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Improvements in Ground Engaging Blades for Grader Moldboards

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ABSTRACT

A ground engaging blade for releasable attachment to a moldboard stub of a grader, including: a front face; a rear face spaced from said front face and arranged either parallel thereto with an edge face adjoining the lower edges of the front and rear faces or such that at least part of the front and rear faces taper to meet along a lower edge; two spaced ends; one or more lower edge recesses in and extending along said lower edge or lower edge face and opening generally downward; one or more rear face recesses in and extending along and opening to the rear face and spaced from said lower edge or edge face; and hardfacing in said recesses, and, in the form of a hardfacing layer, on at least some of the rear face, said hardfacing layer substantially covering the hardfacing in said rear face recess or recesses and said hardfacing layer covering at least some of said lower face recess or recesses and, where provided, said lower edge face. The lower edge may be provided as a discontinuous lower edge comprising a plurality of lower edge portions separated by a corresponding plurality of notches, each notch being provided between adjacent lower edge portions.

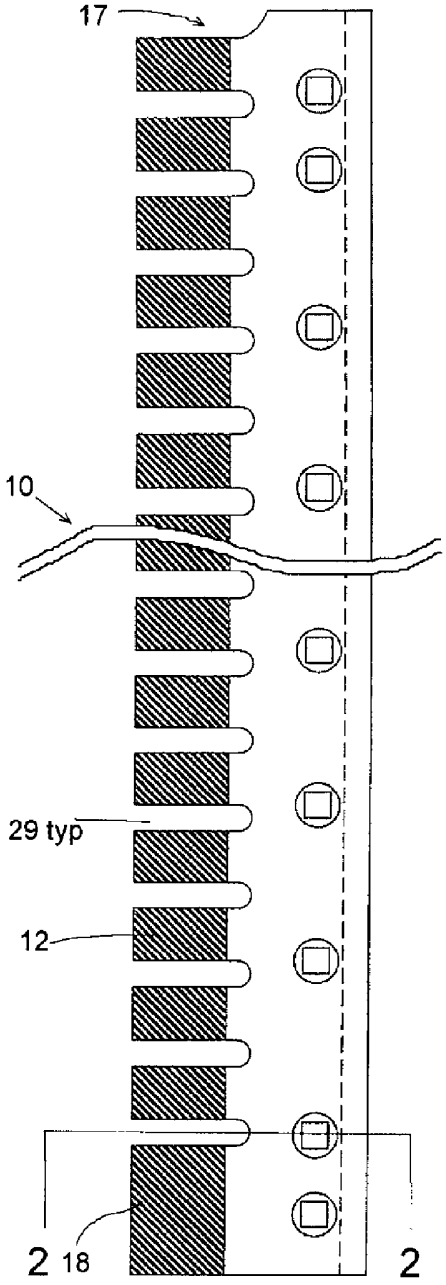

Fig. 1

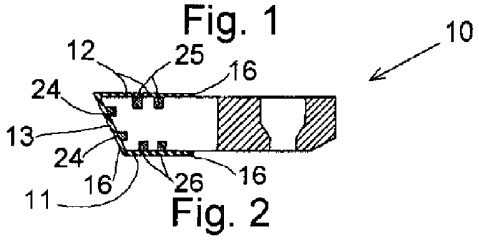

Fig. 2

IMPROVEMENTS IN GROUND ENGAGING BLADES FOR GRADER MOLDBOARDS

THIS INVENTION relates to improvements in ground engaging blades for grader moldboards.

Although the invention has been developed primarily for use with grader moldboards it will be appreciated that the invention is not limited to this particular field of use.

Grader moldboards frequently have one or more replaceable ground engaging blades attached so that the part of the moldboard which engages the ground and wears away may be readily replaced. Hereinafter, that part of the moldboard to which the ground engaging blades are attached will be referred to as a moldboard stub. Hardfacing has sometimes been applied to the heel portion of the blades in an effort to increase service life since it is from the heel that the blades commence and continue to wear.

Sometimes, the ground engaging blade may be referred to as a "grader blade" or a "blade insert", and sometimes the assembly of the grader blade to the moldboard stub may be referred to as a "grader blade". In this specification, the term "blade" is used to refer to the removable and replaceable element attachable to a moldboard stub to form a grader moldboard when so attached.

The grade blade may be curved in cross section, as generally used in normal duty service, or straight in cross section for heavy duty service. In heavy duty service, significant wear occurs, particularly on the corners of the blade. The cutting and carrying ability blade may be enhanced by reducing the point contact loading.

The present invention aims to provide an improved ground engaging blade for a grader moldboard having a longer service life than ground engaging blades of the prior art.

With the foregoing in view, the present invention resides broadly in a ground engaging blade for releasable attachment to a moldboard stub, the blade including:

a front face;

a rear face spaced from said front face and arranged substantially parallel thereto;

lower edge face extending between lower edges of said front and rear faces;

two spaced ends;

one or more lower edge recesses in and extending along said lower edge face, spaced from said lower edges of said front and rear faces and opening generally downward;

one or more rear face recesses in and extending along and opening to the rear face and spaced from said lower edge face; and

hardfacing in said recesses, and, in the form of a hardfacing layer, on at least some of the rear face, said hardfacing layer substantially covering the hardfacing in said rear face recess or recesses and said hardfacing layer covering at least some of said lower edge face and said lower face recess or recesses.

In another aspect, the present invention resides broadly in a ground engaging blade for releasable attachment to a moldboard stub, the blade including:

a front face;

a rear face spaced from said front face and arranged such that at least part of said front and rear faces taper to meet along a lower edge;

two spaced ends;

one or more recesses (referred to as "lower edge recesses") in and extending along said lower edge and opening generally downward;

one or more recesses (referred to as "rear face recesses") in and extending along and opening to the rear face and spaced from said lower edge; and

hardfacing in said recesses, and, in the form of a hardfacing layer, on at least some of the rear face, said hardfacing layer substantially covering the hardfacing in said rear face recess or recesses and said hardfacing layer covering at least some of said lower face recess or recesses.

The lower edge may be provided as a discontinuous lower edge comprising a plurality of lower edge portions separated by a corresponding plurality of notches, each notch being provided between adjacent lower edge portions. In such an arrangement, the lower edge recess is preferably provided as a set of lower face recesses, each of recess extending along the lower edge of each lower edge portion in regular spaced relationship. The rear face recess or recesses may be provided either as a continuous recess from one end of the blade to the other if provided above the notches, or if not provided above the notches, as a set of rear face recesses, each member of which extends fully along the rear face of each respective lower edge portion.

In one form suitable for light to regular duty, the front and rear faces are curved about a horizontal axis or focal line

forward of the front face. In another form suitable for heavy duty, the front and rear faces are substantially parallel.

It will be appreciated that terms such as "upper", "lower", "downward", "horizontal" and the like refer to the blade in its normal orientation, and do not limit the invention to any particular orientation.

Preferably, the recesses are in the form of a groove running along at least some of the lower edge, lower edge face or edge portions and/or the rear face. It is also preferred that each groove or recess be of a width and depth sufficient that it may be filled by from one to three beads of hardfacing weld and such that the hardfacing layer covers the or each groove or recess. In such form, the rear face recesses and the lower edge recesses are all in the form of a groove having a semicircular or part circular cross section, each lower edge groove being provided along the entire length of the lower edge or each lower edge portion (as the case may be) and the rear face groove being provided along the entire length of the rear face. In another form, the recesses are of a square or rectangular cross section.

Preferably, the layer of hardfacing is formed from a plurality of weld beads laid up beside one another in edge-to-edge abutting relationship. Preferably, each bead of weld

being applied in a longitudinal direction from one end of the blade to the other. In the various forms of the invention, there maybe notches provided as described, in which case, the preferred longitudinal arrangement of the beads is discontinuous. It is also preferred that the hardfacing be formed by electric arc welding, from ARM-2 weld wire as may be provided by Abrasion Resistant Materials Pty Ltd, at a suitable current, typically 200 to 400 amps, and a suitable electrical potential, typically 22 to 30 volts in a metal-inert-gas atmosphere at a linear rate sufficient to coat the net area required for the bead of weld. The preferred wire conforms to BS2901 Part 1 1970A18 and AWS 5.18 E70S-6. The hardfacing includes tungsten carbide grit added to the molten weld pool during the welding process, by any suitable means, and is preferably mesh size 12/35.

In another aspect, the present invention resides broadly in a grader moldboard including a ground engaging blade as hereinbefore described operatively attachable to a moldboard stub.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate two preferred embodiments of the invention, and wherein:

Fig. 1 is a diagrammatic front elevation of a heavy duty ground engaging blade according to the invention;

Fig. 2 is a diagrammatic sectional view along lines 1-1 of Fig. 2;

Fig. 3 is diagrammatic sectional view along lines 3-3 of Figs. 4 and 5 of a non-heavy duty ground engaging blade according to the invention;

Fig. 4 is a diagrammatic front elevation of the ground engaging blade of Fig. 3; and

Fig. 5 is a diagrammatic front elevation of an alternative form of non-heavy duty ground engaging blade according to the invention and having notches along the lower edge, but having substantially the same cross-section between the notches as the ground engaging blade of Figs. 3 and 4.

The heavy duty ground engaging blade 10 shown in Figs. 1 and 2 as a front face 11, a rear face 12 spaced from the front face and a lower edge face 13 extending between the lower edges of the front and rear faces, the lower edge of the blade being shown towards the left of Figs. 1 and 2. Two rear face recesses 25 extend along the rear face between respective regularly spaced notches shown typically at 29. A similar arrangement is provided for two front face recesses 26 and two lower ledge

face recesses 24. It can be seen in particular in Fig. 2 that the lower edge face tapers toward the rear face to meet at an acute angle thereto and intersects with the front face at an obtuse angle. A hardface coating 16 is provided over all of the lower edge face, and partway up the front and rear faces to substantially the same height below the semi-circular ends of the notches.

As can be seen in Fig. 2 in particular, one end of the heavy duty ground engaging blade has the hardfaced portion of a greater width than the other portions to accommodate the heavier loading generally encountered towards the end of moldboards on graders. In usual configurations, four blades are provided, the two end blades being mirror images of one another, that is, one being of the form shown in Fig. 1 and the other being the mirror image thereof so that the widened piece is at the other end. The intermediate blade pieces would be of a form which has the half-notch 17 provided at both ends.

The non-heavy duty ground engaging blade 30 shown in Figs. 3 and 4, has a front face 31 curved about a horizontal axis or focal line and a rear face 32 spaced from the front face and curved such that at least some of the front and rear faces taper to meet along a lower edge 35. The front and rear faces diverge from one another upwardly and meet with an upper edge

face 34 parallel to and spaced from the lower edge. The upper edge face is substantially planar. The blade extends between two spaced ends 38 (a part of one being shown in Figs. 1, 4 & 5). A lower edge recess 41 is provided in and extending along the lower edge and a rear face recesses 42 is provided along, and opening to, the rear face and extending from one end of the blade to the other. Hardfacing is provided in each of the recesses as shown at 45, and, in the form of a hardfacing layer 46, is provided on a lower portion of the rear face, the hardfacing layer substantially covering the hardfacing in or on the recesses.

In the ground engaging blade 40 shown in Fig. 5, the same reference numerals are used for the features which do not differ from those of the ground engaging blade 30 of Figs. 3 and 4. However, the lower edge is notched to provide a plurality lower edge portions 48, each lower edge portion being spaced apart by a respective notch portion 49 intermediate adjacent lower edge portions. The notches shown at 49 are semicircular in form, their width being about twice the height. In an alternative, deeper notches may be provided to a depth similar to that shown in respect of Figs. 1 and 2, such as shown in phantom outline in Fig. 5 at 47.

The rear face recesses and the lower edge recesses are in the form of a groove having a semicircular cross section, each lower edge groove being provided along the entire length of the lower edge or each lower edge portion (as the case may be) and the rear face groove being provided along the entire length of the rear face for each embodiment of blade (just above the notches, of the alternative blade 40). Alternatively, the rear face groove in the alternative blade is provided just below the inner end of the notches and along the entire length of each lower edge portion.

In use, one or more ground engaging blades are attached to a lower and forward facing rebate along a moldboard stub to form a grader moldboard. Generally, either notched or non-notched blades are selected for a particular grader moldboard and/or application. For heavy duty applications, embodiments based on the heavy duty ground engaging blade shown in Figs. 1 and 2 would be suitable. For other duties, embodiments based on the non-heavy duty ground engaging blades of Figs 3, 4 and 5 would be suitable.

The blades are formed in accordance with the invention by machining the grooves in a blank blade (that is, a blade prior to the application of hardfacing), and then hardfacing is added into the grooves by welding one or more beads of hardfacing

along and in each groove. The layer of hardfacing is then added to the lower edge of the blade and a lower portion of the rear face to form the ground engaging blade in accordance with the invention.

It is believed that the present invention, where the hardfacing is in the form of a composite hardfacing where particulate wear resistant material is added to a molten weld pool, permits extra hardfacing material to be added to the blade without causing excessive dissolution of the wear resistant material as often occurs if multiple layers of composite hardfacing are welded onto a substrate.

Although the invention has been described with reference to one or more specific examples, it will be appreciated by persons skilled in the art that the invention may be embodied in many other forms within the broad scope and ambit of the following claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A ground engaging blade for releasable attachment to a moldboard stub, the blade including:

a front face;

a rear face spaced from said front face and arranged substantially parallel thereto;

lower edge face extending between lower edges of said front and rear faces;

two spaced ends;

one or more lower edge recesses in and extending along said lower edge face, spaced from said lower edges of said front and rear faces and opening generally downward;

one or more rear face recesses in and extending along and opening to the rear face and spaced from said lower edge face; and

hardfacing in said recesses, and, in the form of a hardfacing layer, on at least some of the rear face, said hardfacing layer substantially covering the hardfacing in said rear face recess or recesses and said hardfacing layer covering

at least some of said lower edge face and said lower face recess or recesses.

2. A ground engaging blade according to Claim 1, wherein the lower edge face is provided as a discontinuous lower edge comprising a plurality of lower edge portions separated by a corresponding plurality of notches, each notch being provided between adjacent lower edge portions.

3. A ground engaging blade for releasable attachment to a moldboard stub, the blade including:

a front face;

a rear face spaced from said front face and arranged such that at least part of said front and rear faces taper to meet along a lower edge;

two spaced ends;

one or more lower edge recesses in and extending along said lower edge and opening generally downward;

one or more rear face recesses in and extending along and opening to the rear face and spaced from said lower edge; and

hardfacing in said recesses, and, in the form of a hardfacing layer, on at least some of the rear face, said

hardfacing layer substantially covering the hardfacing in said rear face recess or recesses and said hardfacing layer covering at least some of said lower face recess or recesses.

4. A ground engaging blade according to Claim 3, wherein the lower edge is provided as a discontinuous lower edge comprising a plurality of lower edge portions separated by a corresponding plurality of notches, each notch being provided between adjacent lower edge portions.

5. A ground engaging blade according to Claim 2 or Claim 4, wherein said lower edge recess is provided as a set of regularly spaced lower face recesses each extending along each lower edge portion.

6. A ground engaging blade according to Claim 5, wherein at least one of the lower edge portions at the end or ends of the blade one end is of a greater width than the other lower edge portions.

7. A ground engaging blade according to Claim 5 or Claim 6, wherein the rear face recess or recesses are provided as a continuous recess or recesses from one end of the blade to the other above the notches.

8. A ground engaging blade according to Claim 5 or Claim 6, wherein said notches extend above the spacing of said rear face

recess or recesses from said lower edge or edge face, and said rear face recess or recesses extends as a substantially discontinuous recess or recesses from one end of the blade to the other between the notches.

9. A ground engaging blade according to Claim 5 or Claim 6, wherein the rear face recess or recesses are provided as a set of rear face recesses below the notches, each member of said set extending substantially fully along the rear face of each respective lower edge portion.

10. A ground engaging blade according to Claim 1, wherein the recesses are in the form of a groove running along at least some of the lower edge face or edge portions and/or the rear face.

11. A ground engaging blade according to Claim 3, wherein the recesses are in the form of a groove running along at least some of the lower edge or edge portions and/or the rear face.

12. A ground engaging blade according to Claim 1 or Claim 3, wherein the layer of hardfacing is formed from a plurality of weld beads laid up beside one another in edge-to-edge abutting relationship

13. A ground engaging blade according to Claim 11 wherein each bead of weld is applied in a longitudinal direction from one end of the blade to the other.

14. A grader moldboard including a ground engaging blade according to Claim 1 operatively attachable to a moldboard stub.

15. A grader moldboard including a ground engaging blade according to Claim 3 operatively attachable to a moldboard stub.

16. A ground engaging blade substantially as hereinbefore described with reference to Fig. 1 and Fig. 2.

17. A ground engaging blade substantially as hereinbefore described with reference to Fig. 3 and Fig. 4.

18. A ground engaging blade substantially as hereinbefore described with reference to Figs. 3 and 5.

Dated this 14th day of August, 2003

THE TRACK SHOP PTY LTD

by their Attorneys

AHEARN FOX

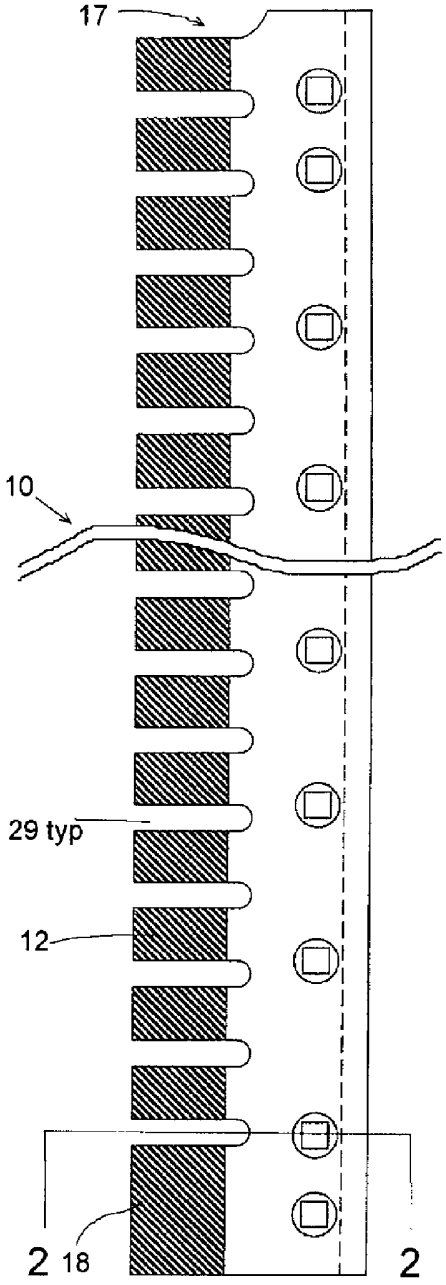

Fig. 1

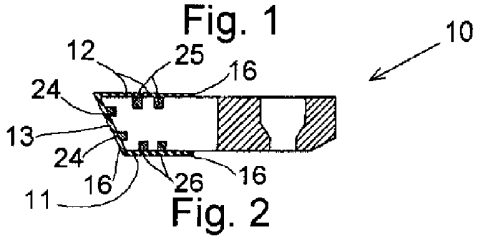

Fig. 2

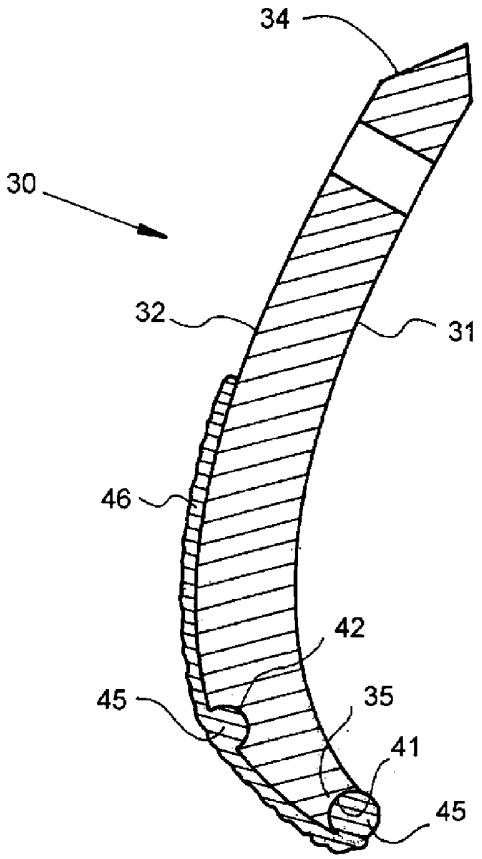

Fig. 3

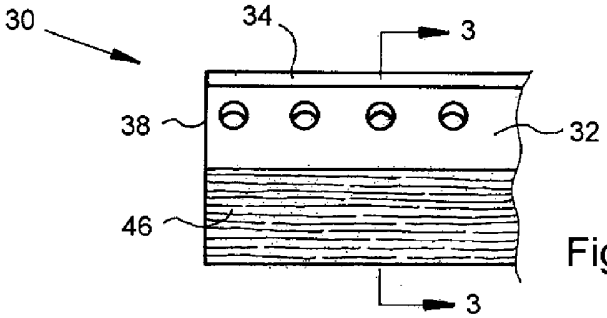

Fig. 4

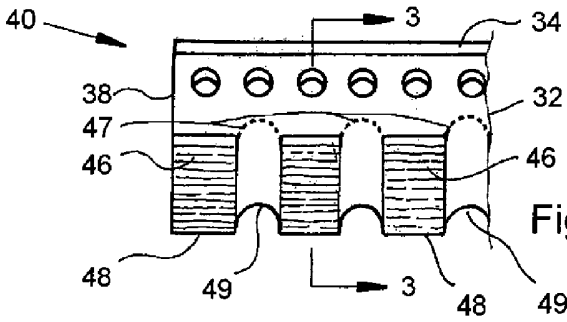

Fig. 5