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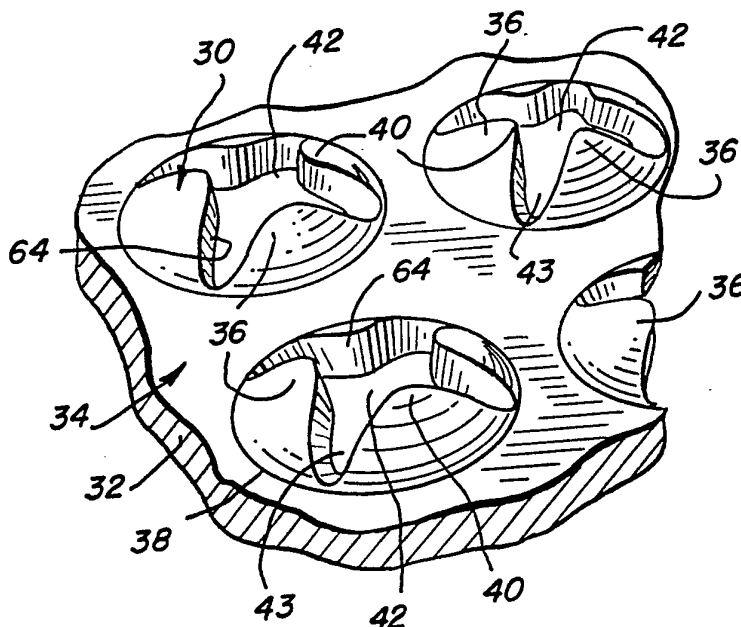
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<b>(21) International Application Number:</b> PCT/US79/00431 <b>(22) International Filing Date:</b> 18 June 1979 (18.06.79) <b>(71) Applicant (for all designated States except US):</b> CATERPILLAR TRACTOR CO. [US/US]; 100 Northeast Adams Street, Peoria, IL 61629 (US). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> BAHNFLETH, William, A. [US/US]; Route 5, High Point Lane, East Peoria, IL 61611 (US). <b>(74) Agents:</b> WALTERS, Ralph, E.; 100 Northeast Adams Street, Peoria, IL 61629 (US) et al.	<b>(81) Designated States:</b> BR, JP, US.  <b>Published</b> <i>With international search report</i>	

**(54) Title:** BEVELED LOBE ANTI-SKID GRATING AND METHOD OF MANUFACTURING SAME

**(57) Abstract**

An improved anti-skid tread or grating (10) design is provided with gripping members or rosettes (30) having a plurality of upstanding individual lobes (36) which are configured in such a way and project high enough to provide an excellent gripping surface. The lobes (36) of the design are self-cleaning, and have non-continuous gripping edges at their crests (40) that accommodate a greater build up of ice or mud without clogging the grating (10). The invention includes an improved method of making the anti-skid tread or grating (10).



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DescriptionBeveled Lobe Anti-Skid Grating  
And Method of Manufacturing SameTechnical Field

5           This invention related to an anti-skid tread and, more particularly, to an anti-skid tread having non-continuous, self-cleaning lobes and a method of making same.

Background Art

10           There are a large number of places where steel tread plate is used and, in fact, where it is required, such as on steps, decks and walkways on earthmoving equipment or railroad engines, on bridges, on cranes, and the like. Its use is dictated by its strength and  
15 by its ability to have its surface corrugated, roughed or distressed so as to provide an anti-skid, gripping surface. In the past, the desired anti-skid, gripping surface characteristics have been accomplished, particularly under reasonably ideal conditions. However, under  
20 footwear containing heavy mud, or under mud, water and freezing conditions, the corrugated, roughened or distressed surfaces may become clogged or packed with mud and/or ice and become dangerous.

          Many of the prior art devices have openings  
25 which do provide a cleaning function, but they are shaped in a way that the mud and the like compact in the openings, clogging the openings and rendering the tread less than 100% effective.

          Some prior art devices have a continuous edge  
30 for the contact surface of the tread which edge can become iced and slippery.



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Disclosure of Invention

The present invention is directed to overcoming one or more of the problems as set forth above.

The present invention has all of the advantages  
5 of the prior art devices including an anti-skid tread.  
In addition, the invention has non-continuous gripping  
edges that are provided by lobes that stick up high  
enough to provide the grip desired and wherein the  
lobes are configured and spaced in a manner to provide  
10 self-cleaning characteristics without compacting and  
accumulating debris. The crests of the lobes have  
rounded abrading edges for gripping the sole of the foot-  
wear or the bottom of a container, or the like, to re-  
duce or eliminate slipping across the surface of the  
15 tread.

A novel punch and backup ring are provided for  
punching gripping members or rosettes into a metal sheet  
to produce the tread or grating. A novel method is dis-  
closed for punching the sheet using the punch and back-  
20 up ring to manufacture the improved tread or grating.

The improved grating or tread is easier and  
cheaper to manufacture while still maintaining all of  
the desired features and advantages.

Brief Description of Drawings

25 Fig. 1 is a top plan view of a gripping member  
of one prior art device;

Fig. 2 is a cross-sectional view taken along  
line 2-2 of Fig. 1 with a punch and die shown in phantom;

30 Fig. 3 is a perspective view of a portion of  
a piece of tread or grating showing the improved rosettes  
or gripping members of the present invention;



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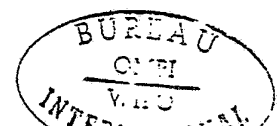
Fig. 4 is an enlarged plan view of a rosette or gripping member of the improved design;

Fig. 5 is an enlarged view of a punch and backup ring with the punch penetrating a sheet of metal to form an improved rosette; and,

Fig. 6 is an end view of the punch of Fig. 5.

#### Best Mode for Carrying Out the Invention

Referring to the drawings wherein similar reference numerals refer to similar parts throughout, Figs. 1 and 2 show one popular prior art grating 10 with a gripping member 12 having a continuous gripping and cleaning edge 14 struck upward from the plane of the grating 10. Each gripping member 12 may be made by positioning a backup die 16, shown in phantom in Fig. 2, against the under surface 18 of the plate 20 whereupon a circular punch 22, shown in phantom in Fig. 2, strikes the plate 20 from above and distorts the plate 20 at the edge 24 of the die 16 to form a conical surface 26 extending angularly away from the plate 20. The punch 22 penetrates the plate 20 leaving the continuous edge 14 about a circular aperture 28 in the plate. After a plurality of gripping members 12 are struck from the plane of the plate 20, the plate is turned over so that the edges 14 project upward for gripping the bottoms of footwear walking on the grating. The apertures 28 will provide clean-out openings into which dirt, mud, ice, and the like, can be scraped. It has been found that the conical surfaces 26 are not long enough and the continuous circular edges 14 can become ice coated and less effective than desired. The mud and ice compacts



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in the apertures 28 and, if it dries or freezes there, reduces the gripping and cleaning ability of the grating.

As shown in Figs. 3 and 4, an improved gripping member or rosette 30 is shown struck from a plate 32 to form a grating or tread 34. A plurality of gripping members or rosettes 30 project upward from the plate 32, either in an established pattern or in a random pattern. The pattern of rosettes 30 in the plate 32 forms no part of the invention.

Each gripping member or rosette 30 includes, preferably, three or four lobes 36 extending upwardly from the plane of the plate 32. Each lobe 36 is tongue-shaped or has a somewhat parabolic configuration with the lobe 36 connected to the plate 32 along a circular path at a base 38. Each lobe 36 ascends upward and inward to form a crest 40 which is spaced from each crest 40 of the remaining lobes 36 to provide a star-shaped opening or aperture 42 between the lobes 36. Aperture 42 is defined by a continuous wall 41 extending around the edges of the lobes 36 and between adjacent lobes 36.

Aperture 42 includes extensions 43 between adjacent lobes 36 which extend from the crest 40 of one lobe to the base 38 thereof and to the crest 40 of an adjacent lobe 36. Portions of wall 41 defining extensions 43 between adjacent lobes 36 are preferably divergent as they extend from base 38 to their respective crests 40, as is best shown in Fig. 4.

To produce the gripping members or rosettes 30, reference is made to Figs. 5 and 6, wherein a punch 44 is provided which has a base 45 adapted to be connected



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to a moving head of ram 47 of a punch press, or the like, not shown. The punch 44 has a pointed leader 46 and a star-shaped cutting shank 48. The cutting shank 48 may have three or four radially extending flutes 50, each flute having a shape in horizontal cross section conforming to the extensions 43 of the aperture 42 in the resulting rosette 30. Each flute 50 has a flat end 51, the edges 53 of which form the cutting edge for the punch.

10           The punch press, not shown, has a guide 52 in which is formed an aperture 54 for receiving and guiding the punch 44 therein. A die 56, having circular cutouts or apertures 58, is positioned in the punch press with the axis of each cutout 58 aligned with the axis of an aligned aperture 54 in the guide 52. The die 56 with the cutout or aperture 58 aligned with the punch 44 in 15 the guide 52 forms a backup ring 60 for the punch 44. In practice, the sheet or plate of steel 32 is placed on the top surface 62 of the die 56 whereupon the 20 guide 52 is lowered against the top of the plate 32. The punch press is actuated to drive the punch 44 through the plate 32 to form the gripping members or rosettes 30 as the material of the plate 32 is deformed and pierced by the punch 44.

25           The inside diameter of the cutout 58 in the backup ring 60 is slightly larger than the outside diameter of the punch 44 such that the edges 53 of the flat end 51 of the flutes 50 starts cutting the plate 32 on the outer periphery of the punch corresponding to 30 the inner periphery of the die 56. This causes the



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metal of the plate to be split into individual extensions 43 of the lobes 36 as the flutes 50 of the punch 44 pushes more metal ahead of it, to stretch the metal of the plate as it moves through the plate. As the punch 5 44 completes the penetration of the plate 32 and continues to traverse the opening 42 in the plate 32, the walls of the punch 44 will work the walls 41 of the extensions 43 and lobes 36 to shape them along a vertical path or even to give the wall 41 a shape which is slight- 10 ly inwardly tapered or beveled toward the underside of the plate 32 as shown in Figs. 3 and 4. Typical of die punch cuts in a plate, a small welt or ledge 66 is left around the top edge of the lobes 36 of the rosette 30 when the punch 44 is withdrawn, which welt or ledge 66 15 forms an additional cleaning edge for the rosette 30.

#### Industrial Applicability

With a large number of rosettes or gripping members 30 struck from a plate 32 and the plate is inverted so that the rosettes 30 project upward from the 20 plate, an improved, efficient and inexpensive tread or grating 10 is provided. The individual crests 40 of the lobes 36 bite into the soles of the footwear to grip and hold the footwear in place. The shape of the lobes 36 create extensions 43 in the opening there- 25 between which, along with the inwardly and downwardly beveled or sloped walls 41, clean mud, ice, and the like, from the soles of the footwear and because of said extensions 43, the residue of mud and ice does not compact in the opening 42. The mud and ice is spread out 30 and dispersed so as to loosen it, thereby causing it to





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fall through the opening 42 in the grating under its own weight and from the force of the cleaning stroke of the footwear across the grating. The lobes 36 are taller, sharper and provide individual points of contact which improves the anti-skid and the self-cleaning characteristics of the grating 10. The edges of the lobes 36 are non-continuous in a plane thereby giving non-continuous gripping to footwear brought in contact therewith. Non-continuous gripping is considered somewhat preferred in recent United States Government safety specifications. The non-continuous gripping edges of the lobes 36 of the rosettes 30 are not likely to become iced over since pressure on the grating will cause the edges of the crests 40 of the lobes 36 to penetrate and crack the ice loose.



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Claims

1. In a grating (10) for use as a deck, said grating (10) includes a metal plate (32), a plurality of gripping means (30) extending upwardly from the plane of said plate (32), each said gripping means (30) having at least three radially inwardly projecting lobes (36), each lobe (36) having a crest (40) at the uppermost end thereof, the crest (40) of each lobe (36) being spaced from the crest (40) of each other lobe (36) to form an opening (42) therebetween.

2. In a grating (10) as claimed in claim 1 wherein said crests (40) have extensions (43) of the opening (42) therebetween which assist in dispersing mud scraped loose by said crests (40) of the gripping means (30).

3. In a grating (10) as claimed in claim 1 wherein each gripping means (30) is circular in shape including a base (38) at its junction with said plate (32) and has four upwardly and inwardly projecting lobes (36), each lobe (36) converging from a wide portion at said base (38) to a narrow curved portion at its crest (40).

4. The grating of claim 1 wherein each gripping means (30) is defined by a base (38) and each opening (42) is defined by a wall (41), adjacent lobes (36, 36) being separated by an extension (43) defined by portions of said wall (41), said portions of said wall (41) divergently extending from said base (38) toward said crests (40).



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5. In a grating (10) for use on a deck upon which walking and working takes place, said grating (10) including a plate (32) of steel, a plurality of gripping means (30) struck up from the plane of said plate (32),  
5 each said gripping means (30) having a plurality of lobes (36), each lobe (36) having a crest (40) at the uppermost end thereof, the crest (40) of each lobe (36) being spaced from the crest (40) of each other lobe (36) to form a star-shaped opening (42) through said gripping means (30).

10 6. In a grating (10) as claimed in claim 5 wherein each crest (40) has an upwardly oriented gripping edge projecting from the crests (40) of each lobe (36) which presents non-continuous gripping to footwear in contact with said grating (10).

15 7. In a grating (10) as claimed in claim 5 wherein said crests (40) have walls (41) which are beveled to assist in dispersing mud scraped loose by said crests (40) of the gripping means (30).

20 8. In a method of making a grating having a plurality of gripping means (30) thereon, comprising the steps of placing a plate (32) of steel on the surface (62) of a die (56) in a punch press, moving a guide (52) into contact with said plate with the axis of the guide aligned with the axis of the die (56), moving a punch  
25 (44) through said guide (52) downwardly toward said plate with the leader (46) of the punch contacting and distorting said plate downward in the die (56), ramming said punch (44) through said plate (32) to cut the plate (32) near the edge of said die (56) with the outer edges (53) of  
30 the flutes (50) on said punch (44), the flutes (50)



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continue to stretch the metal of the plate (32) as it penetrates and cuts the plate into a plurality of lobes (36), said punch (44) shaping the walls (41) of said lobes (36).



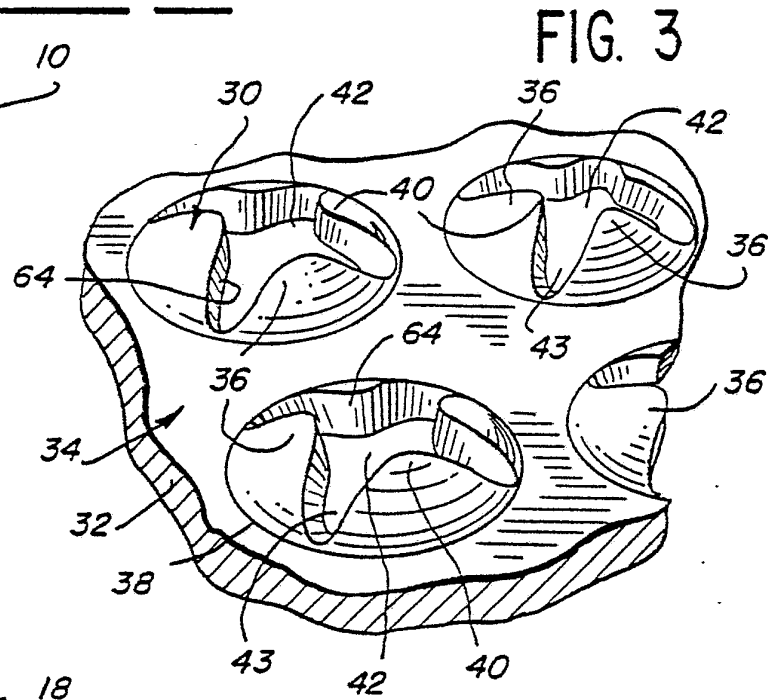
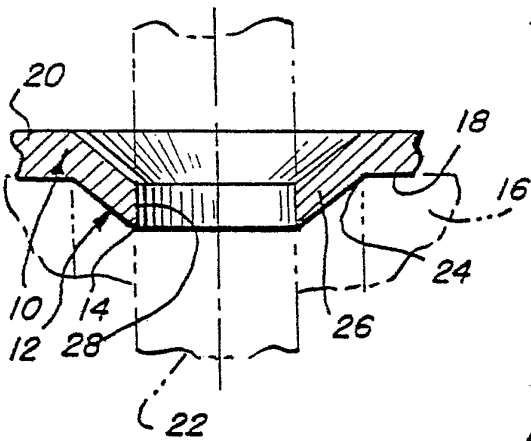
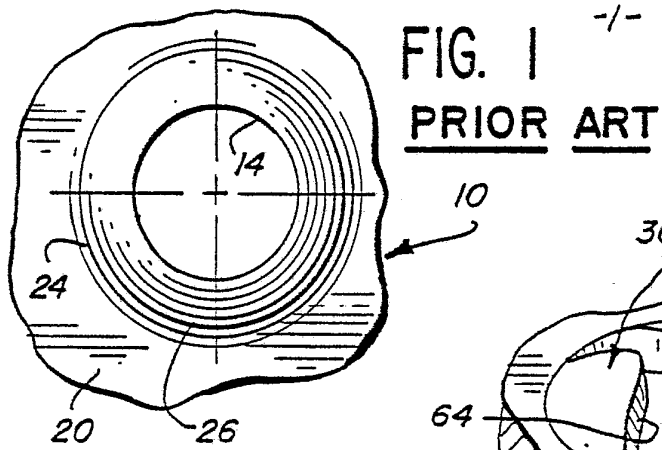


FIG. 4

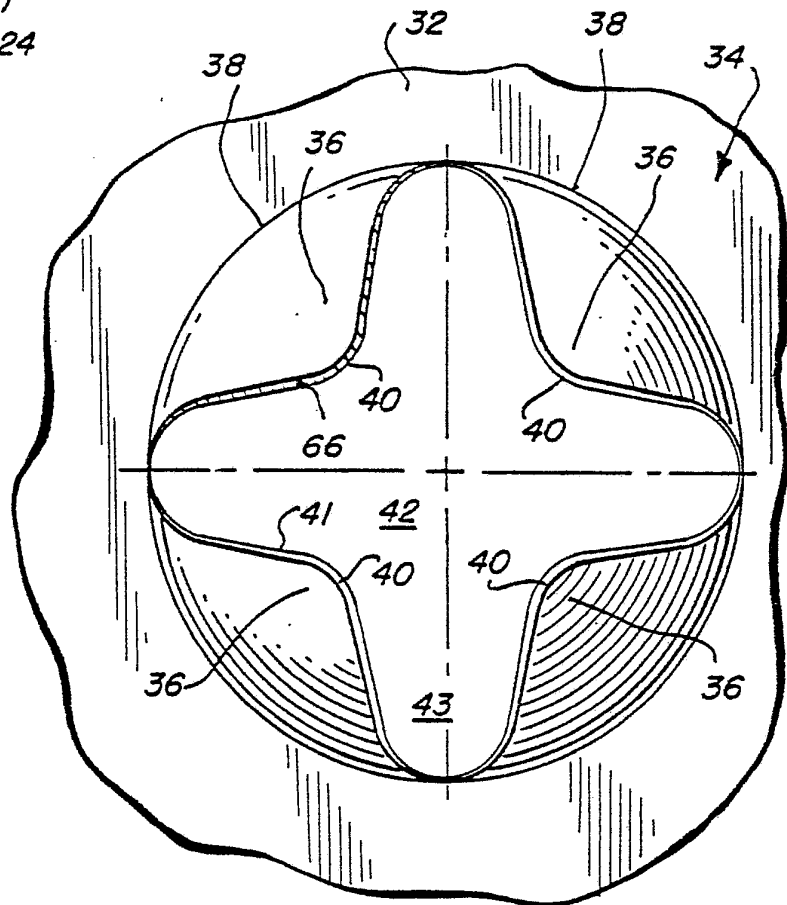


FIG. 5

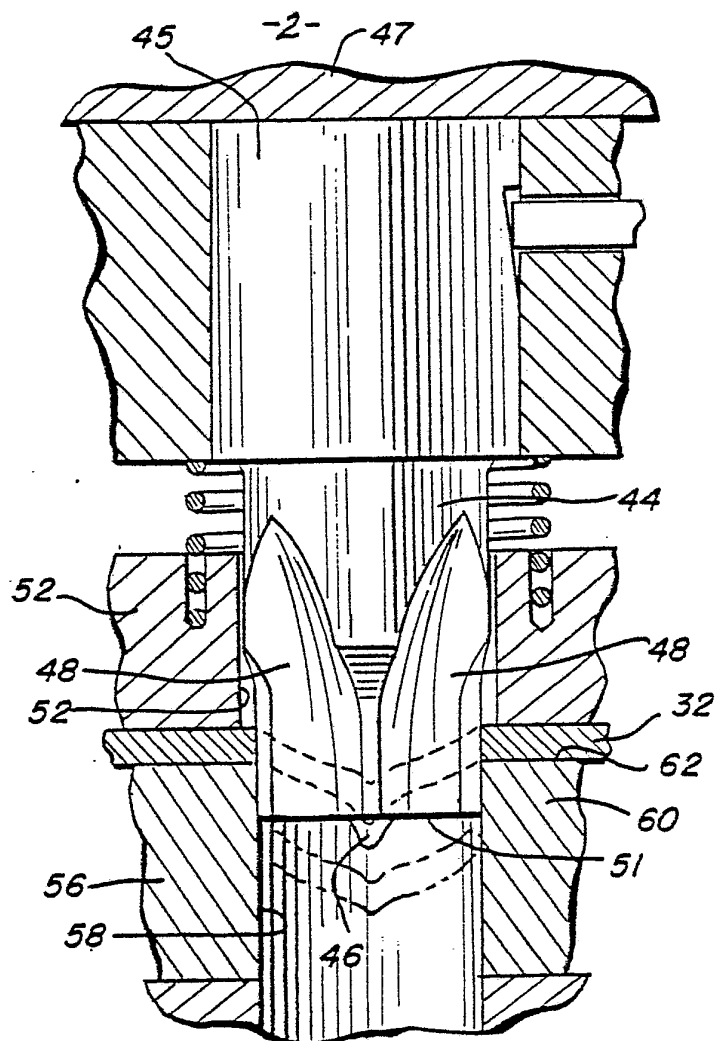
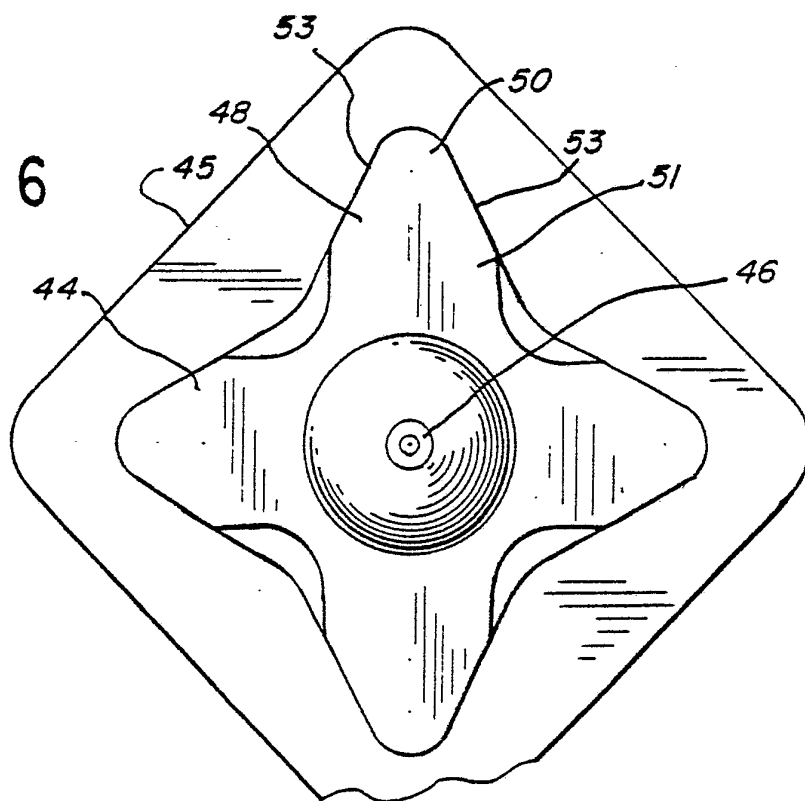


FIG. 6



# INTERNATIONAL SEARCH REPORT

International Application No PCT/US79/00431

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. E04F 11/16, E04C 2/42 U.S. Cl. 52-180, 29-160		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
U.S.	D25/69,87,90, * 29/160,163.5R, 52/177,180,673, 674,675, 113/116FF	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>6</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	U S , A, 538,467 published 30 April 1895, Schaper.	1-7
X	U S , S, Des.81,988, published 9 September, 1930, MacDonald	1-7
X	G B, A, 220,106 published 14 August 1924, Rogers	1-7
A	U S , A, 3,093,216, published 11 June 1963 Dunham	1-7
A	U S , A, 1,166,423, published 4 January 1916, Atwood	1-7
A	U S , A, 1,215,235, published 6 February 1917, Atwood	1-7
X	U S , A, 1,044,283, published 12 November 1912, Stanger	8
X	U S , A, 2,590,807, published 25 March 1952, Voslamber	8
<p><sup>15</sup> Special categories of cited documents:</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> </div> <div style="width: 45%;"> <p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>2</sup>		Date of Mailing of this International Search Report <sup>2</sup>
11 FEBRUARY 1980		07 MAR 1980
International Searching Authority <sup>1</sup>		Signature of Authorized Officer <sup>20</sup>
ISA/US		<i>Alfred C. Berham</i>

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X	U S , A, 1,268,802, published 4 June 1918 Schumacher	8
A	U S , A, 1,441,327, published 9, January 1923 Blum	1-7
A	U S , A, 2,281,822, published 5 May 1942, Bills et al	1-7

V. ☒ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>10</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers ....., because they relate to subject matter <sup>12</sup> not required to be searched by this Authority, namely:

2. ☐ Claim numbers ....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>11</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

## Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.  
☐ No protest accompanied the payment of additional search fees.