suitable manner, before the material is introduced into the apparatus, or, alternatively, thereafter.

When the crack-reducing material is placed directly on the surface of the packaging material, one may find it expedient, in order to ensure that the crack-reducing material stays in position during the cutting and scoring operation, to utilise
5 the clamping effect provided by, for example, the resilient ejectors disposed on the punch and bearing against the crack-reducing material and the underlying packaging material.

The crack-reducing effect of the invention is especially pronounced with packaging material of corrugated paperboard, and
10 it has been possible to cut and score, without any crack formation problems whatsoever, also such corrugated paperboard that has a facing containing a considerable amount of recycled fibres.

In the following, the invention, and embodiments thereof,
15 will be described in more detail, reference being had to the accompanying drawings.

Brief description of the drawings

Fig. 1 is a plan view of a cut and scored packaging material comprising blanks for two identical packages.

20 Fig 2 is a schematic central sectional view of a cutting/scoring apparatus provided with the crack-reducing material according to the present invention, the apparatus being ready to cut and score a packaging material introduced therein, so as to produce the cut and scored packaging material in Fig.
25 1.

Fig 3. Is a view similar to Fig. 2, showing the punch of the apparatus in its operating position.

Fig. 4. Is a schematic sectional view of an alternative embodiment of the apparatus, the crack-reducing material being
30 arranged to cover only a portion of the packaging material.

Description of embodiments

Fig 1. Shows a typical example of a cut and scored packaging material comprising two identical blanks 1 and 2 separated from

each other by the cut 3. In Fig 1, the cuts made by the cutting knives are shown with full lines, whereas the fold lines (score lines) are represented by dashed lines. Naturally, the outer boundary lines of the blanks are cuts.

5 The packaging material shown in Fig. 1 has been cut and scored in an apparatus shown in Figs. 2 and 3 from a starting material 5 in sheet form, which on all sides is slightly larger than the finished packaging material 1, 2. In conventional manner, the apparatus comprises a punch or die form 7 with
10 cutting knives 9 which on both sides have conventional resilient ejector elements 11, so-called rubber ejectors, and scoring rules 13. As is apparent from Fig.2, the blunt scoring rules 13 do not project as far as the knives 9 which are provided with cutting edges. The end surfaces of the ejectors 11 are situated
15 in a plane somewhat outside a plane containing the cutting edges of the knives 9. It is appreciated that the cutting knives 9 and the scoring rules 13 are arranged in a pattern corresponding to the pattern of cuts and fold lines in Fig. 1

Furthermore, the apparatus comprises a conventional anvil
20 plate 15 on which the packaging material 5 is placed in order to be cut and scored, as well as conventional means (not shown) adapted to push the punch 7 against the plate 15.

In view of the entirely conventional design of the apparatus in these respects, a more detailed description of the component
25 parts is uncalled for.

According to the invention, a crack-reducing material 17 in sheet form is arranged on the punch 7, substantially parallel to the plate 15, said material covering all the cutting knives 9 and scoring rules 13. In other words, practically the entire
30 surface of the packaging material 5 (with the exception of a minor, circumferential edge area) is covered by the crack-reducing material 17 when the cutting and scoring operation is carried out (Fig. 3). The material 17 is mounted on, i.e.

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attached to, the end surfaces of the ejectors 11, such that the material is substantially stretched, preferably with a certain tension. It is appreciated that by placing the crack-reducing material 17 "outside" ("beneath" in the Figure) the cutting knives 9 and scoring rules 13, the material will be applied against the surface of the packaging material 5 before the cutting knives 9 and scoring rules 13 are moved into contact with the packaging material on the anvil plate 15. At the movement of contact, the crack-reducing material 17 absorbs the first impact and thus relieves the packaging material 5 of crack-producing forces.

The crack-reducing material 17 preferably is a thin film, foil or web of plastic material having a typical thickness in the order of 1 mm or less.

As has become apparent, the risk of crack formation is particularly great in the areas where a cut on both sides has adjacent fold lines. In the embodiment according to Fig. 1, these areas are the two areas between the cut 3 and the fold lines 21 and 22. Thus, cracks running essentially parallel to the cut 3 and the lines 21, 22 often arise in the middle of these two areas, i.e. at a certain distance from said cut and the lines.

In such a case, a major crack-reducing effect can be obtained if the crack-reducing material is substantially arranged over these particularly exposed areas only.

This has been applied in a modified embodiment of the apparatus according to the invention, which is shown in Fig. 4. The apparatus is the same as in Figs. 2 and 3, save that the crack-reducing material 17' here only covers the central area underneath the cutting knife 9' and the scoring rules 13'. In this case as well, the material is stretched between, and attached to, the end surfaces of resilient elements consisting of the rubber ejectors 11' associated with the cutting knife 9',

and further fastening rubber members 23 which are made and mounted in the same fashion as the ejectors 11', but which are disposed on the opposite side of the associated scoring rule 13'.

5 Although the crack-reducing material in this embodiment is affixed to the punch, it could obviously be otherwise arranged, for example, mounted in a frame or the like, the frame being applied over the packaging material, such that the crack-reducing material rests on the packaging material, whereupon the
10 die-cutting and scoring operation is carried out.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A process for die-cutting and scoring by means of cutting knives and/or scoring rules, of packaging material which, when being die-cut and scored, has a tendency to crack in the direction of its plane at the places where the cutting knives and/or scoring rules are brought into contact with the packaging material, characterized in that a crack-reducing sheet material (17) capable of absorbing forces and impact energy in the direction of its plane is arranged between the packaging material (5) to be die-cut and scored, and the cutting knives (9) and/or scoring rules (13) used for the die-cutting and scoring.
2. A process as claimed in claim 1, characterised in that the crack-reducing material (17) is arranged such that, when die-cutting and scoring is carried out, it is applied against and extends over at least those areas of the packaging material (5) where any substantial crack formation can be expected.
3. A process as claimed in claim 1 or 2, characterised in that the crack-reducing material (17) is provided on a punch (7) in which said cutting knives (9) and/or scoring rules (13) are disposed.
4. A process as claimed in claim 1 or 2, characterised in that the crack-reducing material is positioned on the surface of the packaging material to be die-cut and scored.

5. A process as claimed in any one of claims 1 to 4, characterised in that the crack-reducing material (17) is held against the packaging material (5) during die-cutting and scoring.
6. A process as claimed in claim 5, characterised in that, for holding said crack-reducing material, use is made of resilient members (11, 23) disposed in a punch (7) accommodating the cutting knives (9) and/or the scoring rules (13).
7. A process as claimed in any one of claims 1 to 6, characterised in that the crack-reducing material (17') is arranged at least over an area where a cutting knife (9') and adjacent scoring rules (13') situated at both sides thereof, operate.
8. An apparatus for die-cutting and scoring of packaging material, which has a tendency to crack in the direction of its plane when being die-cut and scored, comprising a punch (7) with cutting knives (9) and/or scoring rules (13), an anvil (15) against which the packaging material (5) is applied during operation, and means causing said punch and said anvil plate to cooperate for die-cutting and scoring of a packaging material therebetween, characterised in that a crack-reducing sheet material (17) capable of absorbing forces and impact energy in the direction of its plane is arranged such that when the die-cutting and scoring is carried out, said crack-reducing sheet material is situated between at least some cutting knives (9) and/or scoring rules (13) and the packaging material (5), and such that it covers the cutting knives and/or scoring rules and at least the adjacent

areas, the crack-reducing material (17) being arranged such that it is applied against the corresponding areas of the packaging material (5) during operation.

9. An apparatus as claimed in claim 8, characterised in that the crack-reducing material (17) is provided on the punch (7), such that it is at least substantially stretched.

10. An apparatus as claimed in claim 8 or 9, characterised in that the crack-reducing material is affixed to the punch by means of resilient fasteners (11, 23).

11. An apparatus as claimed in claim 10 wherein at least some of said resilient fasteners comprise resilient ejectors (11).

12. A process for die-cutting and scoring laminated packaging material such as corrugated paperboard by means of cutting knives and/or scoring rules, such laminated material having a tendency to crack in the direction of its plane at locations where it is contacted by such cutting knives and/or scoring rules, characterised in that a crack-reducing sheet material is interposed between said laminated material that is to be die-cut and scored and the cutting knives and/or scoring rules, said crack-reducing sheet material being capable of absorbing forces and impact energy in a direction of its plane.

13. Apparatus for die-cutting and scoring laminated packaging material

such as corrugated cardboard which has a tendency to crack in the direction of its plane when being die-cut and scored, said apparatus comprising a punch having cutting knives and/or scoring rules carried thereon; an anvil against which the packaging material is positioned during operation; and means causing said punch and said anvil to cooperate for die-cutting and scoring of such packaging material therebetween characterized by a crack-reducing sheet material that is capable of absorbing forces and impact energy in a direction in its plane, said sheet material being adapted for positioning between at least some of said cutting knives and/or scoring rules and the packaging material being cut such that it covers areas of said packaging material that register with or are adjacent the location of such cutting knives and/or scoring rules.

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PATENT AGENTS

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FIG.1

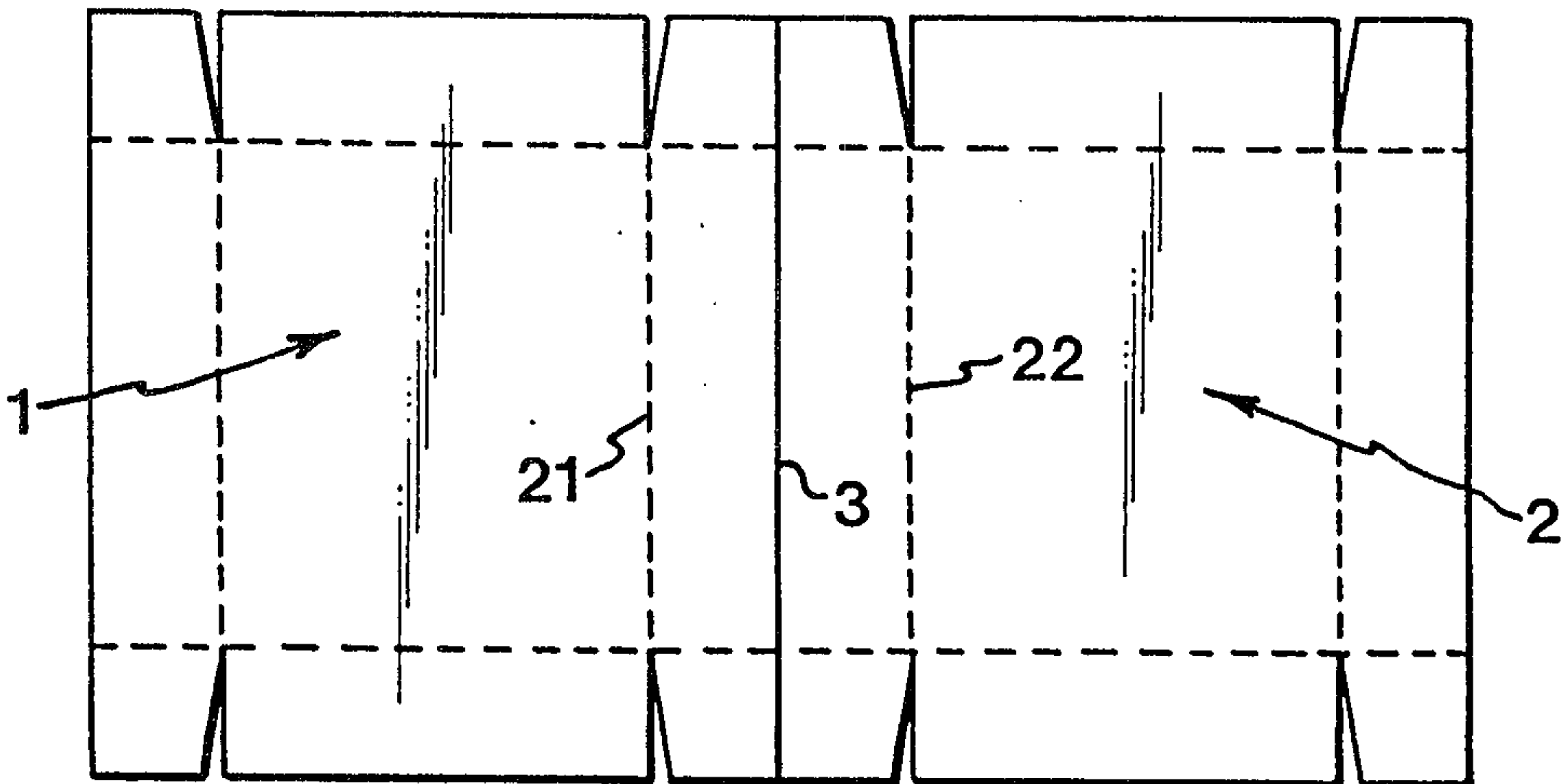


FIG.2

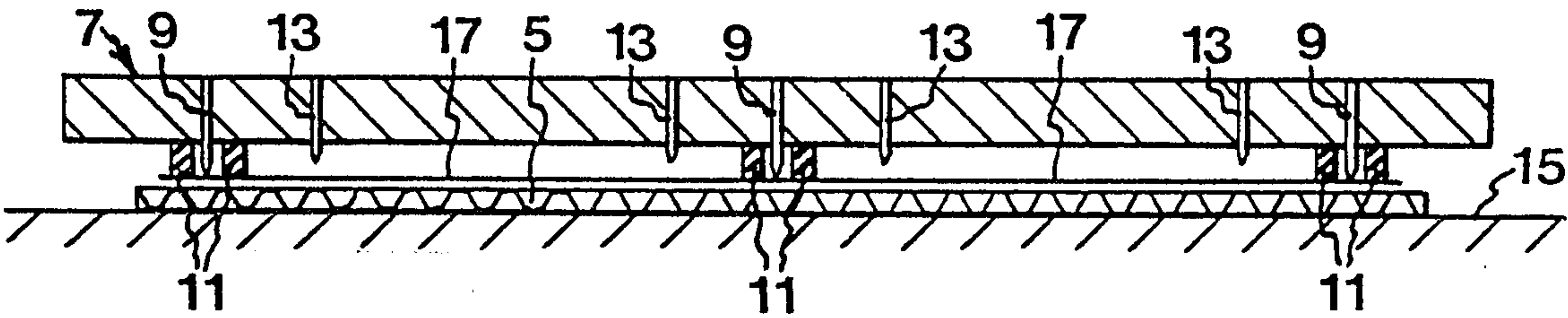


FIG.3

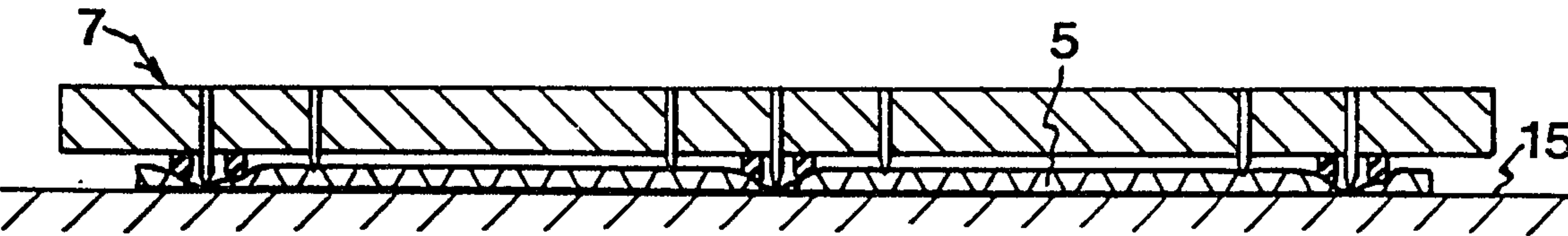
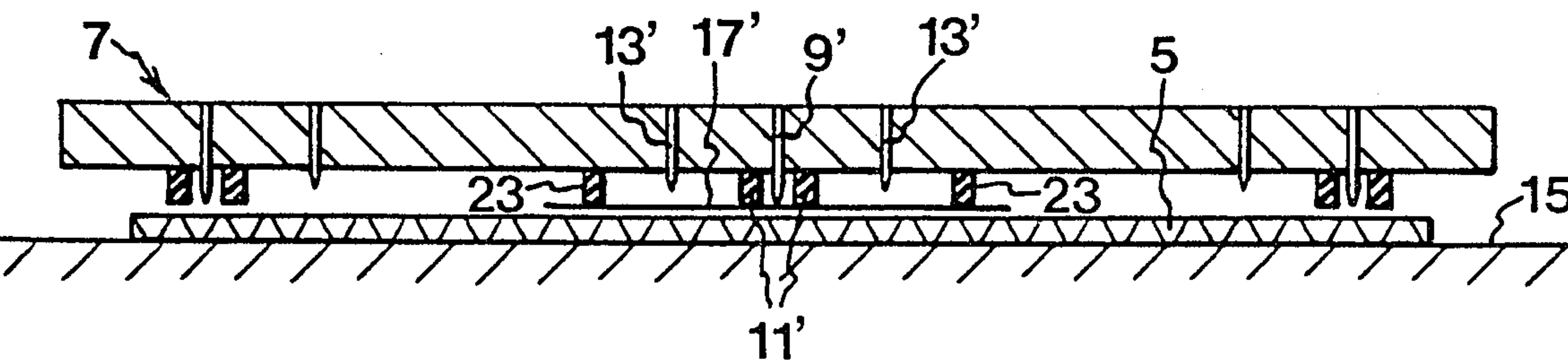


FIG.4



SUBSTITUTE SHEET

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