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NOTICE OF ENTITLEMENT

I, SVEN-ERIK SJÖDIN of, Dalkärrsleden 37, S-162 24 Vällingby, Sweden, being the applicant in respect of Application No. 34666/93 state the following:-

The Person nominated for the grant of the patent is the actual inventor.

The person nominated for the grant of the patent is the applicant of the application listed in the declaration under Article 8 of the PCT.

The basic application listed on the request form is the first application made in a Convention country in respect of the invention.

SVEN-ERIK SJÖDIN

By my Patent Attorneys,
WATERMARK PATENT & TRADEMARK ATTORNEYS

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L J DYSON
Registered Patent Attorney

8 November 1995

.....

(Date)

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ROTATING TOOL

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(56) Prior Art Documents
WO 87/00107
US 2950495
US 3076219

(57)

The object of the present invention is to provide a rotating tool, which in comparison to the state of the art has a very large material removal capacity and has its working tip elements fastened in such a way that there exists very little risk that pieces of metal shall be able to come loose and be thrown off in operation.

CLAIM

1. A rotating tool, comprising a rotatably supported hub, around the circumference of which a number of working tip elements are arranged, characterised in that the hub consists of at least one essentially disc shaped, elastic, and in the axial direction elastically deflectable hub section, and that the working tip elements are located in the ends of pin-like holders which are imbedded in the hub section in a way to be able to follow deflections of said disc shaped hub-section under load.

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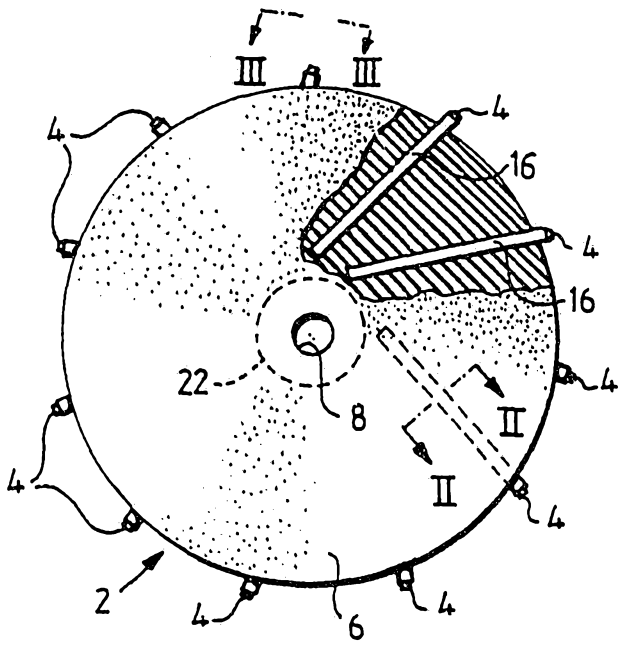

(57) Abstract

A rotating tool comprises a rotatably supported hub, around the circumference of which a number of working tip elements (4) are arranged. The hub consists of at least one essentially disc shaped, elastic, and in the axial direction elastically deflectable hub section (6), and the working tip elements (4) are located in the ends of pin-like holders (16) which are imbedded in the hub section (6).

ROTATING TOOL.

Technical field.

The present invention relates to a rotating tool, comprising a rotatably supported hub, around the circumference of which a number of working tip elements (4) are arranged.

More particularly it is the question of a rotating tool of the type intended for the rough-finishing of surfaces, such as the removal of rust on steel plates, machining of welds before application of additional weld material, grinding of concrete surfaces, paint removal, etc.

State of the art.

Through i.a. DE 2,652,716, FR 718,874, US 1,633,274, US 3,958,294, US 4,183,113, and PCT/SE86/00307 rotating tools of the kind indicated by way of introduction are known, which have their working tip elements situated at the ends of more or less elastic metal wires which are attached to the hub. A serious disadvantage with these tools is, besides in many cases poor material removal capacity and limited resistance against wear, that the wires break so that wire pieces can be thrown off with great force, with the accompanying risk for personal injuries.

Statement of the invention.

The object of the present invention is to provide a rotating tool, which in comparison to the state of the art has a very large material removal capacity and has its working tip elements fastened in such a way that there exists very little risk that pieces of metal shall be able to come loose and be thrown off in operation.

This object has been achieved for a rotating tool of the kind defined by way of introduction, according to the invention, in that the hub consists of at least one essentially disc shaped, elastic, and in the axial direction elastically deflectable hub section, and that the working tip elements are located in the ends of pin-like holders which are imbedded in the hub section in a way to be able to follow deflections of said disc shaped

hub-section under load. Preferably the holders are rigid.

Preferably the holders are applied in the hub section by injection moulding of the latter.

According to an advantageous embodiment the holders consist of sleeves, in the outer end of which the working tip element is fastened, allowing for the sleeves to be applied in the hub section by injection moulding of the latter such that its material also penetrates into the sleeves.

According to a further advantageous embodiment the sleeves has a longitudinally extending slit, which i. a. allows for the working tip elements to be fastened in the end of the respective sleeve by means of a solder metal piece applied in the slit.

Alternatively the working tip elements may be fastened in the end of the respective sleeves by clamping which, according to a very advantageous embodiment, is obtained by locating the working tip elements in a countersink in the end of the respective sleeves, and fastening them therein by clamping the wall of the countersink into engagement with the side of the working tip element. The clamping effect is, according to a preferred embodiment, enhanced if the working tip elements have a conical shape and rest with their base end on the bottom of the countersink.

A tool with very advantageous operational qualities is obtained if, according to a further embodiment, the disc shaped hub section has peripheral recesses between the working tip elements to leave tooth-like portions of the disc material in which the working tip elements are imbedded.

In still a further embodiment the tool according to the invention may comprise at least two disc shaped hub sections attached on the same shaft.

Description of drawings

The invention shall now be described in more detail below with reference to the attached drawing, on which;

Figure 1 in a plane view, partly broken away, shows a first embodiment of a rotating tool according to the invention,

Figure 2 shows a section of the same tool in the direction of arrows II-II in Figure 1,

Figure 3 shows an end view in the direction of arrows

III-III in Figure 1 of a working tip forming a part of the tool,

Figure 4 shows a perspective view of the tool in order to illustrate the automatic adaption of the tool's shape to an example of use during operation,

Figure 5 in a plane view shows a second embodiment of a rotating tool according the the invention,

Figure 6 shows an enlarged section in the direction of arrows VI-VI in Figure 5 to illustrate one step during the manufacture of working tip units included in the tool, and

Figure 7 in a similar section illustrates a following step.

Description of embodiments.

The rotating tool comprises, in a first embodiment shown in Figure 1, a rotatably supported hub 2, around the circumference of which a number of working tip elements 4, e.g. of hard metal, are arranged as described in more detail below. The hub comprises a round, essentially disc shaped hub section 6, which consists of a deflectable and elastic material, e.g. an elastomer.

The hub disc 6 has a central hole 8 by means of which it is brought onto a rotatable shaft 10 on which it is rigidly affixed in a suitable way, e.g. fixedly fastened by means of nuts 12 between two rigid supporting washers 14 of metal. The shaft 10 can be intended to be rotatably driven by means of a hand machine, not shown, e.g. a conventional drill, in the chuck of which the shaft 10 is fastened.

The working tip elements 4 are in the form of short pins each held at the end of pin-like holders 16, which are embedded in an essentially spoke-like pattern in the hub disc 6 in the way illustrated by Figures 1 and 2. The working tip elements 4 and their respective holders 16 will also be referred to below as working tip units 4, 16.

Figure 3 illustrates how, in a first embodiment of said working tip units, the working tip elements 4 may be in the form of short pins each soldered in the free end of a sleeve forming the respective pin-like holder 16 and having a longitudinally extending slit 18. More particularly, the tip elements 4 are fastened in the ends of their respective sleeves 16 by a solder metal piece 20 applied in the slit 18 of the sleeve.

The sleeves 16 protrude outside the circumference of the hub disc 6 by a short part of their length, which may approximately correspond to the length of the working tip 4. The length of the sleeves 16 may not be such that their inner ends become clamped between the supporting washers 14, the outer circumference of which being indicated in Figure 1 by a dashed line 22. The sleeves are thus not rigidly affixed with respect to the shaft 10, but allow and can follow bending of the hub disc 6 caused by such use of the tool as demonstrated in Figure 4. In Figure 4 the tool is used, as seen, for working the surface of an angled workpiece 24, the hub disc being deflected under the influence of the applied force.

The pin-like holders 16 with mounted hard metal tip elements 4 are imbedded in the hub disc 6 upon injection molding of the latter. In the case of the holders 16 being slitted sleeves as in Figures 2 and 3, the material of the hub disc will fill the interior of the sleeves during the injection moulding, as indicated by Figure 2, the longitudinal slits 18 then also providing for easy escape of air from the interior of the sleeves when filled. This leads to a very safe attachment of the sleeves, which practically precludes their breakage in a way that carries risk for throwing off pieces during operation. The attachment is in fact strengthened additionally during operation by the radial extension of the elastic disc 6 caused by centrifugal force and the getting thinner of the disc caused thereby, which in turn causes clamping of the disk's material essentially in the axial direction onto the sleeves.

Figure 5 illustrates a second embodiment of the tool according to the invention. In this Figure similar or similarily acting elements as in the preceeding Figures have been given the same reference characters.

In Figure 5 the disc shaped hub section 6 has peripheral recesses 30 between the working tip elements 4 to leave tooth-like portions 32 of the disc material in which the working tip units 4, 16 are imbedded. This arrangement has turned out in practice to result in strengthened peripherally directed vibrations of each working tip 4 when the tool rotates, as well as short movements in the length direction of the working tip units. This in turn results in each working tip hitting the

surface of the work piece a limited number of times for each revolution of the tool, typically of an order of magnitude of 4 in a practical case. A similar phenomenon is also obtainable to a limited extent in the embodiment according to Figure 1.

The above described action has, particularly for the embodiment according to Figure 5, turned out in practice to greatly improve the operational result obtainable with a tool according to the invention.

Figures 6 and 7 illustrate two steps during the manufacture of a second embodiment of the working tip unit 4, 16, which may be alternatively used in the embodiment in Figure 5. The pin-like holder 16 is also here in the form of a sleeve, although not slitted. In one end this sleeve 16 has a countersink 34 for receiving the working tip element 4, which here tapers conically towards the working tip 36 proper.

Figure 6 illustrates a situation where the working tip element 4 has been put in place in the countersink 34 but not affixed therein. In a next step the peripheral wall of the countersink is clamped towards the conical surface of the working tip element 4. This results in the situation shown in Figure 7, where the countersink wall keeps the element 4 steadily trapped by virtue of the engagement between the countersink wall and the conical surface of the element 4. Although having turned out in practice to be completely safe for keeping the working tip element 4 against loosening in operation, said engagement nevertheless allows easy escape of air via the countersink 34 in connection with filling the interior of the sleeve 16 with molding material during embedding of the working tip units by injection molding.

In one practical realization of the tool according to the invention, corresponding to the embodiment according to Figures 5-7, the sleeve 16 has a length of 33 mm, and the working tip element 4 a length of 5,8 mm. The top and base diameters of the element 4 are 1,8 mm and 2,5 mm, respectively. The relative dimensions of the working tip element and the disc 6 appear from a comparison between the length of the unit 4' indicated with dashed lines and the diameter of the disc 6.

For certain fields of application it may be advantageous to fasten two or more hub discs 6 on the same shaft 10, as is

indicated with dashed lines in Figure 4, so that one obtains a working tool having greater extension in the axial direction. These hub discs do not need, contrary to what is indicated in Figure 4, to be placed at a distance from each other, but can be placed on the shaft side-to-side between two shared holding washers 14.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A rotating tool, comprising a rotatably supported hub, around the circumference of which a number of working tip elements are arranged, characterised in that the hub consists of at least on essentially disc shaped, elastic, and in the axial direction elastically deflectable hub section, and that the working tip elements are located in the ends of pin-like holders which are imbedded in the hub section in a way to be able to follow deflections of said disc shaped hub-section under load.

2. A tool according to claim 1, characterised in that the holders are rigid.

3. A tool according to claim 1 or 2, characterised in that the holders are applied in the hub section by injection moulding of the latter.

4. A tool according to any of claims 1-3, characterised in that the holders consist of sleeves, in the outer end of which the working tip element is fastened.

5. A tool according to claim 2 and 3, characterised in that the holders consist of sleeves, in the outer end of which the working tip element is fastened and wherein the sleeves are applied in the hub section by injection moulding of the latter such that its material also penetrates into the sleeves.

6. A tool according to claim 4 or 5, characterised in that the sleeves have a longitudinally extending slit.

7. A tool according to claim 6, characterised in that the working tip elements are fastened in the end of the respective sleeve by means of a solder metal piece applied in the slit.

8. A tool according to claim 4 or 5, characterised in that the working tip elements are fastened in the end of the respective sleeves by clamping.

9. A tool according to claim 8, characterised in that the working tip elements are located in a countersink in the end of the respective sleeves, and fastened therein by clamping the wall of the countersink into engagement with the side of the working tip element.

10. A tool according to claim 9, characterised in that the working tip elements have a conical shape and rest with their base end on the bottom of the countersink.

11. A tool according to any of the preceding claims, characterised in that the disc shaped hub section has peripheral recesses between the working tip elements to leave tooth-like portions of the disc material in which the working tip units are imbedded.

12. A tool according to any of the previous claims, characterised in that it comprises at least two disc shaped hub sections attached on the same shaft.

DATED this 9th day of November 1995

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LJD:RJD:SZ Doc 015 AU3466693.WPC

34666/93

Fig. 1

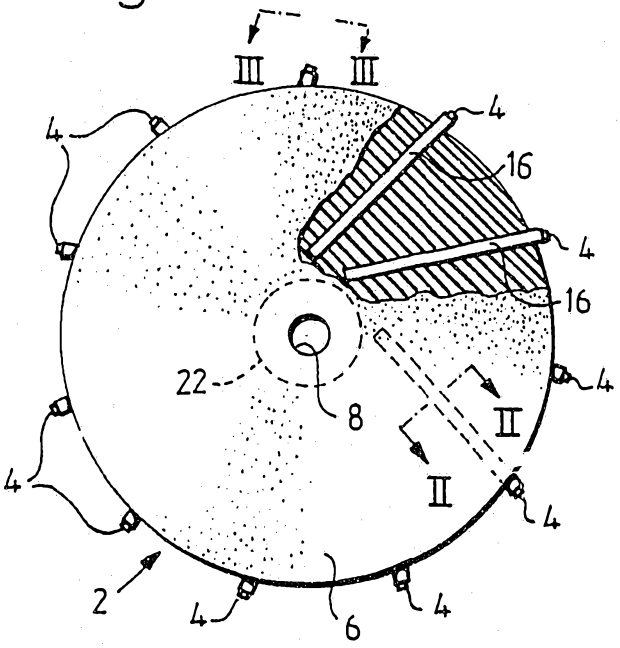


Fig. 2

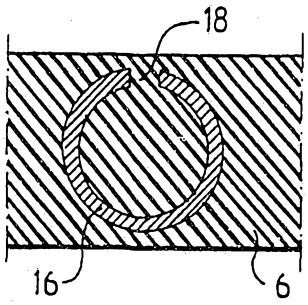


Fig. 3

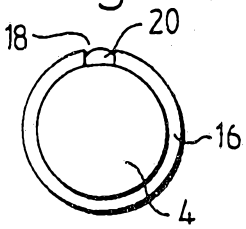


Fig. 4

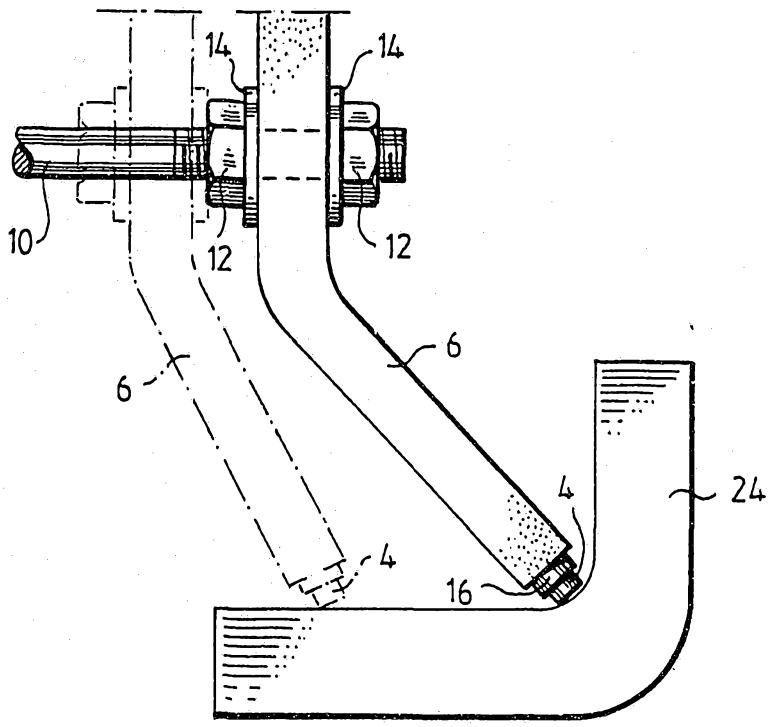


Fig.5

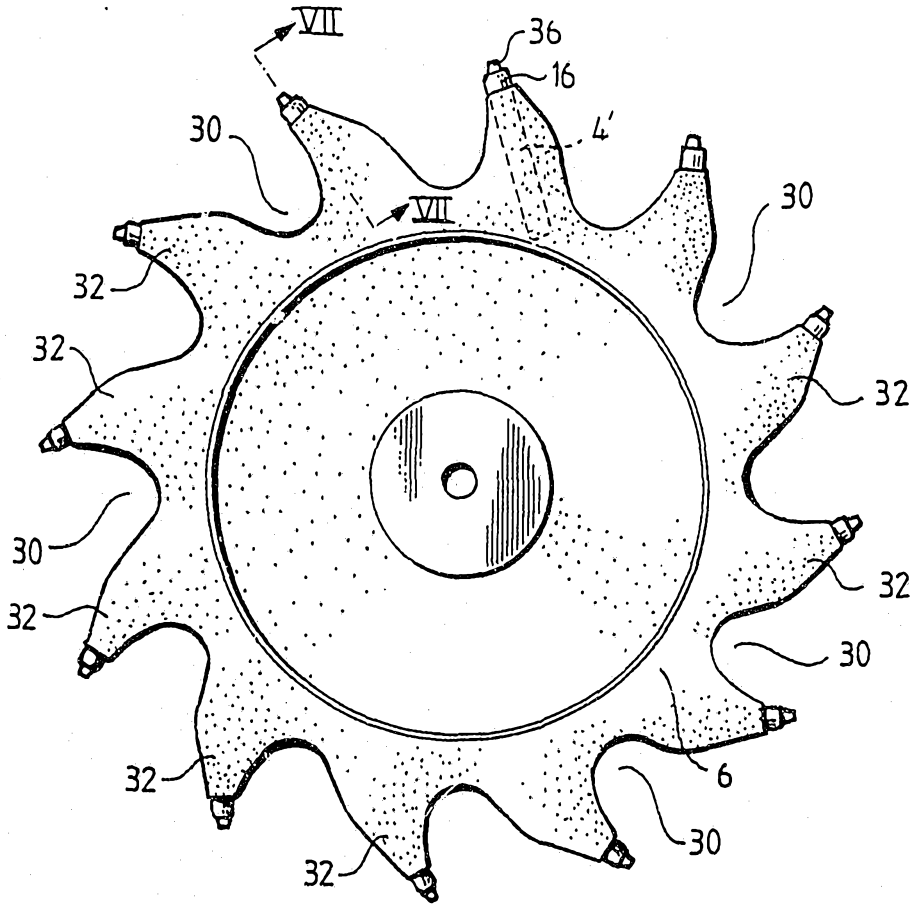


Fig.6

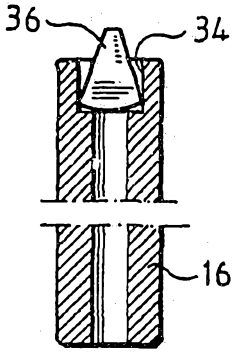
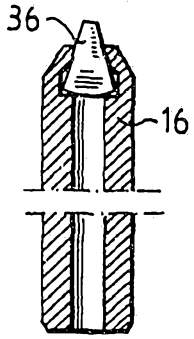


Fig.7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 93/00064

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: A47L 13/06, B24D 13/02, B44D 3/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: A46B, A47L, B23P, B24D, B44D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, C, 283361 (THEODOR STIEGELMEYER), 13 April 1915 (13.04.15), page 1, line 16 - line 38, figures 1,2	2,4
A	DE, B, 1006829 (KULLENBÜRSTEN KULLEN & CO. K.G.), 25 April 1957 (25.04.57), column 3, line 64 - column 4, line 62, figures 1,2	1
A	DE, B, 2308258 (C.F. SCHRÖDER SCHMIRGELWERKE GMBH), 16 December 1976 (16.12.76), column 4, line 31 - column 5, line 36, figures 1-3	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 April 1993	04 -05- 1993
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Allan Westrin Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 93/00064

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A, 2356391 (GRAF, JOHANNES), 15 May 1975 (15.05.75), page 3, line 15 - line 25, figure 1, claims 1-3,7	1
A	US, A, 2950495 (NORMAN H. STINGLEY), 30 August 1960 (30.08.60), column 1, line 30 - column 4, line 11, figures 1-4	1
A	US, A, 3076219 (RUBEN O. PETERSON), 5 February 1963 (05.02.63), figures 1,2,10-13	1,11
A	US, A, 3090061 (VERNON K. CHARVAT), 21 May 1963 (21.05.63), column 4, line 17 - line 48, figure 7	1
A	WO, A, 8700107 (SJÖDIN, SVEN-ERIC), 15 January 1987 (15.01.87), figures 1-3,5, abstract	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

31/03/93

International application No.
PCT/SE 93/00064

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C- 283361	13/04/15	NONE	
DE-B- 1006829	25/04/57	NONE	
DE-B- 2308258	16/12/76	CA-A- 1004856 US-A- 3885358	08/02/77 27/05/75
DE-A- 2356391	15/05/75	NONE	
US-A- 2950495	30/08/60	NONE	
US-A- 3076219	05/02/63	NONE	
US-A- 3090061	21/05/63	NONE	
WO-A- 8700107	15/01/87	SE-A- 8503171	27/12/86