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(54) **Wearing element for a plow blade**

(57) A replaceable wearing element for a plow blade, said wearing element (1) comprising a mounting plate (2) for attachment to the blade, and a front plate (3) for

removing snow, debris and the like from a ground (G) or road surface. The plates (2, 3) are resiliently spaced from each other by means of an elastomeric element (4) bonded to the plates (2, 3).

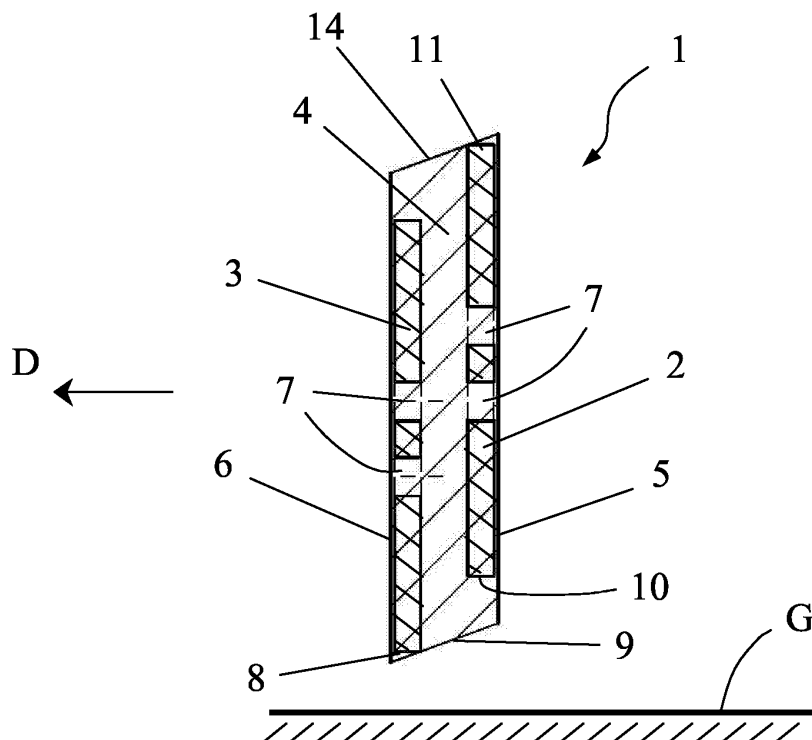


Fig 3

EP 1 783 280 A1

Description

Technical Field

[0001] The present invention relates to a replaceable wearing element for a plow blade.

Background Art

[0002] Plow blades, or road scrapers, make during use contact with a roadway or ground surface, which results in considerable wear on the plow blade. As a consequence it is necessary to protect the blade, or the mold-board, and this is done by mounting a replaceable wear cutting edge on the lower part of the plow. Hence it is the wear edge, or wearing element, that makes contact with the ground surface during operation, and when the wear cutting edge is worn out, it is readily replaced with a new one.

[0003] DE-A-4404969 discloses a wear cutting edge having two joining steel plates. At a lower part of the edge the plates are separated by means of a rubber material bonded to the plates. The plates provide protection against cutting-damage to the rubber material, while the rubber material is highly wear-resistant offering longer operational time compared to a pure steel cutting edge.

[0004] US-A-5,746,017 discloses a plowshare having individual metallic shares embedded in an elastomeric mass to allow adjustments to irregularities in an underlying road strip.

[0005] Common problems related to these wear cutting edges and plowshares are low wear resistance and high noise and vibration levels during operation. Moreover, roadways and road markings on the roadway are damaged and worn by the wear cutting edges.

[0006] Further background art is reflected by US-A-4,437,677, US-A-5,471,770 and WO-A-00/31346.

Summary of the Invention

[0007] It is an object of the present invention to provide an improvement of the above techniques and prior art.

[0008] A particular object is to provide a wearing element having high wear resistance and longer operational life and being simple in structure and offering low production costs.

[0009] Another object is to provide a wearing element that causes less noise to the surroundings during use, as well as less vibrations and noise in the vehicle carrying the plow blade fitted with wearing elements.

[0010] Yet another object is to provide a wearing element causing less damage to the roadway, including road markings on the roadway.

[0011] Another object is to provide a wearing element providing less friction between the wearing element and the ground surface.

[0012] A further object is to provide a wearing element that still efficiently clears the road from debris and snow,

and efficiently removes ice formed on a roadway.

[0013] These and other objects as well as advantages that will be apparent from the following description of the present invention are achieved by a wearing element having the features of appended claim 1, and by a plow blade according to claim 10. Preferred embodiments are defined in the dependent claims.

[0014] According to the present invention, a replaceable wearing element for a plow blade is provided, said wearing element comprising a mounting plate for attachment to the blade, and a front plate for removing snow, debris and the like from a ground or road surface, wherein the plates are resiliently spaced from each other by means of an elastomeric element bonded to the plates.

[0015] This is highly advantageous since the resilient relationship between the two plates provides increased damping and allows for the front plate to more smoothly follow a surface being scraped. As a result, less noise and vibrations are experienced, and less damage is caused to the roadway. A further positive effect is that the plates, when one of the plates is subject to impact from the ground surface along the direction of driving, are moved closer to each other which compresses the elastomeric element and causes it to bulge towards the ground surface. When this resilient bulging occurs, the wearing element is lifted from the ground, thus providing better damping and reducing friction between the ground and the wearing element.

[0016] The front plate of the wearing element may, in relation to the mounting plate, be resilient in all directions.

[0017] This allows efficient damping if the front surface of the front plate in a horizontal direction hits a hard and heavy object, as well as when the front plate experiences vertical forces due to irregularities in the underlying surface, such as wheel track wear (rutting), bumps etc.

[0018] The front plate of the wearing element may also, in relation to the mounting plate, be resilient in respect of shear and/or torsion.

[0019] Since ground surfaces are seldom even in a direction perpendicular to the direction of travel, forces and impacts are not evenly distributed along the length of wearing element, which makes a shear- and/or torsion resilient relationship between the plates particularly beneficial.

[0020] The wearing element may also have its front plate similar to its mounting plate.

[0021] This similarity provides a turnable wearing element that readily may be flipped over when the front plate and the elastomeric element are worn down. When the wearing element is flipped over, the former front plate acts as a mounting plate, and the former mounting plate acts as a front plate. This is highly beneficial since the operational lifetime of the wearing element is doubled.

[0022] The front plate and the mounting plate of the wearing cutting element may be symmetrically bonded to the elastomeric element.

[0023] This symmetrical relationship between the elastomeric element and the plates further facilitates the dou-

ble sided usage of the wearing element.

[0024] The front plate may be offset from the mounting plate in a direction of height of the wearing element.

[0025] The offset makes it possible to arrange the wearing element with only one of its plates in contact with the ground surface, which is beneficial for obtaining efficient removal of, for example, ice from a roadway.

[0026] The plates and the elastomeric element may extend the full length of the wearing element.

[0027] This is advantageous since a continuous element is more easy and cost efficient in terms of manufacture. Moreover, the plates and the elastomeric element extending the full lengths guarantees that the resilient properties are present throughout the entire wearing element.

[0028] An elastomeric layer may cover the mounting plate on the mounting plate side opposite the elastomeric element, and an elastomeric layer may cover the front plate on the front plate side opposite the elastomeric element.

[0029] The elastomeric layer covering the mounting plate on the side opposite the elastomeric element provides additional damping between the wearing element and the plow blade on which it is mounted, thereby improving noise- and vibration-reducing capabilities. The elastomeric layer covering the front plate on the side opposite the elastomeric element, prevents, for example, snow from sticking to the front plate, thereby reducing the risk of ice-chunks flying off, which would pose a threat to traffic safety.

[0030] The wearing element may further comprise means for compressing the elastomeric element by decreasing the space between the front plate and the mounting plate.

[0031] When the space between the front plate and the mounting plate has been decreased, the elastomeric element is compressed and tends to bulge, or flow out, at the edges of the wearing element. Thereby the elastomeric element has a more convex shape at said edges. Since the complete elastomeric element is compressed, elastomeric material continuously bulges at said edges when both the front plate and the elastomeric element are worn during operation. This bulging effect causes elastomeric material to be efficiently in contact with the ground surface, resulting in reduced friction between the ground and the wearing element. When snow, slush or ice is removed from a roadway, a hydroplaning effect is also created which further reduces the friction. Small friction is desired since a vehicle then consumes less fuel. Reduced friction also reduces wear on the wearing element as well as wear on the ground surface. Preferably, the compressing means also constitute securing means for attachment to the plow blade, whereby said means may be arranged according to plow blade standards to facilitate fast market introduction of the wearing element. The mounting plate preferably comprises the securing means for attachment to the plow blade.

[0032] A plow blade is also provided which comprises

a replaceable wearing element according to the invention.

[0033] The plow blade has basically the same advantages as the wearing element described above.

Brief Description of the Drawings

[0034] Embodiments of the present invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is perspective view of a wearing cutting element mounted on a plow blade fitted on a vehicle, Fig. 2 is a front view of the wearing cutting element, and

Fig. 3 is a sectional view of the wearing cutting element taken along line III-III in Fig 2.

Detailed Description of Embodiments

[0035] With reference to Fig. 1, a wearing element 1, also referred to as wearing cutting element or cutting edge, is illustrated, designed to be mounted to the lower part of a plow blade 12 by suitable securing means (not shown). The plow blade 12 is attached to any suitable vehicle 13 such as a lorry, truck, tractor or the like. For the purpose of directional reference, the cutting side (front side) of the wearing element is the side facing the direction of travel D, when the vehicle 13 fitted with the plow blade 12 drives in the forward direction.

[0036] Fig. 2 illustrates the front side of the wearing element 1, and compressing means 7 also being standardized fastening means, are located on the element 1 in a standardized mutual relationship, as further elucidated below.

[0037] Fig. 3 illustrates a front plate 3 on the cutting side of the wearing element 1, and the lower part 8 of the front plate 3 interacts with a road, runway or any ground surface G that should be cleared from, for example, snow, slush, ice, mud, soil, stones or debris. The forward direction of travel is indicated by the arrow D. Spaced apart from the front plate 3, by means of an elastomeric element 4, is a mounting plate 2 for attachment to a plow. The elastomeric element 4 is permanently bonded to the plates 2, 3, typically by vulcanization, and provides a resilient relationship between the plates 2, 3. Preferably, the plates 2, 3 and the elastomeric element 4 are rectangular in shape when seen from the direction of travel D. It should be noted that the level of resilience may be varied, but preferably the elastomeric element 4 provides rather firm damping between the plates 2, 3 in order to efficiently absorb shock and impacts.

[0038] The side of the mounting plate 2 opposite the elastomer element 4 is preferably covered with a resilient layer 5, and the side of the front plate 3 opposite the elastomeric element 4 is preferably covered with a similar resilient layer 6. The wearing element 1 has parallelogram-shaped cross-section (see Fig. 3) with two parallel

outer surfaces and two inclined edge surfaces one of which is positioned near the ground surface G in operation.

[0039] Preferably, the plates 5, 6 are offset in a direction of height of the wearing element 1, as is clearly illustrated in Fig. 3. The lower part 9 of the elastomeric element 4 is preferably upwardly slanted as seen from the front plate 3, and as illustrated in Fig. 3, but the lower part 9 may have any suitable profile, such as a concave, convex or straight profile.

[0040] During operation, material is worn off from the lower part 8 of the front plate 3 as well as from the lower part 9 of the elastomeric element 4. Eventually, the lower part 10 of the mounting plates 2 interacts with the ground surface G and is also subjected to wear.

[0041] Preferably, the wearing element 1 is turnable and has a symmetrical shape, and compressing/mounting means 7 are symmetrically arranged on both the front plate 3 and the mounting plate 2, respectively. When the wearing element 1 is worn to a predetermined level, a user dismounts the wearing element 1, flips it, and mounts it with the front plate 3 in the direction of the plow blade. When this is done, the mounting plate 2 is facing the direction of travel D and provides the same functionality as the front plate 3 did when the front plate 3 was facing the direction D of travel. Now the upper part 11 of the mounting plate 2 has the former position of the lower part 8 of the front plate 3, as seen in a relationship to plow blade and ground surface G.

[0042] The front plate 3 is preferably similar to the mounting plate, and may advantageously be identical. The word "similar" reflects the fact that the plates 2, 3 may be of different thicknesses or heights, while still providing the turnable functionality described above.

[0043] Preferably, the wearing element 1 may have the elastomeric element 4 made of polyurethane, rubber, any other polymer material or a combination thereof, and preferably, the resilient layers 5, 6 also are made of any of these materials.

[0044] Moreover, the wearing element 1 may have the mounting plate 2 and the front plate 3 made of ceramics, metallic material such as steel, polymeric material or any other hard material, or a combination thereof.

[0045] The mounting plate 2 and the front plate 3 may advantageously be made of a material less wear-resistant than the material of the elastomeric element 4. This feature results in a hydroplaning effect between the elastomeric element 4 and the roadway G when snow, slush and ice are removed, which decreases friction and hence wear on the wearing element 1.

[0046] The compressing means 7 preferably comprise through holes in the wearing element 1, machine screws (not shown) inserted in the respective holes and nuts (not shown) screwed onto the screws and tightened for compressing the plates 2, 3, but any technique for moving the plates 2, 3 closer to each other may be used. The diameter of the screws is preferably smaller than the diameter of the through holes in order avoid interference

of the resilient relationship between the plates 2, 3. Preferably, the compressing means are also mounting means for attaching the wearing element 1 to the plow blade 12, and in this case, when the wearing element 1 is mounted, the machine screws also pass through holes (not shown) arranged in the blade 12. One set of compressing/mounting means 7 per wearing element 1 is sufficient, but for optimum result a plurality of sets should be provided. The through holes in the wearing element 1 are preferably also arranged with a diameter and a mutual relationship according to plow blade standards, in consideration of a slightly greater diameter of the wearing element through holes.

[0047] Preferably, the mounting means 7 of the wearing element 1 are arranged in the center of the wearing element 1, or at least close to the center of the wearing element 1. This provides further damping when the lower part 8 of the front plate 3 is subjected to impacts from the ground surface G along the direction of driving D. Since the lower parts 8, 10 of the plates 3, 2, are brought closer by the impact, the elastomeric element 4 is compressed at its lower part 9. When the lower part 9 of the elastomeric element 4 is compressed, the part 9 bulges towards the ground surface G, thereby lifting the wearing element 1 from the ground G, which provides better damping and reduces friction between the ground G and the wearing element 1. Due to constant volume characteristics of the elastomeric element 4, its lower part 9 regains its original shape after absorption of the impact. Of course, when the lower parts 8, 10 of the plates 3, 2 are brought closer, the upper (opposite the lower) parts of the plates 3, 2 may be spaced further apart as the upper part of the elastomeric element 4 is extended. However, the lower part 9 of the elastomeric element 4 may be compressed without the upper (opposite the lower) part of the elastomeric element 4 being extended.

[0048] It should be noted that the mounting means 7 of the wearing element 1 must not comprise through holes, but may also be any means for attaching the wearing element 1 to the plow blade 12.

[0049] Of course, the effect described above resulting from impacts bringing the lower parts 8, 10 of the plates 3, 2 closer, is achieved independently of the compressing/mounting means 7, but may be affected by how the means 7 are arranged.

[0050] The lower and/or the upper parts of the plates 2, 3 may also be serrated, jagged or toothed in order to provide a serrated ground surface G during operation.

Claims

1. A replaceable wearing element for a plow blade (12), said wearing element (1) comprising a mounting plate (2) for attachment to the blade (12), and a front plate (3) for removing snow, debris and the like from a ground (G) or road surface, wherein the plates (2, 3) are resiliently spaced from each other by means

of an elastomeric element (4) bonded to the plates (2, 3).

2. A wearing element according to claim 1, wherein the front plate (3) is, in relation to the mounting plate (2), resilient in all directions. 5
3. A wearing element according to claim 1 or 2, wherein the front plate (3) is, in relation to the mounting plate (2), resilient in respect of shear and/or torsion. 10
4. A wearing element according to any one of claims 1-3, wherein the front plate (3) is similar to the mounting plate (2). 15
5. A wearing element according to any one of claims 1-4, wherein the front plate (3) and the mounting plate (2) are symmetrically bonded to the elastomeric element (4). 20
6. A wearing element according to any one of claims 1-5, wherein the front plate (3) is offset from the mounting plate (2) in a direction of height of the wearing element (1). 25
7. A wearing element according to any one of claims 1-6, wherein the plates (2, 3) and the elastomeric element (4) extend the full length of the wearing element (1). 30
8. A wearing element according to any one of claims 1-7, wherein an elastomeric layer (5) covers the mounting plate (2) on the mounting plate side opposite the elastomeric element (4), and an elastomeric layer (6) covers the front plate (3) on the front plate side opposite the elastomeric element (4). 35
9. A wearing element according to any one of claims 1-8, further comprising means (7) for compressing the elastomeric element (4) by decreasing the space between the front plate (3) and the mounting plate (2). 40
10. A plow blade, comprising a replaceable wearing element according to any one of claims 1-9. 45

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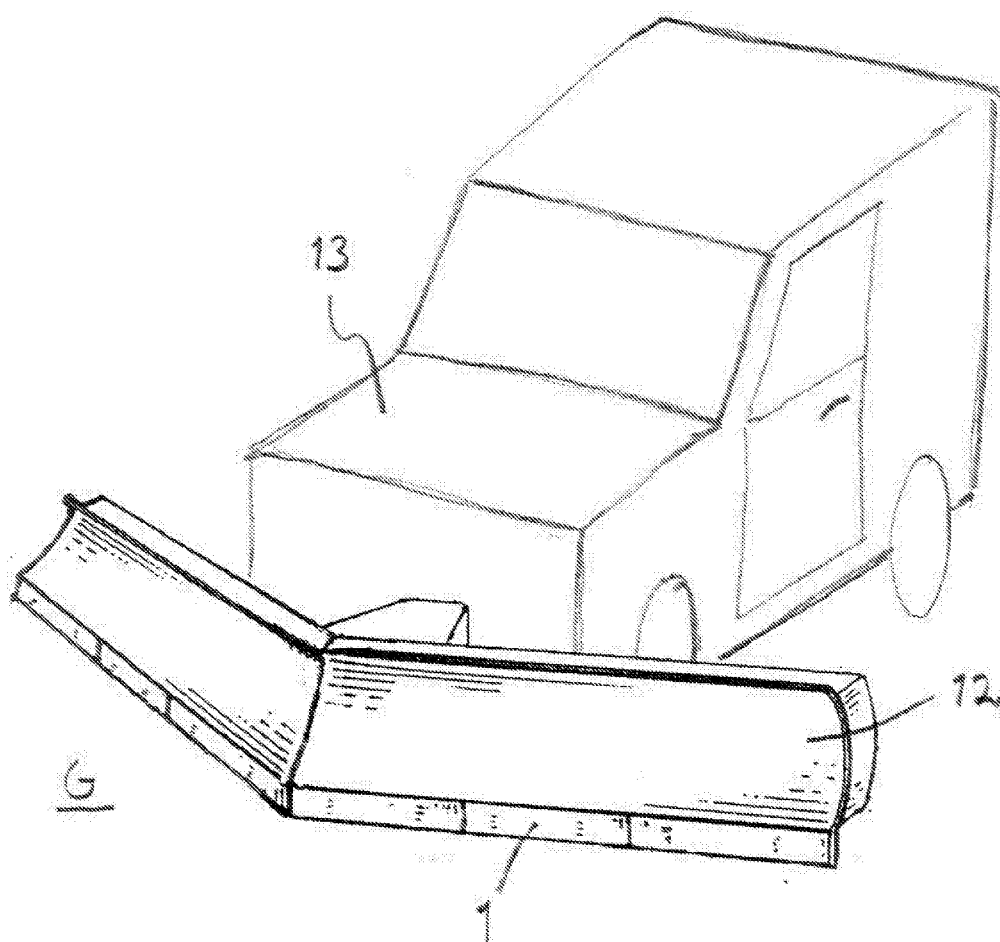


Fig. 7

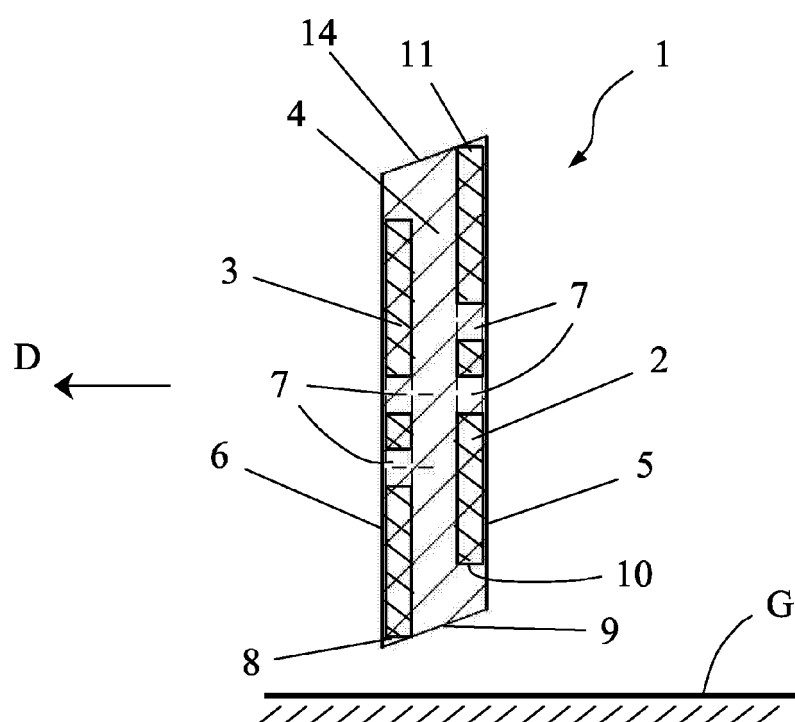
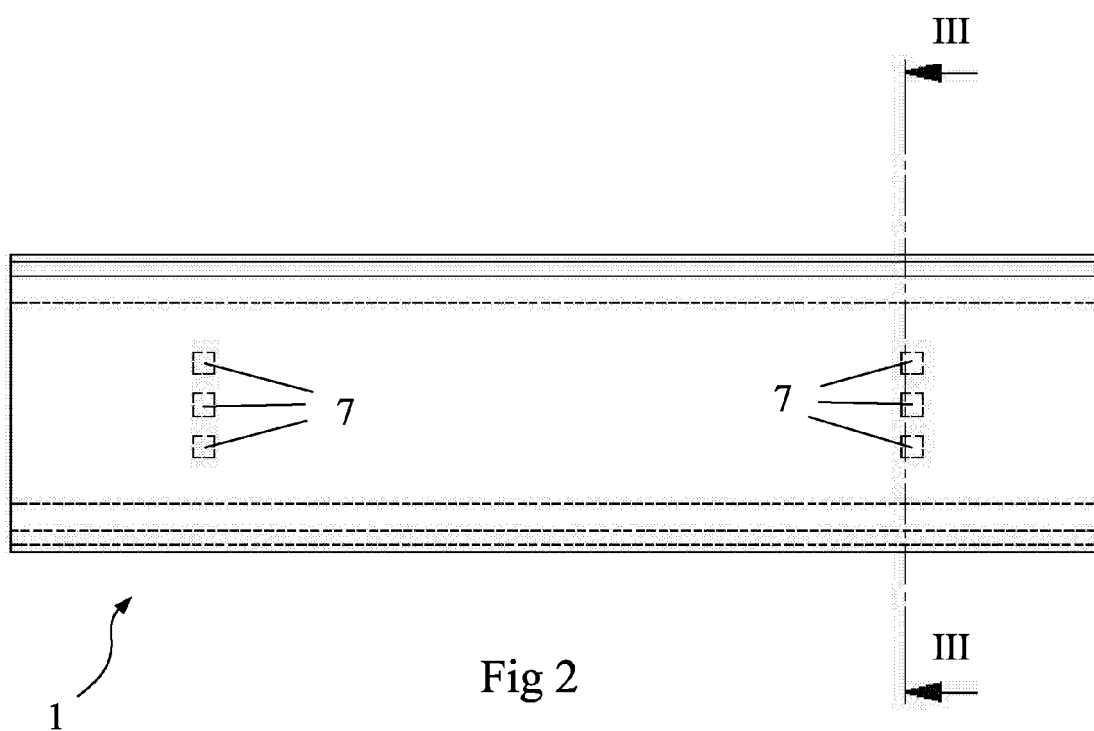


Fig 3



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 11 0266

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 April 2006	Examiner Kerouach, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 11 0266

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