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PATENT REQUEST: STANDARD PATENT

We, GERHARDT INTERNATIONAL A/S, being the person(s) identified below as the Applicant, request the grant of a standard patent to the person identified below as the Nominated Person, for an invention described in the accompanying complete specification.

Full application details follow.

Applicant: GERHARDT INTERNATIONAL A/S

Address: 3, Kirstinehoj, DK-2770 Kastrup DENMARK

Nominated Person: GERHARDT INTERNATIONAL A/S

Address: 3, Kirstinehoj, DK-2770 Kastrup DENMARK

Invention Title: "Device for cutting a sheet material and process for its manufacture"

Name(s) of Actual Inventor(s): Jorgen GERHARDT

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Attorney Code: RI

BASIC CONVENTION APPLICATION(S) DETAILS

Application No	Country	Country Code	Date of Application
P4132120.0	Germany	DE	26 September 1991

We are not an eligible person described in Section 33 - 36 of the Act.

Drawing number recommended to accompany the abstract Fig 1

Dated this 17 day of September 1992

GERHARDT INTERNATIONAL A/S

S 032222 180992

By: _____
Registered Patent Attorney

Spp3/58446

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Section 29 (1)
Regulation 3.1(2)

NOTICE OF ENTITLEMENT

(To be filed before acceptance)

~~I~~/We Jørgen Gerhardt
of Gerhardt International A/S
Danmark

being *~~the applicant~~/*authorised by the applicant in respect of an application for a patent for an invention entitled Device for cutting a sheet material and process for its manufacture
filed under Application No. _____, state the following:-

Part 1 - Must be completed for all applications.
The person(s) nominated for the grant of the patent:

[ ] *~~is/are the actual inventor(s)~~
or
[X] has, for the following reasons, gained entitlement from the actual inventors(s):
the nominated person would, on the grant of a patent to the inventor for the invention, be entitled to have the patent assigned to it.

Part 2 - Must be completed if the application is a Convention application.
The person~~(s)~~ nominated for the grant of the patent *is/*~~are~~:

[X] the applicant~~(s)~~ of the basic application(s) listed on the patent request form
or
~~[ ] entitled to rely on the basic application(s) listed on the patent request form~~
by reason of the following:

Part 3 - must be completed if the application was made under the PCT and claims priority.
The person(s) nominated for the grant of the patent *is/*are:

[ ] the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT

or

[ ] entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:-

(continued over)

or the application was made under the PCT and the applicant made a declaration under Article 8 of the PCT in respect of the basic application.

[X] The basic application(s) *listed on the patent request form/*~~referred to in the declaration under Article 8 of the PCT~~ *is/*~~are~~ the application(~~s~~) first made in a Convention country in respect of the invention.

Gerhardt International A/S
Danmark

Signed: _____ Date: 7.9.1992

Status: Managing Director

(12) PATENT ABRIDGMENT (11) Document No. AU-B-25234/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 654211

(54) Title
DEVICE FOR CUTTING A SHEET MATERIAL AND PROCESS FOR ITS MANUFACTURE

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4132120 **26.09.91** **DE GERMANY**

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(56) Prior Art Documents
US 4217693
US 3827340
DE 4006611

(57) Claim

1. A device for cutting through, cutting into, perforating through or perforating into sheet material, such as papers, metal foils or plastic films, particularly a label material disposed on a backing material which is not to be impaired, comprising a cutting disk which is to be detachably and coaxially clamped between a dolly disk and a pressure disk, the outside diameter of which is somewhat greater than the outside diameter of said dolly disk and of said pressure disk, wherein that said cutting disk comprises a peripheral surface, the diameter of which is essentially symmetrical to a centre plane of said cutting disk, and has a rounded off summit area, and that said cutting disk has such a small thickness that the peripheral surface thereof allows to perform cutting respectively perforation operations.

15. A method of cutting sheet material, comprising:
(A) providing a cutting disk which is detachably and coaxially clamped between a dolly disk and a pressure disk, said cutting disk having a radial diameter which is

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greater than the diameter of the larger of said dolly disk and said pressure disk and having a rounded off summit area; and

(B) cutting said sheet material with a peripheral surface of said cutting disk.

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ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

"Device for cutting a sheet material and process for its manufacture"

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

Background of the Invention

The invention relates to a device for cutting through, cutting into, perforating through or perforating into sheet material, such as papers, metal foils or plastic films, more particularly a label material disposed on a backing material which is not to be impaired, by means of a cutting disk which is to be detachably coaxially clamped between a dolly disk and a pressure disk and the outside diameter of which is somewhat greater than the outside diameter of the dolly disk and of the pressure disk.

In the case of a known device of this kind according to German Offenlegungsschrift 30 13 098, the cutting disk is equipped at its periphery with a cutter. During the cutting operation or perforating operation, the cutter is subjected to considerable wear resulting in increasingly less sharp (dull) cut edges or perforation edges in the sheet material, such that the cutting disk has to be replaced relatively frequently.

Summary of the Invention

In accordance with a first aspect of the invention, there is provided a device for cutting through, cutting into, perforating through or perforating into sheet material, such as papers, metal foils or plastic films, particularly a label material disposed on a backing material which is not to be impaired, comprising a cutting disk which is to be detachably and coaxially clamped between a dolly disk and a pressure disk, the outside diameter of which is somewhat greater than the outside diameter of said dolly disk and of said pressure disk, wherein said cutting disk comprises a peripheral surface which is essentially symmetrical to a centre plane of said cutting disk, and has a rounded off summit area,

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sufficiently small so that the peripheral surface thereof will perform cutting or perforating operations.

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~~thereof to perform a cutting operation.~~ "Cutting", within the context of the invention, is to be understood to encompass cutting through, cutting into, perforating through, or perforating into the sheet material. "Sheet material" is to be understood to encompass papers, metal foils or plastic films, or a label disposed on a backing material which is not to be impaired by the cutting disk.

In accordance with a preferred aspect of the invention, the thickness of the cutting disk is between 0.08 and 0.19 mm, and is preferably between 0.10 and 0.17 mm.

In accordance with another preferred aspect of the invention, a rotatable dolly roller supports the sheet material on a side of the sheet material which faces away from the cutting disk. The dolly roller preferably has a peripheral surface which is composed of hardened steel.

Another object of the invention is to provide a process of manufacturing annular cutting disks, comprising the steps of punching blanks of the cutting disks from a metal plate, then placing a plurality of the blanks on a shaft adjacent to one another, and then clamping the plurality of blanks to one another to form a pack. Subsequent steps include rotating the shaft and grinding the blanks of the pack to produce cutting disks, then individually conveying the cutting disks through an etching system which sprays the cutting disks from above and below with an etching liquid, and then washing and drying the cutting disks.

In accordance with a preferred aspect of the invention, a further step is provided of forming grooves in the peripheral areas of the disks having a depth of between 0.20 mm and 0.25 mm, and preferably having a depth of between 0.21 mm and 0.24 mm.

Other objects, features and advantages of the present invention will become apparent to those skilled in the art from the following detailed description. It should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments

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of the present invention, are given by way of illustration and not limitation. Many changes and modifications within the scope of the present invention may be made without departing from the spirit thereof, and the invention includes all such modifications.

Brief Description of the Drawings

The above and further objects of the invention will become more readily apparent as the invention is more clearly understood from the detailed description to follow, reference being had to the accompanying drawings in which like reference numerals represent like parts throughout, and in which:

Fig. 1 shows a device for the clamping-in of a cutting disk in exploded representation.

Fig. 2 shows an enlargement of the area II in Fig. 1.

Fig. 3 shows - not according to scale - a peripheral area of a perforation disk from the line of vision III in Fig. 1.

Fig. 4 shows, in diagrammatic form, the interaction between a device according to Fig. 1 in the assembled state while it cooperates with a dolly roller.

Fig. 5 shows an elevational view of an etching device in longitudinal section.

Fig. 6 shows a plan view of a blanks-bearing grating of the etching device, along the line of vision VI of Fig. 5.

Fig. 7 schematically illustrates a system for manufacturing a cutting disk, the system including the devices of Figs. 5 and 6.

Detailed Description of the Preferred Embodiments

In order to achieve the objects of the invention, a device is provided having a cutting disk which is of such small thickness that the cutting work or perforating work can be carried out with its peripheral surface.

With this achievement of the object, the invention was based on the discovery that even a cutting disk having a rounded-off peripheral surface can perform cutting work and perforating work, that a rounded-off peripheral surface of this type has a relatively low susceptibility to wear and, even after wear, is still able to perform uniformly tidy cutting work or perforating work, provided only that it is of sufficiently small thickness.

Fig. 1 shows a dolly disk 2 with a predefined outside diameter and a pressure disk 4 with essentially the same outside diameter. An annular cutting disk 6 is removably clamped coaxially between the dolly disk 2 and the pressure disk 4. Cutting disk 6 has a periphery 8 which protrudes all around slightly beyond the outside diameters of the dolly disk 2 and of the pressure disk 4. Cutting disk 6 is preferably composed of carbon steel or chromium steel. The dolly disk 2 exhibits a hub 10 which passes through a central hole 12 in the cutting disk 6, and a central hole 14 in the pressure disk 4 and is equipped with an external thread 16 for the screwing-on of a pressure ring 18. In the pressure ring 18 are holes 20, into which a turning tool can be inserted and applied. The periphery of the hub 10, positioned axially adjacent the dolly disk 2, is configurated as a guide surface 19 for the central hole 12 in the cutting disk 6. The hub 10 exhibits, in its periphery, four axial rotation-inhibiting recesses 22 which merge into the bores 24 passing through the dolly disk 2. Two of these rotation-inhibiting recesses 22 interact with rotation-inhibiting projections of the cutting tool which jut or project radially inward into the hole 12 of the cutting disk 6. The dolly disk 2 and the pressure disk 4 are bounded at their peripheries by conical surfaces 28, 30, the bases of which face one another. A roller bearing (not shown) is provided in a central hole 32 of the hub 10 and is adapted to be mounted onto a bearing axle.

As shown in Fig. 2 in cross-section, the peripheral surface 31 provided at the periphery 8 of the cutting disk 6 runs essentially symmetrical to the center plane 33 of the cutting disk 6 and is rounded off in its summit area 34. Converging flanks 40, 42 lead to the summit area 34 from the lateral surfaces 36 and 38 of the cutting disk 6. In the cross-section shown, these converging flanks 40, 42 are straight. The outside diameter D_6 of the cutting disk 6 is somewhat greater than the outside diameter D_2 of the dolly disk 2 or greater than the outside diameter D_4 of the pressure disk 4, depending upon which of these outside diameters D_2, D_4 is the greater.

It is preferred, in this connection, that the peripheral surface should, from the outset, i.e. prior to initial usage of the cutting disk, run in cross-section essentially symmetrical to the center plane of the cutting disk and should be rounded off in the summit area.

Due to the small thickness of the cutting disk, it is preferred that the outside diameter of the cutting disk should be 0.50 mm to 0.70 mm, preferably 0.55 mm to 0.65 mm, greater than the outside diameter of the dolly disk or of the pressure disk, depending upon which of these outside diameters is the greater, in order that the peripheral surface implementing the cutting work or perforating work is securely guided in its operation.

Particularly for cutting through label material on a backing material, but also in other cases, it has been found that the thickness of the cutting disk should measure 0.08 to 0.19 mm, preferably 0.10 to 0.17 mm.

Fig. 3 shows the peripheral area of a cutting disk 6 designed with perforation bars 46. The perforation bars 46 are separated from one another by gaps 48. The dimensions of the bars 46 and of the gaps 48 can be adjusted without difficulty to the requirements which have been set in each case.

It has been shown that the cutting disk works particularly reliably if the sheet material which is to be cut or perforated is supported by a rotatably mounted dolly roller on the side facing away from the cutting disk. At the same time, the peripheral surface - if not the entire body - of the dolly roller is preferably composed of hardened steel. To this end, Fig. 4 shows that the cutting disk 6 interacts with the peripheral surface of a rotatably mounted dolly roller 44, which acts as support for the back of the sheet material and, where applicable, for the backing of the sheet material.

A particularly economical process for the manufacture of the discussed cutting disks, but also/or of cutting disks which do not satisfy the thickness requirement of the cutting disks described above, includes punching blanks 52 of the annular cutting disks 6 from a metal plate via a conventional punching device 70, placing a plurality of these blanks as a pack directly adjacent to one another onto a shaft, clamping them together on the shaft and, as a pack, circularly grinding them as the shaft is rotated via a conventional grinding device 72. Then the circularly ground cutting disks are individually conveyed horizontally through an etching system 74 in which they are sprayed from above and below with an etching liquid, and the circularly ground and etched grinding disks are then washed and dried in conventional device(s).

For the manufacture of perforation disks of the type, illustrated in Fig. 3, the circularly ground, etched, washed and dried grinding disks, in particular, are placed as a pack directly adjacent to one other onto a shaft and are clamped together on the shaft. Then, axial grooves of a depth of 0.20 mm to 0.25 mm, preferably 0.21 mm to 0.24 mm, are ground or milled into the pack in the peripheral area via a grinding or milling device forming a groove forming device 78.

The etching device according to Fig. 5, used for manufacturing cutting disks 6, exhibits a housing 50

having an inlet slit, not shown, and an outlet slit, not shown, for blanks 52 to be punched on both sides. These blanks 52 have been previously punched from a metal plate and are conveyed individually, i.e., separated from and detached from one another, on a grating 68 through the housing 50. In front of the housing, in the housing, and behind the housing, the grating 68 is horizontally supported by rollers 54. Distributing pipes 56 and 58 for downwardly or upwardly directed nozzles 60, 62 are provided in housing 50. Etching liquid 64 for the spraying of the blanks 52 issues from above and below out of nozzles 60, 62. The etching liquid 64 accumulates in the floor area 66 of the housing 50 and, in a manner not shown, for example, by a conventional pumping arrangement, and is recycled back to the nozzles 60, 62.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A device for cutting through, cutting into, perforating through or perforating into sheet material, such as papers, metal foils or plastic films, particularly a label material disposed on a backing material which is not to be impaired, comprising a cutting disk which is to be detachably and coaxially clamped between a dolly disk and a pressure disk, the outside diameter of which is somewhat greater than the outside diameter of said dolly disk and of said pressure disk, wherein said cutting disk comprises a peripheral surface which is essentially symmetrical to a centre plane of said cutting disk, and has a rounded off summit area, and wherein the cutting disk has a thickness which is sufficiently small so that the peripheral surface thereof will perform cutting or perforating operations.

2. A device as claimed in claim 1, characterized in that converging, straight flanks lead to said summit area from lateral surfaces of said cutting disk.

3. The device as claimed in claim 1, wherein said diameter of said cutting disk is between 0.50 and 0.70 mm greater than the diameter of the larger of said dolly disk and said pressure disk.

4. The device as claimed in claim 3, wherein said diameter of said cutting disk is between 0.55 and 0.65 mm greater than the diameter of the larger of said dolly disk and said pressure disk.

5. The device as claimed in claim 1, wherein said thickness of said cutting disk is between 0.08 and 0.19 mm.

6. The device as claimed in claim 5, wherein said thickness of said cutting disk is between 0.10 and 0.17 mm.

7. The device as claimed in claim 1, wherein said cutting disk is composed of one of carbon steel and chromium steel.

8. The device as claimed in claim 1, further comprising

a rotatable dolly roller for supporting said sheet material on a side of said material which faces away from said cutting disk.

9. The device as claimed in claim 8, wherein said dolly roller has a peripheral surface which is composed of hardened steel.

10. A process of manufacturing annular cutting disks as claimed in claim 1, comprising the steps of:

(A) punching blanks of said cutting disks from a metal plate; then

(B) placing a plurality of said blanks on a shaft adjacent to one another; then

(C) clamping said plurality of blanks to one another to form a pack; then

(D) rotating said shaft and grinding the blanks of said pack; then

(E) individually conveying said blanks through an etching system which sprays said blanks from above and below with an etching liquid to produce cutting disks; and then

(F) washing and drying said cutting disks.

11. The process as claimed in claim 10, further comprising the step of placing said cutting disks onto a shaft following said step (F) and clamping said cutting disks together to form a pack, and then forming axial grooves into the peripheral areas of said disks of said pack to produce perforated disks.

12. The process as claimed in claim 11, wherein said step of forming axial grooves comprises forming grooves having a depth of between 0.20 mm and 0.25 mm.

13. The process as claimed in claim 12, wherein said step of forming axial grooves comprises forming grooves having a depth of between 0.21 mm and 0.24 mm.

14. The process as claimed in claim 10, further comprising the step of supporting said blanks on a grating

following said grinding step, said grating being supported on a plurality of rollers, and wherein said step (E) comprises conveying said blanks on said grating through an etching system comprising distributing pipes which are located above and below said grating and which supply etching fluid to nozzles which are directed towards said grating and which spray said blanks with said etching fluid.

15. A method of cutting sheet material, comprising:

(A) providing a cutting disk which is detachably and coaxially clamped between a dolly disk and a pressure disk, said cutting disk having a radial diameter which is greater than the diameter of the larger of said dolly disk and said pressure disk, a peripheral surface which is essentially symmetrical to a centre plane of the cutting disc, a rounded off summit area, and a thickness which is sufficiently small so that the peripheral surface thereof will perform cutting or operations; and

(B) cutting said sheet material with the peripheral surface of said cutting disk.

16. The method as claimed in claim 15, wherein said step (B) comprises cutting said sheet material with a cutting disk having a thickness which is between 0.08 and 0.19 mm.

17. The method as claimed in claim 16, wherein said step (B) comprises cutting said sheet material with a cutting disk having a thickness which is between 0.10 and 0.17 mm.

18. A cutting device as hereinbefore described with reference to the accompanying drawings.

19. A method of cutting sheet material as hereinbefore described with reference to the accompanying drawings.

DATED this 30th day of August 1994

GERHARDT INTERNATIONAL A/S
Patent Attorneys for the
Applicant:

F.B. RICE & CO.

Abstract of the Disclosure

A device is disclosed for cutting through, cutting into, perforating through or perforating into sheet material, such as papers, metal foils or plastic films, more particularly a label material disposed on a backing material which is not to be impaired, by means of a cutting disk which is to be detachably and coaxially clamped between a dolly disk and a pressure disk and the outside diameter of which is somewhat greater than the outside diameter of the dolly disk and of the pressure disk. The cutting disk is of such small thickness that the cutting work or perforating work can be carried out with its peripheral surface.

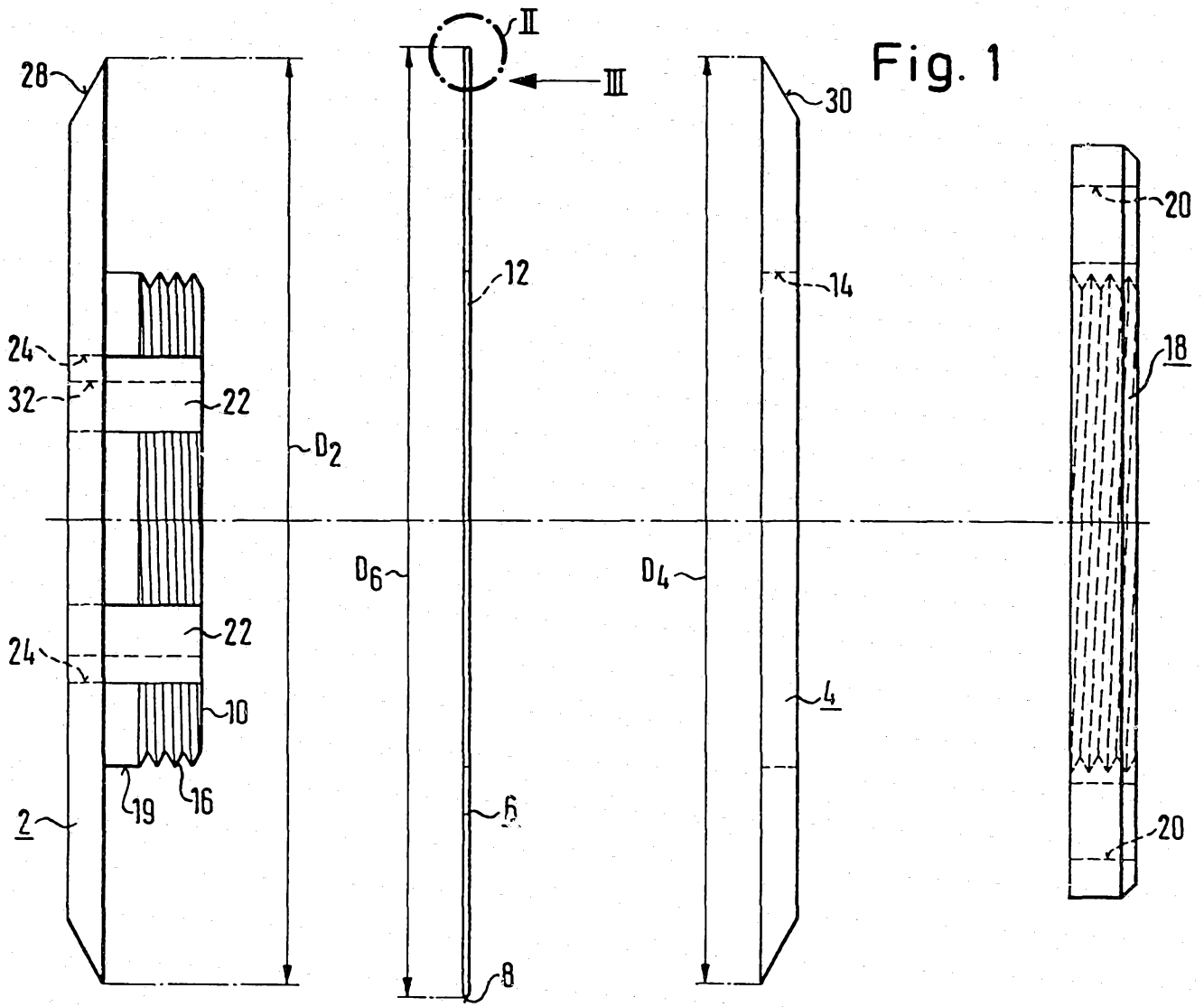


Fig. 1

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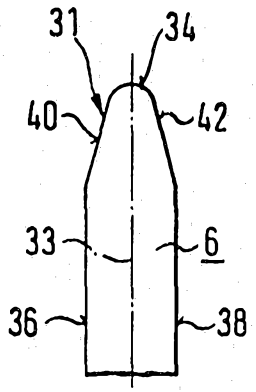


Fig. 2

Fig. 3

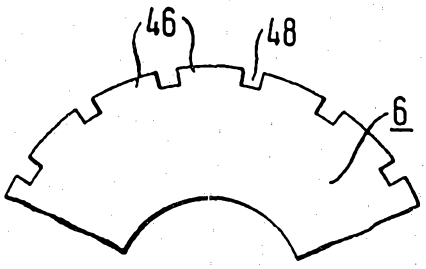


Fig. 4

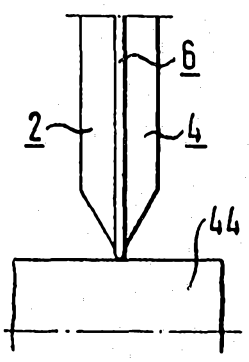


Fig. 5

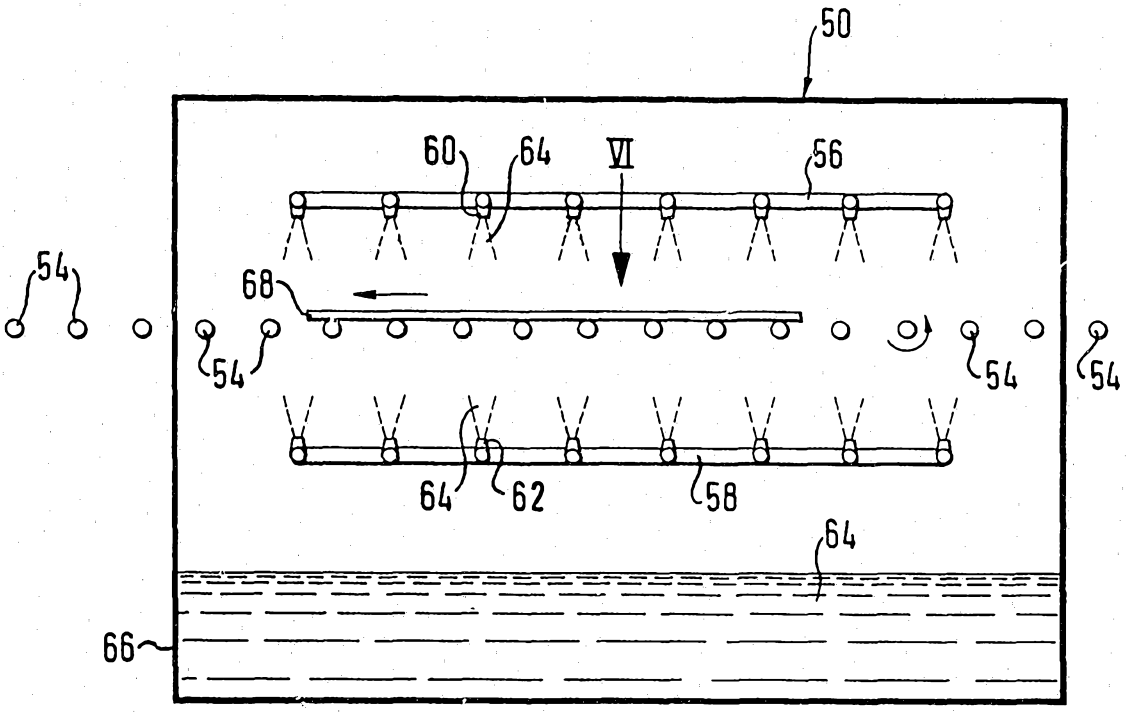


Fig. 6

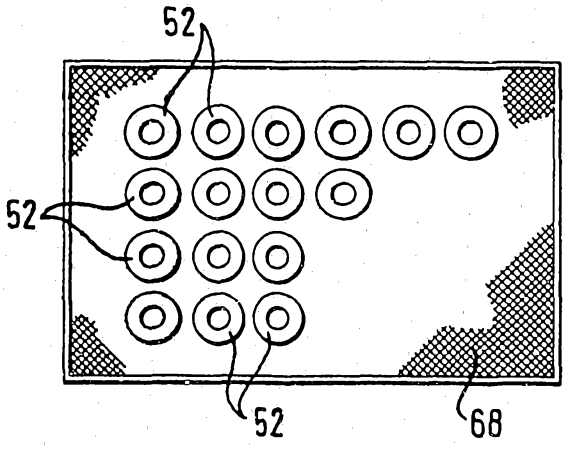
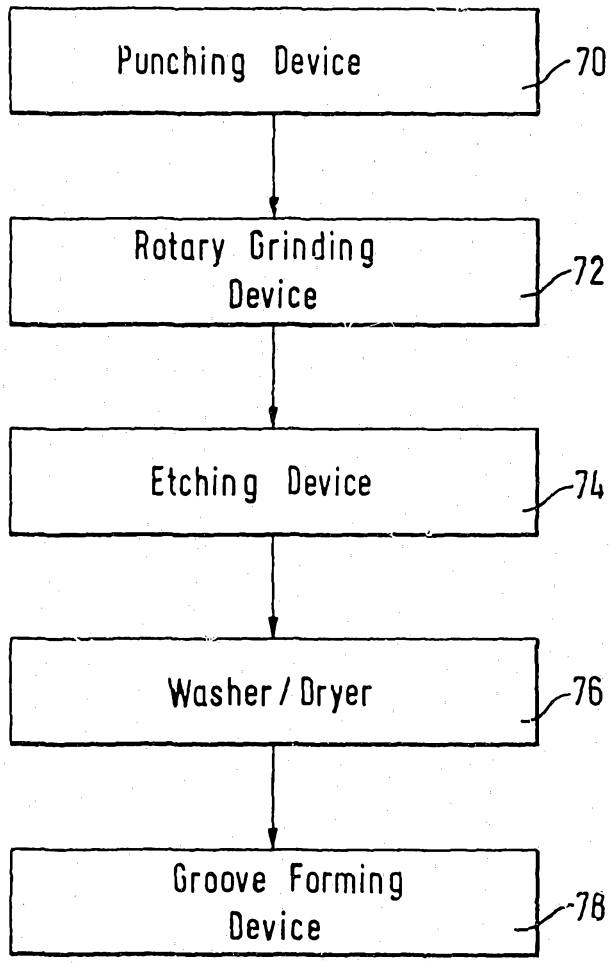


Fig. 7


Punching Device
70
Rotary Grinding Device
72
Etching Device
74
Washer / Dryer
76
Groove Forming Device
78