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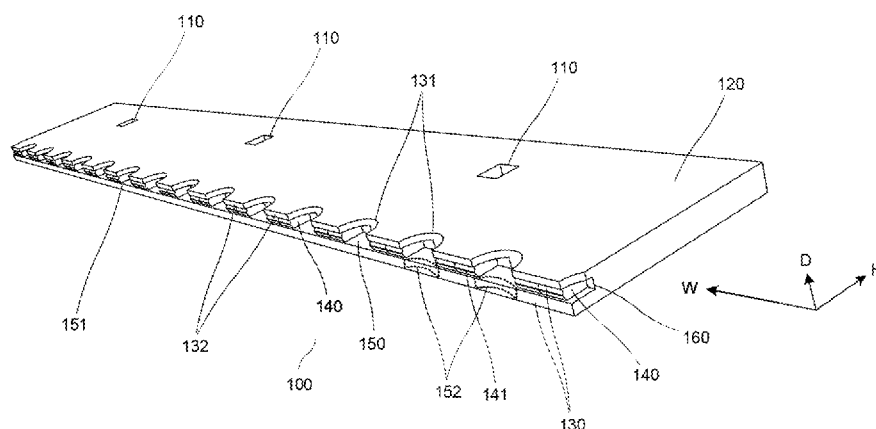
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(54) Title: PLOW STEEL FOR A SNOW PLOW, AND METHODS FOR MANUFACTURING AND USING SUCH A PLOW STEEL

Fig. 2



(57) **Abstract:** Plow steel (100) for a snow plow, comprising: a fastening means (110) for fastening the plow steel (100) to a snow plow; a main steel support plate (120), with a main plane extending across a width (W) and a height (H) dimension; and a surface contacting edge (130), running in the width (W) dimension along said steel support plate (120), which surface contacting edge (130) comprises a set of indentations (131) formed in the height (H) dimension in the metal support plate (120), hence forming a set of surface contacting teeth (132) along the surface contacting edge (130) and arranged between said indentations (131) along the width (W) dimension. The invention is characterised in that each of said teeth (132) comprises an insert (140) made of a wear-resistant material with better abrasive resistance than the steel material of said steel support plate (120), which inserts (140) do not cover said indentations (131) in a depth (D) dimension perpendicular to said main plane, and in that the steel support plate (120) comprises an elongated steel flange (150) covering said indentations (131) in the depth (D) dimension. The invention also relates to a manufacturing method and a use method.

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Plow steel for a snow plow, and methods for manufacturing and using such a plow steel

The present invention relates to a plow steel for a snow plow. In particular, the present invention relates to a detachable and replaceable plow steel of the said type comprising a wear part. The present invention also relates to a method for manufacturing such a plow steel, and to the use of such a plow steel.

Motor-driven snow plows are conventionally used for clearing paved streets and other hard surfaces from snow and ice. By scraping a plow blade across the surface, snow and ice is removed from the surface and can be pushed to the side of a road; collected for evacuation; or handled in any other desired way.

A plow blade is used as the point of contact with the hard surface across which it is scraped and is therefore subjected to extensive wear during use. The hard surface may be made from asphalt, concrete, gravel and so forth, and may have sand or other granular abrasive and/or friction-increasing material already on it at the time of snow plowing.

Many times, a layer of ice and/or compacted snow is present on the hard surface, which the plow blade needs to be able to penetrate and remove. Often, it is desired to plow a surface, such as a road, at relatively high velocities, while still being able to remove snow and ice sufficiently so as not having to pass several times.

To sum up, in order to perform adequately, the plow blade needs to be able to withstand heavy wear for prolonged periods of time. Plow blades need replacement after certain use, which is not only expensive in terms of replacement blades, but also poses logistic and planning challenges.

In order to handle uneven surfaces, it has been proposed to construct plow blades with rubber wear surfaces, offering a certain flexibility in the contact with the hard surface. The present invention, in contrast thereto, relates to plow blades featuring at least partly a

metal wear surface. Such plow blades are herein denoted "plow steels". Such a plow steel may also be used as a detachable and replaceable wear part on a larger plow blade.

For such plow steels, it is known to use a toothed metal contact surface, arranged to contact the hard surface. The teeth maximize the contact pressure while snow plowing.

It is also known to use tungsten carbide inserts in a plow steel to increase its abrasive resistance and prolong its useful life. For instance, SE9804018-1 discloses the use of soldered-in cemented carbide inserts in a steel blade.

In SE0500764-5, a plow blade is disclosed featuring a corrugated surface.

There are a number of problems with conventional steel blades, in addition to the ones pointed out above.

Firstly, it is desirable to scrape off as much snow and ice as possible, not leaving substantial amounts of snow or ice on the road as snowbanks or snowdrifts. For instance, snow or ice may be left behind if the plow blade has substantial space between hard surface contacting points.

Secondly, it is desired to leave a certain amount of friction-increasing sand, or other granular mineral material, which may be already present on the surface or be applied during snow plowing, on the hard surface even after the plow steel has passed a particular part of the snow plowed surface.

This should be achieved in an uncomplicated and easily reproducible way, with a plow steel with good durability and which is not more expensive than necessary.

The present invention solves the above described problems.

Hence, the invention relates to a plow steel for a snow plow, comprising: a fastening means for fastening the plow steel to a snow plow; a main steel support plate, with a main plane extending across a width and a height dimension; and a surface contacting edge, running in the width dimension along said steel support plate, which surface contacting edge comprises a set of indentations formed in the height dimension in the metal support plate, hence forming a set of surface contacting teeth along the surface contacting edge and arranged between said indentations along the width dimension, which plow steel is characterised in that each of said teeth comprises an insert made of a wear-resistant material with better abrasive resistance than the steel material of said steel support plate, which inserts do not cover said indentations in a depth dimension perpendicular to said main plane, and in that the steel support plate comprises an elongated steel flange covering said indentations in the depth dimension.

Moreover, the invention relates to a method for manufacturing a plow steel of the said type, which manufacturing method is characterised in that it comprises the following steps: a) providing a main steel support plate, with a main plane extending across a width and a height dimension, and comprising a surface contacting edge running in the width dimension along said steel support plate, which surface contacting edge comprises a set of indentations formed in the height dimension in the metal support plate hence forming a set of surface contacting teeth between said indentations along the width dimension, as well as an elongated steel flange covering said indentations in the depth dimension; b) providing a set of inserts made of a wear-resistant material with better abrasive resistance than the steel material of said steel support plate; and c) permanently fastening a respective of said inserts at each of said teeth, in a way so that the fastened inserts do not cover said indentations in the depth dimension.

Furthermore, the invention relates to a method for using a plow steel of the said type, for snow plowing a hard surface, which use method is characterised in that it comprises the following steps: a) mounting a plow steel of said type to a motorized snow plow, using fastening means of said plow steel; b) snow plowing said hard surface until the steel material of the steel flange has worn down partly into said indentations from the surface contacting

edge in the height dimension; c) continuing to snow plow said hard surface, allowing the inserts to wear down; d) replacing the plow steel for a new plow steel of the said type; and e) reiterating from step b.

5 In the following, the invention will be described in detail, with reference to exemplifying embodiments of the invention and to the enclosed drawings, wherein:

Figure 1 is a perspective view of a prior art plow steel;

Figure 2 is a perspective view of a plow steel according to the present invention;

10 Figure 3 is a cross-sectional perspective view of the plow steel illustrated in Figure 1;

Figure 4 is a first plan view of a plow steel according to the present invention;

Figure 5 is a second plan view of the plow steel shown in Figure 4;

Figure 6 is a detail view of Figure 5, according to marking "B" in Figure 5;

15 Figure 7 is a flow chart illustrating a method according to the present invention for manufacturing a plow steel; and

Figure 8 is a flow chart illustrating a method according to the invention for using a plow steel.

The Figures share the same reference numerals for the same or corresponding parts.

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Figure 1 illustrates a prior art plow steel 1, comprising three fastening means 10 for fastening the plow steel 1 to a snow plow (not shown). The plow steel 1 also comprises a main steel support plate 20, extending in a main plane across a width W and a height H dimension. A depth dimension D extends perpendicularly to said support plane 20. The support
25 plane 20 in essence is constructed as a relatively thick piece of sheet steel metal.

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The plow steel 1 further comprises a surface contacting edge 30, in fact forming a lower edge of the support plate 20 in an orientation of the plow steel 1 used during snow plowing operation. Thus, the surface contacting edge 30 is arranged to contact a ground surface
30 during such snow plowing use.

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As illustrated in Figure 1, the surface contacting edge 30 is split up into two elongated edges or flanges, having an elongated recess 60 therebetween. In and along the recess 60, an insert 40 made from cemented carbide is arranged.

5 During use, the insert 40 will prevent the plow steel 1 from being worn down too quickly.

In contrast to the plow steel illustrated in Figure 1, Figures 2-6 illustrate a plow steel 100 according to the present invention. As is the case for the plow steel 1, the inventive plow steel 100 also comprises a fastening means 110 for fastening the plow steel 100 to a snow
10 plow (not shown). The fastening means 110 may be in the form of a series of through holes, as is illustrated in the Figures, but may also have other suitable geometric configurations.

Similarly, to the plow steel 1 illustrated in Figure 1, the plow steel 100 comprises a main steel support plate 120, with a main plane extending across a width W and a height H di-
15 mension. A depth D dimension extends perpendicularly to the said main plane.

Furthermore, the plow steel 100 comprises a surface contacting edge 130, running in the width W dimension along said steel support plate 120. The surface contacting edge 130 comprises a set of indentations 131, formed in the height H dimension in the metal support
20 plate 120, hence forming a set of surface contacting teeth 132 along the surface contacting edge 130 and arranged between said indentations 131 along the width W dimension of the support plate 120.

Hence, the surface contacting edge 130 is an at least partly toothed edge, such that the
25 teeth 132 contact the surface during snow plowing operation of the plow steel 100.

According to the present invention, each of said teeth 132 comprises an insert 140, preferably individual inserts 140 as will be described below, made of a wear-resistant material with better abrasive resistance than the steel material of said steel support plate 120. As is
30 illustrated in Figure 1, these inserts 140 do not cover said indentations 131 in the depth D dimension.

Further according to the invention, the steel support plate 120 comprises an elongated steel flange 150 covering said indentations 132 in the depth D dimension.

5 As is realized, the plow steel is used, for snow plowing, with the surface contacting edge 130 facing downwards and the main plane perpendicularly or substantially perpendicularly oriented. In this use snow plowing operation orientation, when the plow steel 100 is attached to a snow plow in the form of a tractor, a truck, a car or similar, the plow steel 100 scrapes along the plowed surface, bringing with it snow, ice, granular material and so forth.

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Such a plow steel 100 offers excellent ground surface contact during such use, due to the toothed surface contacting edge. It also provides good abrasive wear resistance, due to the inserts 140, and as a result a long useful life.

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Finally, the relatively soft material of the flange 150 between the inserts 140 will wear down considerably faster than the inserts 140, leaving a worn-down, indented part 152 (illustrated for two pairs of inserts 140 in phantom lines in Figure 2) of the flange 150 between each pair of inserts 140. The such formed indented part 152 hence forms a secondary toothed pattern extending across the surface contacting edge 130, further improving surface contact and providing improved snow plowing action.

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Namely, since the indentations 152 hence formed automatically align with the indentations 131, the surface contact edge 130 as a whole is provided with a toothed overall shape during use. This wear-down of the flange 150 forming the indentations 152 can be achieved relatively quickly, such as after only a few tens of kilometres of snow plowing action on a normal tarmac road, for instance.

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It has also turned out that, for surfaces comprising both snow or ice material and granular mineral material, such as sand, mixed in the snow or ice on the surface, the toothed overall shape mentioned above will be sufficiently varying (in the height H dimension) so as to allow certain granular material to stay on the surface even after plowing. At the same time, the

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wear of the metal material will in general not be too large so as to create large formations of granular material on the plowed surface. Rather, such granular material will in general be present in the valleys produced by the teeth 132 (with the inserts 140), from where it is not easily dispersed by the wind created by vehicles travelling along the surface.

5

Figure 3 illustrates the plow steel 100 in a cross-sectional view, in which part of the plow steel 100 arranged on one side of a certain cross-sectional plane, extending in the width W and height H directions, has been removed. Figure 3 illustrates this cross-sectional plane. As is illustrated in Figure 3, and according to a preferred embodiment of the present inven-
10 tion, the individual inserts 140 are separated from each other at each indentation 131, along the width W dimension.

Regarding the steel flange 150, it is preferred that this covers not only the indentations 131 (as described above), but also that it covers the teeth 132, as seen in the depth D dimension.
15 This is preferably true for at least most, preferably substantially all, most preferably all of said teeth 132.

Furthermore, it is preferred that the steel flange 150 comprises an elongated edge 151 running along the said contacting edge 130, such as in parallel to the contacting edge 130 along
20 the whole length, or at least substantially the whole length, of the contacting edge 130. Preferably, the edge 151 forms part of the surface contacting edge 130.

As is illustrated in Figures 2-6, at least half of the individual ones of said inserts 140, preferably substantially all of said individual inserts 140, preferably all of the individual inserts
25 140, are arranged, in the dept D dimension, between the tooth 132 corresponding to (arranged adjacent to in the depth D dimension) the insert 140 in question and the steel flange 150. Preferably, in each case the insert 140 in question has a shape, in the main plane, which roughly corresponds to the shape of the corresponding tooth 132. Preferably, in the main plane, the insert 140 in question may cover at least 75% of the surface covered by the tooth
30 132 in question. In some embodiments, the insert 140 does not extend outside of the corresponding tooth 132 in the main plane.

According to one exemplifying embodiment, all of said inserts 140, or at least substantially all of said inserts 140, are soldered to the metal support plate 120.

5 As is illustrated in Figures 2-6, the support plate 120, the teeth 132 and the steel flange 150 may together form one single, connected body of steel. Suitable steel materials include S355J2+N and hardened steels.

In particular, the said body of steel may comprise the elongated recess 160 extending from
10 the surface contacting edge 130 and inwards, in the height H dimension, which elongated recession 160 accommodates the inserts 140. As is illustrated in Figures 2-6, each insert 140 arranged in the recess 160 may, this way, be enclosed on either side by the flange 150 and the tooth 132, respectively.

15 In particular, the elongated recess 160 may have a thickness, in the depth D dimension, which is substantially equal along the surface contacting edge 130.

The wear-resistant material of the inserts 140 may be tungsten carbide. It may also be other materials that are considerably harder than the steel type used in the steel plate 120, such
20 as chrome carbide. Preferably, the abrasive resistance of the material of the inserts 140 is at least 3, preferably at least 5 times larger, as measured in HBW, than that of the metal steel plate 120 material.

Regarding the inserts 140 in general, at least some of the inserts 140, preferably substan-
25 tially all inserts 140, more preferably all of the inserts 140, may comprise a cutting edge 141 facing, along the height H dimension, in the same direction as the surface contacting edge 130, preferably forming part of the surface contacting edge 130.

As is further illustrated in Figures 2-6, the teeth 132, the steel flange 150 and the inserts
30 140 may all extend substantially equally far in the height H dimension towards the surface contacting edge 130, and hence together forming the surface contacting edge 130. In other

words, during snow plowing use, the teeth 132, the steel flange 150 and the inserts 140 in this case all constitute part of the surface contacting edge 130 and contact the surface directly during snow plowing use.

5 Preferably, most, preferably substantially all, more preferably all, of said indentations 131 are at least 2 cm wide, preferably at least 3 cm wide, in the width W dimension. Correspondingly, most, preferably substantially all, preferably all, of said indentations 131 may be at the most 10 cm wide, preferably at the most 5 cm wide, in the width W dimension.

10 Preferably, most, preferably substantially all, more preferably all, of said indentations 131 are at least 1 cm high in the height H dimension, as measured from the surface contacting edge 130. Correspondingly, most, preferably substantially all, preferably all, of said indentations 131 may be at the most 3 cm high, preferably at the most 2 cm high, in the height H dimension, as measured from the surface contacting edge 130.

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The corresponding measurements apply to the inserts 140, even if it is realized that the size in the main plane of the inserts 140 is not directly related to the size of the adjacently arranged indentations 131. Hence, each individual tooth 132 and each individual insert 140 may preferably be between 2 and 10 cm wide in the width W dimension and between 1 and
20 3 cm in the height H dimension. The elongated recess 160 may have the same height H dimension extension as the inserts 140, so that the inserts 140 are arranged to abut the bottom of the recess 160 in the height H dimension.

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The metal plate 120 is preferably between 0,5 and 10 cm thick, preferably between 0.8 and
5 cm thick in the depth D dimension. The inserts 140 are each preferably between 25-60% of the total metal plate 120 thickness in the depth D dimension. Preferably, the whole plow steel 100 may form a plate structure which has a substantially or completely uniform thickness (in the depth D dimension) across its entire main plane extension.

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The plow steel 100 is preferably at least 50 cm wide in the width W dimension, preferably at least 60 cm wide. It is furthermore preferably at the most 200 cm wide, preferably at the

most 180 cm wide. It is furthermore preferably at least 10 cm high in the height H dimension and is preferably at the most 50 cm high. It is preferably of substantially planar constitution.

Figure 7 illustrates a method according to the invention, for manufacturing a plow steel 100 of the type described above and herein.

In a first step, the method starts.

In a subsequent step, a main steel support plate 120 is provided of the type described above, with said main plane extending across the width W and height H dimensions and comprising the said surface contacting edge 130 running in the width W dimension along the steel support plate 120 in question. As described above, the surface contacting edge 130 comprises a set of indentations 131 formed in the height H dimension in the metal support plate 120, hence forming said set of surface contacting teeth 132 between said indentations 131 along the width W dimension, as well as an elongated steel flange 150 covering the indentations 131 in the depth D dimension.

The steel support plate 120 can in turn be manufactured using a more detailed manufacturing protocol, comprising machining steps providing said recess 160 and so forth.

In a subsequent step, a set of inserts 140 are provided, made of a wear-resistant material of the above described type, having better abrasive resistance than the steel material of said steel support plate 120.

In a subsequent step, a respective one of said inserts 140 is permanently fastened to each of said teeth 132, respectively, in a way so that the fastened inserts 140 do not cover said indentations 131 in the depth D dimension. For instance, the inserts 140 may be soldered to the steel material as described above.

Then, the method ends.

Figure 8 illustrates a method according to the present invention for using a plow steel 100 of the type described above and herein, for snow plowing a hard surface. The hard surface may preferably be a paved surface, such as a tarmac surface. It may alternatively be a concrete or gravel surface. Preferably, the surface is a road surface, an airport surface or a parking surface. Herein, the term “snow plowing” is intended to cover the mechanical removal of snow, ice and any unwanted granular material from such a surface, using a scraping action using the said plow steel 100 mounted on a motorized snow plow.

In a first step, the method starts.

In a subsequent step, a plow steel 100 of said type is mounted to a motorized snow plow, using the fastening means 110 of the plow steel 100.

In a subsequent step, the said hard surface is snow plowed until the steel material of the elongated edge 151 of the steel flange 150 has worn (inwards) down partly into said indentations 131 from the surface contacting edge 130 in the height H dimension. Preferably, this step lasts until the elongated edge 151 has worn down at least 0.5 cm from the surface contacting edge 130 and may be performed at a different intensity or velocity than the subsequent snow plowing step. In most cases, from a few kilometres up to a few tens of kilometres is enough to achieve such wear of the elongated edge 151.

After this step, which may be seen as a first snow plowing phase using the plow steel 100, the whole surface contacting edge 130 displays a toothed or wave-shaped contour, as has been described above.

In a subsequent step, which may be seen as a second snow plowing phase using the plow steel 100, snow plowing of the said hard surface is continued, allowing the inserts 140 to wear down to such an extent so that snow plowing becomes so inefficient so that replacement of the plow steel 100 is called for. During this step, as the inserts 140 wear down inwards in the height H dimension, it is realized that the now generally wave-shaped elongated edge 151 also continues to wear inwards, maintaining the wave-shaped overall

contour of the surface contacting edge 130 throughout the whole useful life of the plow steel 100. During this second phase, a wave pattern is typically produced in the snow or ice material present on the plowed surface and yielding the above discussed result with any intermixed granular material present in the valleys created.

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In a subsequent step, the plow steel 100 is replaced for a new plow steel 100 of the same type. Hence, the used plow steel 100 is demounted from the snow plow, and the replacement plow steel 100 is mounted to the snow plow.

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In a subsequent step, the method reiterates from the step in which the elongated edge 151 was initially worn down to create said wave-shaped contour of the surface contacting edge 130.

In a subsequent step, the method ends.

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The present invention, in addition to the advantages described above, offers a plow steel 100 which combines the durability resulting from the use of the high abrasive resistance material (of the inserts 140) along the surface contacting edge 130, without requiring a very thick steel material. This provides a durable yet affordable plow steel.

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In the above described first phase, before the steel flange 150 has been worn down to form said waved contour shape, the plow steel 100 will still allow efficient plowing of snowy roads, in particular of roads with plenty of packed snow but without any larger amounts of abrasive sand intermixed with the packed snow. Hence, for such roads the plow steel 100 can be used efficiently even before the plow steel 100 has been used on more abrasive surfaces so that the steel flange 150 forms said waved contour shape. It is even the case that this abrasive wear of the steel flange 150 does not occur at all, or only occurs to a limited extent, in the absence of abrasive granular material on the plowed surface. Hence, the plow steel 100 may be used for efficient snow plowing during extended time periods in the first phase on such surfaces. This is particularly the case under conditions with large amounts of snow, and in particular freshly fallen snow. The same snow plow 100 may then

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be converted for second phase operation by simply starting using under more abrasive conditions, allowing the steel flange 150 to wear down as described above.

This further adds to the flexibility of use of the present plow steel 100.

5 It is furthermore so that the first phase operation provides specifically efficient snow plowing under non-abrasive conditions; while the second phase operation provides specifically efficient snow plowing under more abrasive conditions. The latter is particularly true for sanded roads with ice buildup, for removing such ice while not removing all sand but instead giving rise to a wave pattern in the ice that actually achieves sand retaining.

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Hence, the present invention offers a plow steel 100 which can be used under diverse operating conditions, while still offering long useful life to a reasonable cost.

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Above, preferred embodiments have been described. However, it is apparent to the skilled person that many modifications can be made to the disclosed embodiments without departing from the basic idea of the invention.

For instance, it is realized that the plow steel 100 and the methods described above may have additional features, as long as the principles described herein are observed.

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In particular, the teeth 132 and the inserts 140 may be differently shaped than what is illustrated in the Figures, and the metal steel plate 120 may have additional features and shapes.

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In general, all which has been said regarding the plow steel 100 is equally applicable to the manufacturing method. The corresponding is true also between the plow steel 10 the use method; as well as between the manufacturing method and the use method.

Hence, the invention is not limited to the described embodiments, but can be varied within the scope of the enclosed claims.

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C L A I M S

1. Plow steel (100) for a snow plow, comprising:

a fastening means (110) for fastening the plow steel (100) to a snow plow;

5 a main steel support plate (120), with a main plane extending across a width (W) and a height (H) dimension; and

a surface contacting edge (130), running in the width (W) dimension along said steel support plate (120), which surface contacting edge (130) comprises a set of indentations (131) formed in the height (H) dimension in the metal support plate (120), hence forming a set of surface contacting teeth (132) along the surface contacting edge (130) and arranged between said indentations (131) along the width (W) dimension,

c h a r a c t e r i s e d i n that each of said teeth (132) comprises an insert (140) made of a wear-resistant material with better abrasive resistance than the steel material of said steel support plate (120), which inserts (140) do not cover said indentations (131) in a depth (D) dimension perpendicular to said main plane, and

15 in that the steel support plate (120) comprises an elongated steel flange (150) covering said indentations (131) in the depth (D) dimension.

2. Plow steel (100) according to claim 1, **c h a r a c t e r i s e d i n** that, in a cross-sectional plane in said width (W) and height (H) directions and taken through said indentations (131), the individual inserts (140) are separated from each other at each indentation (131).

3. Plow steel (100) according to claim 1 or 2, **c h a r a c t e r i s e d i n** that the steel flange (150) covers also said teeth (132) in the depth (D) dimension.

4. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r i s e d i n** that the steel flange (150) comprises an elongated edge (151) running along the said contacting edge (130).

5. Plow steel (100) according to claim 4, **c h a r a c t e r i s e d i n** that each individual one of said inserts (140) is arranged, in the depth (D) dimension, between the corresponding tooth (132) in question and the said steel flange (150).

5 6. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that each of said inserts (140) is soldered to the metal support plate (120).

7. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that the support plate (120), the teeth (132) and the steel flange (150) together form one single, connected body of steel.

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8. Plow steel (100) according to claim 7, **c h a r a c t e r i s e d i n** that the said body of steel comprises an elongated recess (160) extending from the surface contacting edge (130) and inwards, in the height (H) dimension, which elongated recess (160) accommodates said inserts (140).

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9. Plow steel (100) according to claim 8, **c h a r a c t e r i s e d i n** that the elongated recess (160) has a thickness, in the depth (D) dimension, which is substantially equal along the surface contacting edge (130).

20 10. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that the wear-resistant material is tungsten carbide.

11. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that each insert (140) comprises a cutting edge (141) facing in the same direction, in the height (H) dimension, as the surface contacting edge (130).

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12. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that the teeth (132), the steel flange (150) and the inserts (140) all extend substantially equally far in the height (H) dimension towards, and together form, the surface contacting edge (130).

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13. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that each of said indentations (131) is at least 2 cm wide in the width (W) dimension.

5 14. Plow steel (100) according to any one of the preceding claims, **c h a r a c t e r - i s e d i n** that each of said indentations (131) is at least 1 cm high in the height (H) dimension.

15. Method for manufacturing a plow steel (100) according to any one of the preceding
10 claims, **c h a r a c t e r i s e d i n** that the method comprises the following steps:

- a) providing a main steel support plate (120), with a main plane extending across a width (W) and a height (H) dimension, and comprising a surface contacting edge (130) running in the width (W) dimension along said steel support plate (120), which surface contacting edge (130) comprises a set of indentations (131) formed in the height (H)
15 dimension in the metal support plate (120) hence forming a set of surface contacting teeth (132) between said indentations (131) along the width (W) dimension, as well as an elongated steel flange (150) covering said indentations (131) in the depth (D) dimension;
- b) providing a set of inserts (140) made of a wear-resistant material with better abrasive
20 resistance than the steel material of said steel support plate (120); and
- c) permanently fastening a respective of said inserts (140) at each of said teeth (132), in a way so that the fastened inserts (140) do not cover said indentations (131) in the depth (D) dimension.

25 16. Method for using a plow steel (100) according to any one of claims 1-14 for snow plowing a hard surface, **c h a r a c t e r i s e d i n** that the method comprises the following steps:

- a) mounting a plow steel (100) of said type to a motorized snow plow, using fastening means (110) of said plow steel (100);
- 30 b) snow plowing said hard surface until the steel material of the steel flange (150) has worn down partly into said indentations (131) from the surface contacting edge (130) in the height (H) dimension;

- c) continuing to snow plow said hard surface, allowing the inserts (140) to wear down;
- d) replacing the plow steel (100) for a new plow steel (100) of the said type; and
- e) reiterating from step b.

Fig. 1

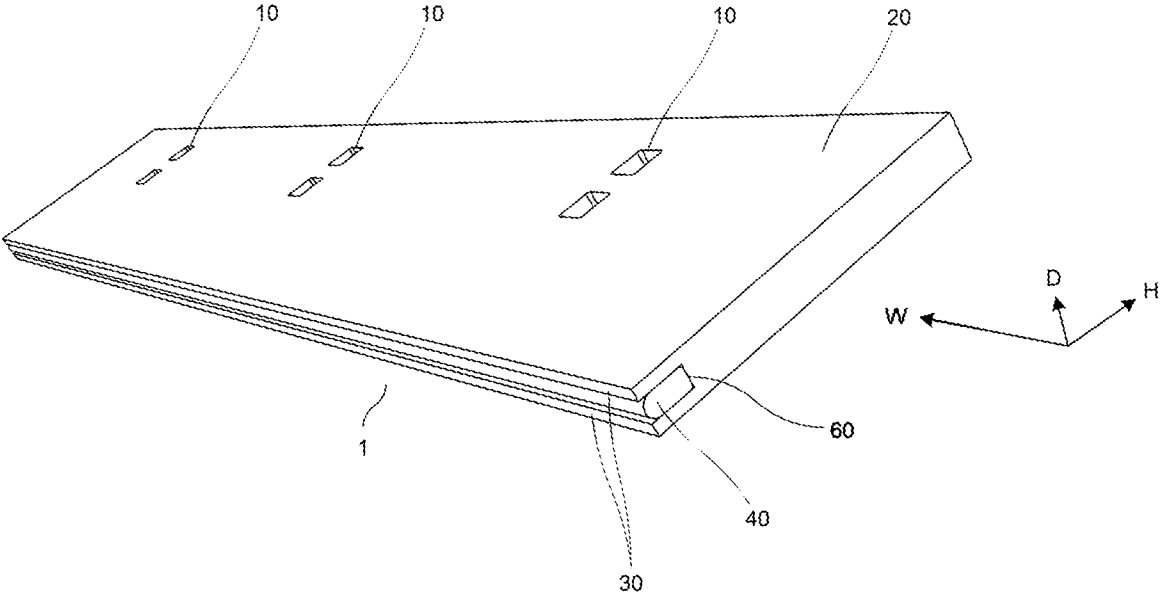


Fig. 2

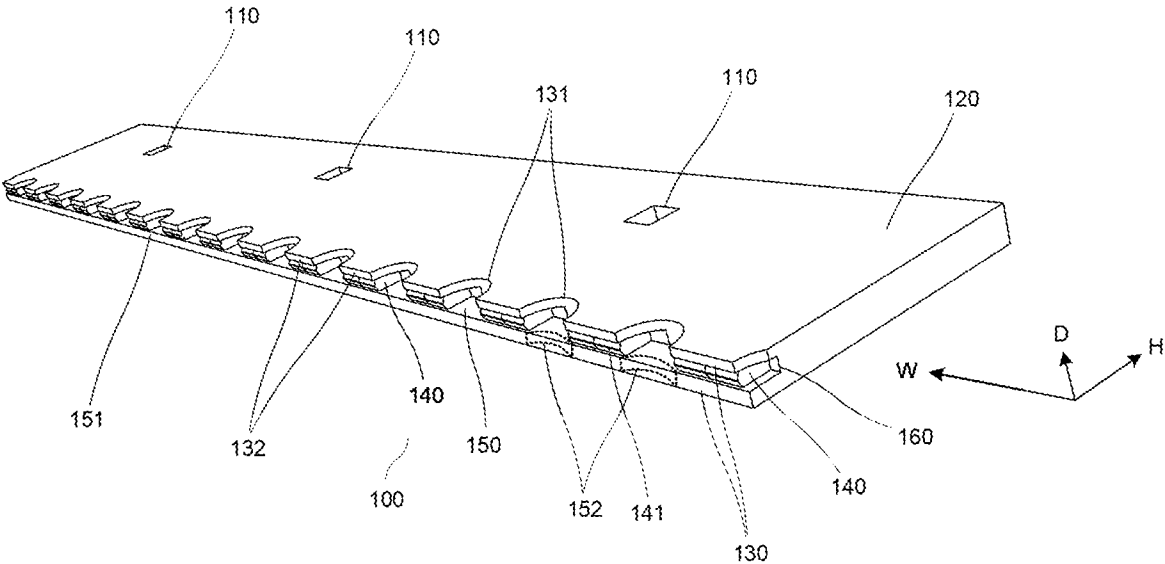


Fig. 3

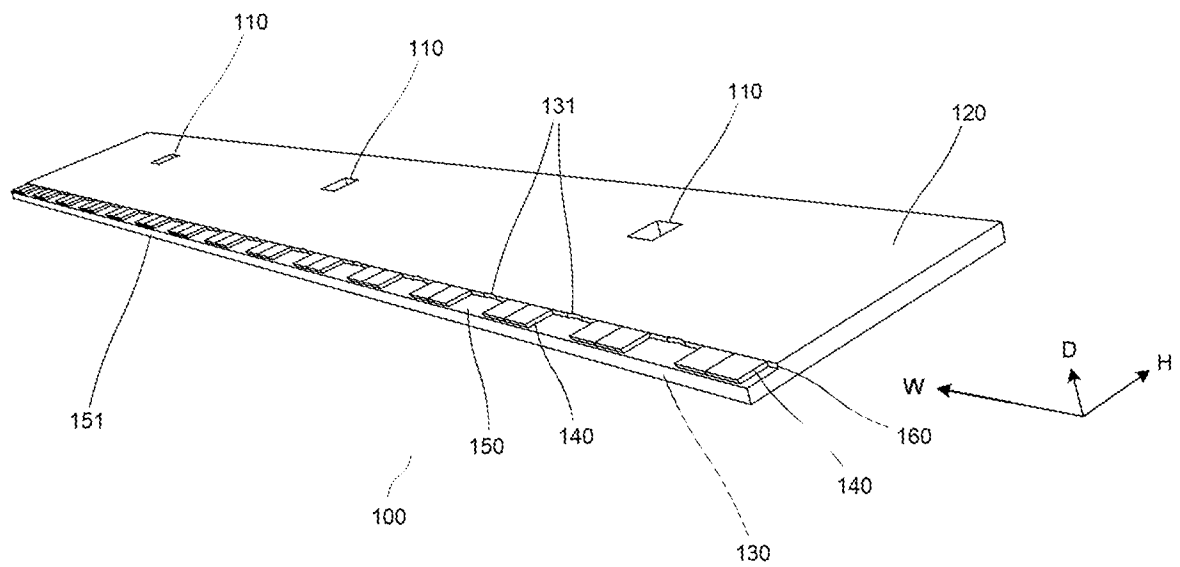


Fig. 4

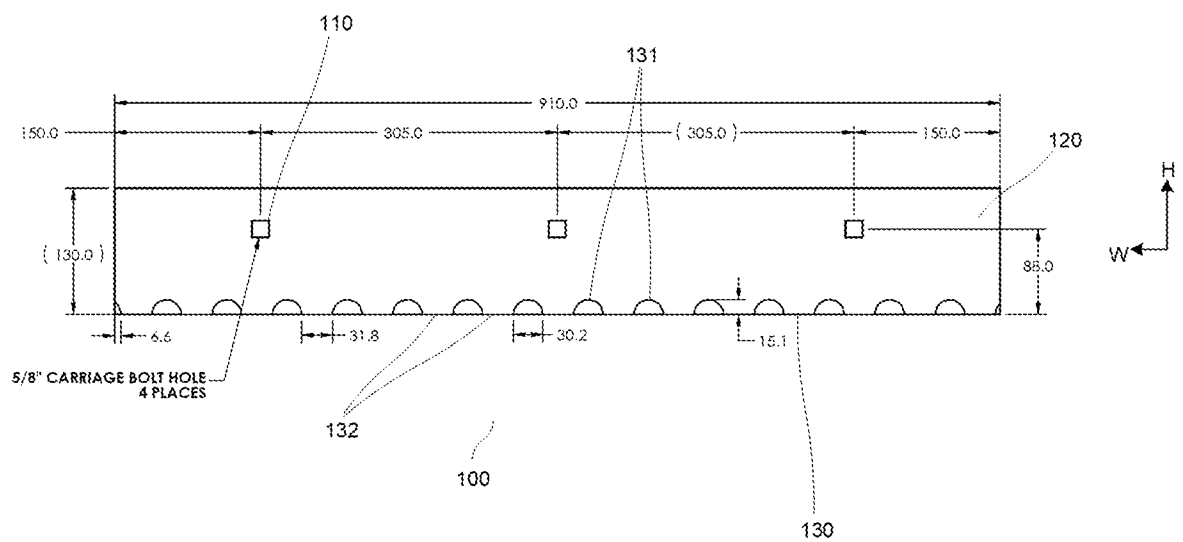


Fig. 5

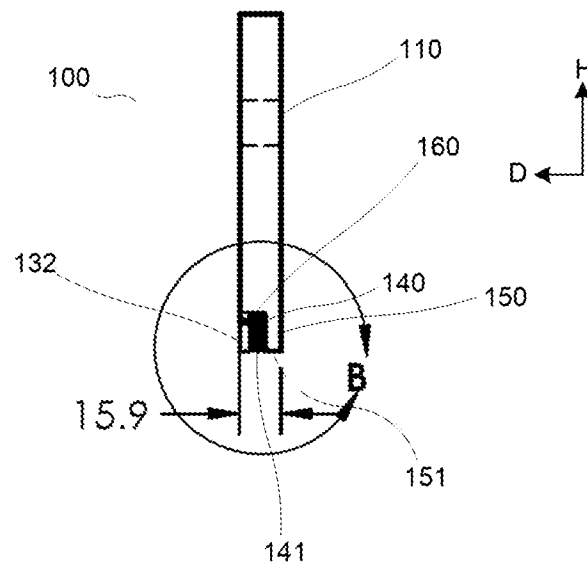


Fig. 6

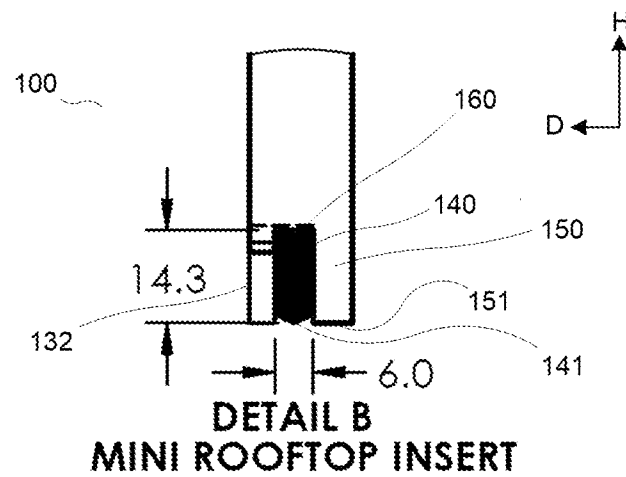
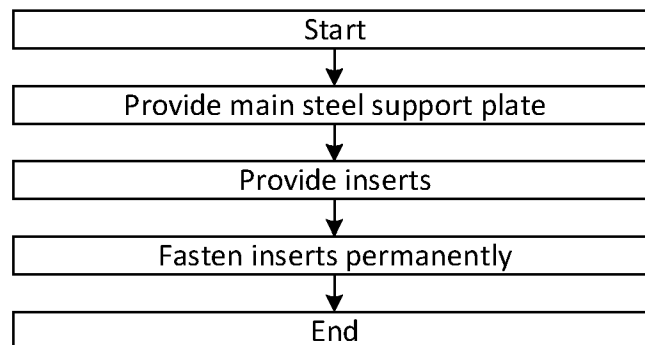
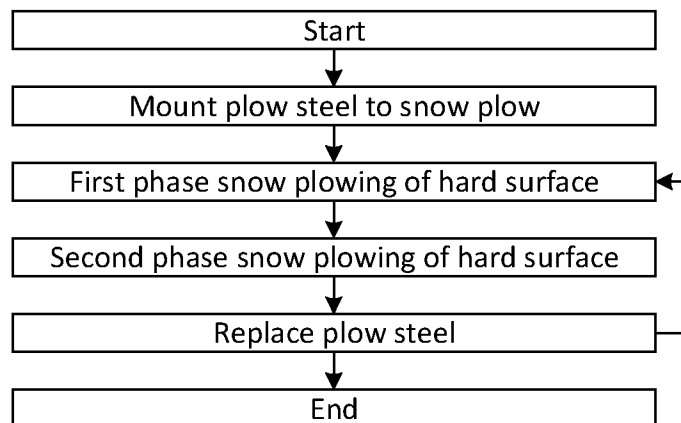


Fig. 7**Fig. 8**

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/SE2019/050349

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: E01H, E02F

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)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	SE 366793 B (UDDEHOLMS AB), 6 May 1974 (1974-05-06); page 1, line 1 - line 5; page 3, line 12 - line 23; figure 4 --	1-16
A	US 4584020 A (WALDENSTROEM MATS G), 22 April 1986 (1986-04-22); abstract; column 2, line 30 - line 64; figure 1 --	1-16
A	CA 2110949 A1 (BAIER DALE), 9 June 1995 (1995-06-09); page 9, line 13 - line 21; figures 2, 6, 7 --	1-16
A	US 20180100279 A1 (AQUINO MATTHEW J), 12 April 2018 (2018-04-12); abstract; paragraphs [0033]-[0036] --	1-16

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published 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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

 Date of the actual completion of the international search
 17-05-2019

 Date of mailing of the international search report
 20-05-2019

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/050349

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	US 20170191236 A1 (WINTER KENT), 6 July 2017 (2017-07-06); abstract; paragraphs [0027], [0033]; figures 1-4 -- -----	1-16

Continuation of: second sheet
International Patent Classification (IPC)
E01H 5/06 (2006.01)

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