

12

EUROPEAN PATENT APPLICATION

21 Application number: 80301638.5

51 Int. Cl.³: **E 04 C 2/42**
E 01 D 19/12

22 Date of filing: 19.05.80

30 Priority: 18.06.79 US 7900431

43 Date of publication of application:
07.01.81 Bulletin 81/1

84 Designated Contracting States:
DE FR GB IT

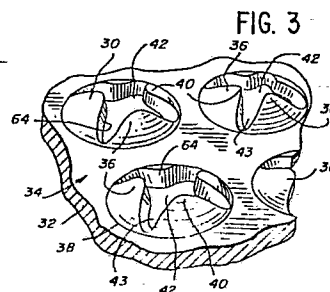
71 Applicant: **CATERPILLAR TRACTOR CO.**
100 Northeast Adams Street
Peoria Illinois 61629(US)

72 Inventor: **Bahnfleth, William A.**
Route 5 High Point Lane
East Peoria, Illinois 61611(US)

74 Representative: **Brunner, Michael John et al,**
Gill Jennings & Every 53 to 64, Chancery Lane
London WC2A 1HN(GB)

54 **Anti-slip grating and method of manufacturing same.**

57 An improved anti-slip 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-slip tread or grating (10).



- 1 -

CATERPILLAR TRACTOR CO.

GJE 5180/071

ANTI-SLIP GRATING AND METHOD OF MANUFACTURING SAME

This invention relates to an anti-slip grating and, more particularly, to an anti-slip grating having non-continuous, self-cleaning lobes and a method of making same.

5. There are a large number of places where steel gratings for tread plates are 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
10. dictated by its strength and by its ability to have its surface corrugated, roughed or distressed so as to provide an anti-slip, gripping surface. In the past, the desired anti-slip, gripping surface characteristics have been accomplished under reasonably ideal conditions.
15. However, under 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
20. which do provide a cleaning function, but instead 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
25. for the contact surface of the tread which edge can become iced and slippery.

- 2 -

According to the invention a grating for use as a work or walking platform, the grating including a metal plate and a plurality of gripping means extending upwardly from the plane of the plate is

5. characterized in that each gripping means has a plurality of radially inwardly and upwardly projecting lobes, each lobe having a crest at its uppermost end spaced from the crest of the or each other lobe to form an opening therebetween.
10. The present invention has all of the advantages of the prior art devices including an anti-slip tread. In addition, the invention has non-continuous gripping edges that are provided by the lobes that stick up to provide the grip desired, the lobes being configured
15. and spaced in a manner to provide self-cleaning characteristics without compacting and accumulating debris. The crests of the lobes may have rounded abrading edges for gripping the sole of the footwear or the bottom of a container, or the like, to reduce or
20. eliminate slipping across the surface of the tread.
- The invention also includes a method of making a grating having a plurality of gripping means thereon, the method comprising the steps of placing a metal plate on the surface of a die in a punch press, moving
25. a guide into contact with the plate with the axis of the guide aligned with the axis of the die, moving a fluted punch through the guide downwardly through the plate with a leader of the punch initially contacting and distorting the plate downwardly in the die, ramming
30. the punch through the plate to cut the plate near the edge of the die with the outer edges of the flutes on the punch, the flutes continuing to stretch the metal of the plate as they penetrate to cut the plate into a plurality of lobes, the punch shaping the walls of the
35. lobes.

- 3 -

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

- One prior art grating and a method according
5. to the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a top plan view of a gripping member of one prior art device;

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

- Figure 3 is a perspective view of a portion of a piece of tread or grating showing improved rosettes or gripping members; _____
- 15.

- 4 -

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.

Referring to the drawings wherein similar reference numerals refer to similar parts throughout,

10 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,

15 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

20 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

25 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

30 less effective than desired. The mud and ice compacts

- 5 -

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

- 6 -

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

5 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
15 aligned aperture 54 in the guide 52. The die 56 with the cutout or aperture 58 aligned with the punch 44 in 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 start cutting the plate 32 on the outer periphery of the punch corresponding to
30 the inner periphery of the die 56. This causes the

- 7 -

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 con-
tinues to traverse the opening 42 in the plate 32, the
walls of the punch 44 will work the walls 41 of the ex-
tensions 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.

With a large number of rosettes or gripping
members 30 struck from a plate 32 and the plate in-
verted 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 ex-
tensions 43, the residue of mud and ice does not com-
pact in the opening 42. The mud and ice is spread out
30 and dispersed so as to loosen it, thereby causing it to

- 8 -

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.

- 9 -

CLAIMS

GJE 5180/071

1. A grating (10) for use as a work or walking platform, the grating (1) including a metal plate (32) and a plurality of gripping means (30) extending upwardly from the plane of the plate (32) characterized
5. in that each gripping means (30) has a plurality of radially inwardly and upwardly projecting lobes (36), each lobe (36) having a crest (40) at its uppermost end spaced from the crest (40) of the or each other lobe (36) to form an opening (42) therebetween.
10. 2. A grating (10) according to claim 1 wherein the crests (40) have extensions (43) of the opening (42) therebetween which assist in dispersing mud scraped loose by the crests (40) of the gripping means (30).
15. 3. A grating (10) according to claim 1 or claim 2, wherein each gripping means (30) is substantially circular in shape and includes a base (38) at its junction with the plate (32), and has three or four upwardly and inwardly projecting lobes (36), each lobe
20. (36) converging from a wide portion at the base (38) to a narrow curved portion at its crest (40).
4. A grating (10) according to any of claims 1 to 3, wherein each gripping means (30) is defined by a base (38) and each opening (42) is defined by a wall
25. (41), adjacent lobes (36) being separated by an extension (43) defined by portions of the wall (41), the portions of the wall (41) divergently extending

- 10 -

from the base (38) toward the crests (40).

5. A grating (10) according to any of claims 1 to 4, wherein the crests (40) have walls (41) which are beveled to assist in dispersing mud scraped loose
5. by the crests (40) of the gripping means (30).
6. A grating (10) according to any of claims 1 to 5, wherein each crest (40) has an upwardly oriented gripping edge projecting from it which presents non-continuous gripping to footwear in contact with the
10. grating (10).
7. A grating (10) according to any of claims 1 to 5, wherein the plate is a steel plate.
8. A method of making a grating having a plurality of gripping means (30) thereon, the method comprising the
15. steps of placing a metal plate (32) on the surface (62) of a die (56) in a punch press, moving a guide (52) into contact with the plate with the axis of the guide aligned with the axis of the die (56), moving a fluted punch (44) through the guide (52) downwardly through
20. the plate with a leader (46) of the punch initially contacting and distorting the plate downwardly in the die (56), ramming the punch (44) through the plate (32) to cut the plate (32) near the edge of the die (56), with the outer edges (53) of the flutes (50) on the
25. punch (50) on the punch (44), the flutes (50) continuing to stretch the metal of the plate (32) as they penetrate to cut the plate into a plurality of lobes (36), the punch (44) shaping the walls (41) of the lobes (36).

30.

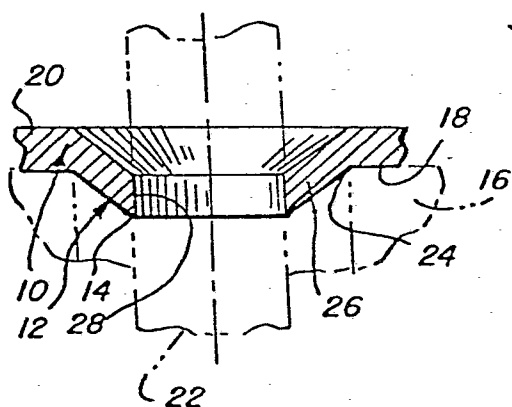
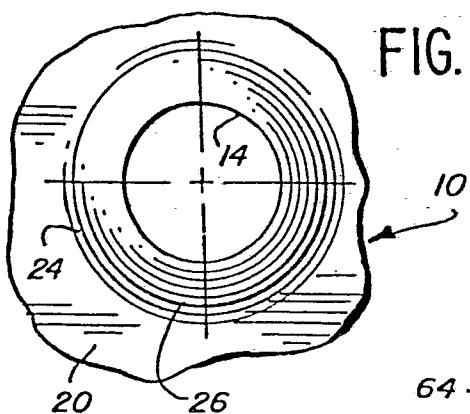


FIG. 2

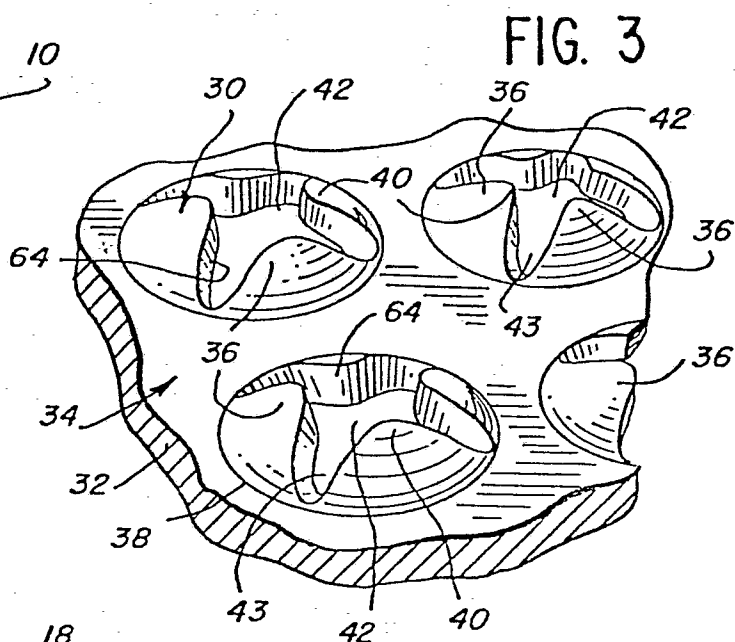


FIG. 4

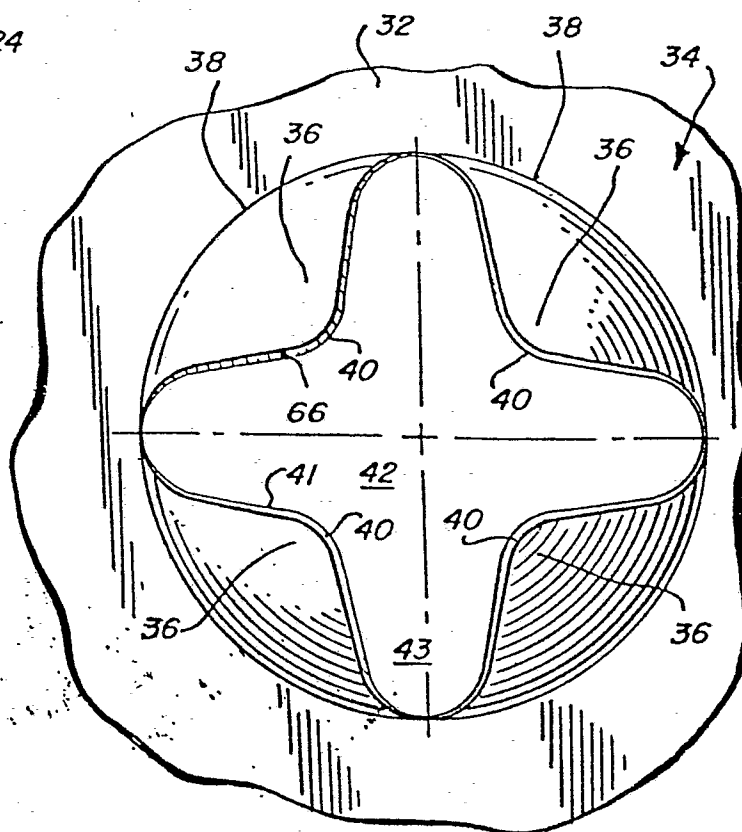


FIG. 5

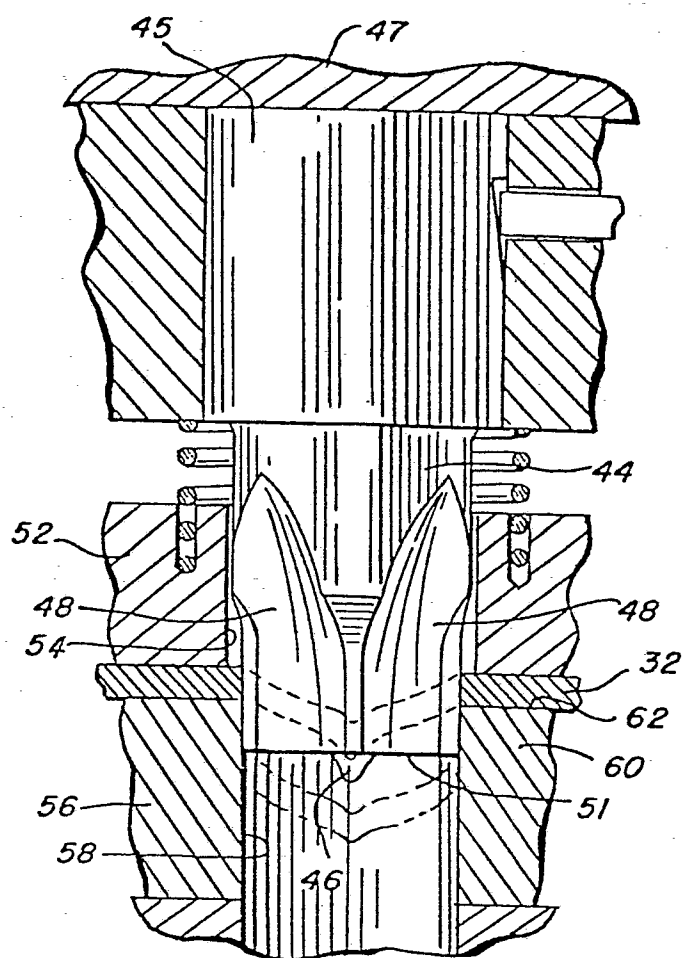


FIG. 6

