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(54) **Road planing machine**

Strassendeckenfräsgerät

Equipement pour le fraisage des chaussées

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DE-A- 19 504 495 **FR-A- 2 642 773**
US-A- 3 895 843 **US-A- 4 221 434**

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Description

[0001] This invention relates to improvements in road planing machines, alternatively referred to as cold milling machines.

[0002] Road planing machines are used to remove the surface region of roads in preparation for laying a new surface. They work by contacting a revolving drum equipped with an array of cutter elements with the surface, which is fragmented and removed. The configuration of the array of cutter elements is generally spiral such that, as the drum rotates, fragmented surface material or "planings", is carried either to one end of the drum for removal or is concentrated in a central region, for ejection to a discharge conveyor.

[0003] The planing drum is located inboard of the chassis of the machine and is mounted off-centre so that one end of the drum extends nearly to the side of the machine; the drum is raised and lowered by alteration of the height of the rear roadwheels relative to the chassis. The rear roadwheel on the "drum" side of the machine is mounted on a pivot such that can be positioned in front of the drum when the machine is used for planing adjacent and up to a kerb or other boundary line or beside and outboard of the drum when the machine is used for planing away from the kerb. Road planing machines may also be fitted with a side cutting wheel mounted on the drum side and outboard of the chassis beyond the planing drum, for the purpose of cutting a groove or trench at the side of the road or carriageway, or for removing kerbstones. Typically, such wheels are either of 80 mm or 300 mm in width and cut to a depth of up to 400 mm. The surface of the wheel is provided with an array of carbide-tipped cutter elements which are angled forwardly in the direction of travel of the lower part of the wheel cutting action on the upstroke. Thus, as the machine advances, the cutter wheel rotates in the reverse direction so that the lower part of the wheel moves in the advance direction and the cutter elements cut and remove material in a scoop-like manner. However, especially with cutting wheels of 300 mm width, the cutting wheel creates a substantial drag force on the drum side of the machine, which tends to cause the machine to adopt a "crabbing" attitude as it advances. This results not only in accelerated wear to the cutter tips but also to wear on the inner edge and side of the cutting wheel itself, since it contacts the side of the trench on the downstroke; to some extent, this also has the unwelcome result that the integrity of the side of the trench is compromised.

[0004] WO-A-95/11346 describes a road cutting apparatus standing on three wheels at the apices of a triangle which is asymmetric in relation to the working direction of the apparatus, the cutter drum lying outside the triangle. DE-A-3620120 describes a road planing machine having a cutting wheel mounted to one side of the planing drum. DE-A-19504495 describes a planing machine having a crusher bar, to granulate large bro-

ken-away pieces of asphalt pavements, mounted adjacent to the planing drum. US4221434 describes a drum planing machine having breaker plates to provide a counteracting shearing force on the top portion of roadway at a predetermined distance from the planing drum, to reduce removed roadway cuttings to a uniform size.

[0005] In one aspect, the present invention provides a road planing machine including a planing drum, the machine having a chassis with front roadwheels for providing steering ability and main roadwheels for supporting the planing drum, in which the main roadwheel on the drum side of the machine is positioned behind the drum, the mounting for the rear roadwheel including means selectively to alter the angle thereof on either side of a vertical plane parallel with the longitudinal axis of the machine, characterised in that a cutting wheel is mounted coaxially with and to one side of the planing drum and a kerbstone restraint member is mounted in front of the cutting wheel for movement between raised and lowered positions, whereby in use in the lowered position the member acts to restrain kerbstones against the lifting action of the cutting wheel.

[0006] When the machine is in use, the ability selectively to alter the angle of the roadwheel on either side of a vertical plane parallel with the longitudinal axis of the machine enables the driver to "steer" the rear of the machine to provide an additional resistance or counteraction to the crabbing tendency, compared with the resistance already provided by positioning the main roadwheel on the drum side of the machine behind the drum.

[0007] When using the machine according to the invention to cut a groove or trench with the side cutting wheel, the drum is used without the planing cutter elements and the minimum height of the chassis is selected, such that the surface of the drum just contacts the road surface and the cutting wheel can operate to the maximum depth according to its diameter. The rear roadwheel may be vertically adjustable relative to the chassis of the machine to provide for height adjustment of the chassis and hence adjustment to the cutting depth of the cutting wheel. The main roadwheel in front of the planing drum may either be removed altogether or vertically retracted away from contact with the ground when the cutting wheel is in use.

[0008] When the cutting wheel is used to removed kerbstones, the purpose of the kerbstone restraint member is to resist the tendency for the kerbstones or at least significant portions thereof to be raised bodily by the cutter elements. Thus, typically, the rear end of a kerbstone would have been reduced to fragments by the cutting wheel but a significant part of the front end would often have been raised away from its seating by the lifting action of the cutter elements, following which the kerbstone part would either have been urged inboard of the machine, where it may have fouled the planing drum as the machine advanced, or outboard of the machine, where it may have presented a hazard to workmen or passers-by. According to the invention, however, the

kerbstone restraint member, which preferably comprises a raisable and lowerable leg including a bottom plate or pad against which a lifting kerbstone or part thereof will engage and will be held or restrained against the lifting action of the cutter elements of the cutting wheel, will cause the section of kerbstone between the rear end thereof and the restraint member to be reduced to fragments as the machine advances.

[0009] A road planing machine according to the invention will now be described, by way of example only, with reference to the accompanying drawings of which:

Figure 1 is a side elevation of a machine in the raised portion prior to trench-cutting:

Figure 2 is a plan view of the machine of Figure 1; and

Figure 3 is a front elevation of the planing drum and cutting wheel assembly of the machine of Figure 1.

[0010] Returning initially to Figure 1, the machine shown generally at 10 includes a motor cover 11, a driving position 12 and front steerable roadwheels 13. At the rear and as shown in the position of Figure 1, the machine is supported by roadwheels 14, 15 (see also Figure 2) carried on vertically-displaceable legs to adjust the height of the rear of the machine above the ground. Only leg 16 is shown, carrying wheel 15. The wheels are individually driven by hydraulic motors fed by a common hydraulic variable displacement pump; a selectable differential lock provides for equal traction at all wheels. A planing drum 17 is mounted off-centre for rotation about a lateral axis and a side cutting wheel 18 is demountably carried coaxially with drum 17, at the drum side of the machine. The cutting wheel carries carbide-tipped cutters 19. A further roadwheel 20 is carried on a vertically retractable leg 21 mounted on a bracket 22 hinged about a vertical axis. Roadwheel 15, as shown in Figures 1 and 2, is disposed behind the planing drum and the vertically displaceable leg 16 is pivoted to the rear of the chassis to provide a steering effect, controlled by hydraulic ram 23.

[0011] The cutting wheel 19 is provided with protective guards 24, 25 (see also Figure 3) mounted respectively to the outside of and above the wheel and by a downwardly-biased plate 26 between the wheel 18 and the planing drum 17. The plate 26 contacts the surface of the ground irrespective of the position of the machine in a vertical plane as determined by the vertically-displaceable legs and the lower edge thereof is shown in dashed outline in Figure 1. The planing drum is shielded by a cover plate 27. The drum 16 and cutting wheel 17 are driven by a belt (not shown) which engages a pulley block 28 drivingly connected to the drum via a reduction gearbox (not shown).

[0012] A leg 29 having its lower end formed as a foot 30 is carried so as to be raised or lowered with the foot

30 in front of the cutting wheel 18, controlled by hydraulic ram 31. The foot 30 is shown at the raised position; 30A indicates the lowered position.

[0013] In use for road planing only, the cutting wheel 18 is removed, the leg 21 is lowered until wheel 20 contacts the ground, and leg 16 is raised to bring wheel 15 clear of the ground. For planing to the edge of the carriageway, bracket 22 is disposed as shown in Figures 1 and 2, whereby the wheel 20 is inboard of the chassis of the machine. For planing away from the edge of the carriageway, the bracket 22 is swung rearwardly about its pivot axis such that it is disposed next to the end of the drum and outboard of the chassis, as indicated by dashed lines 20A in Figure 2. The legs for the wheels 14, 20 are height-adjusted to bring the planing drum to the desired working position in relation to the road surface.

[0014] In use for digging a trench or removing kerbstones, the leg 16 is lowered to raise the rear end of the machine, leg 21 is raised to the position shown in Figure 1, and the cutting wheel 18 is attached. Leg 16 (and also the leg supporting wheel 14) is then raised to lower the rear of the machine while the cutting wheel rotates, digging into the ground until the desired cutting depth is attained; the legs are then held at this position and the machine advances. If removing kerbstones, the leg 29 is lowered until the sole of the foot 30 is at or marginally above the upper surface of the kerbstones, whereby any kerbstones or parts thereof dislodged by the cutting wheel and urged upwardly are restrained by the foot and the exposed kerbstone end between the foot and the cutting wheel is reduced to small fragments as the machine advances.

Claims

1. A road planing machine (10) including a planing drum (17), the machine having a chassis with front roadwheels (13) for providing steering ability and main roadwheels (14, 15) for supporting the planing drum, in which the main roadwheel (15) on the drum side of the machine is positioned behind the drum with respect to the travelling direction of the machine, a mounting for one of the rear roadwheels (15) including means (23) selectively to alter the angle thereof on either side of a vertical plane parallel with the longitudinal axis of the machine, **characterised in that** a cutting wheel (18) is mounted coaxially with and to one side of the planing drum and a kerbstone restraint member (29) is mounted in front of the cutting wheel for movement between raised and lowered positions, whereby in use in the lowered position the member acts to restrain kerbstones against the lifting action of the cutting wheel.
2. A road planing machine according to claim 1, in which the kerbstone restraint member comprises a

raisable and lowerable leg which includes a bottom plate or pad (30) for contacting the kerbstone as the kerbstone is urged upwardly by the cutting wheel.

3. A road planing machine according to claim 1 or claim 2, in which the rear roadwheel (15) is vertically adjustable relative to the chassis of the machine. 5
4. A method of removing kerbstones, the method comprising advancing a road planing machine (10) according to claim 1 along a kerbed road with the cutting wheel (18) in cutting relationship with the kerbstones and deploying the kerbstone restraint member (29) above the kerbstones and in front of the cutting wheel (18), whereby kerbstones or parts thereof dislodged by the cutting wheel (18) and urged upwardly are restrained by the restraint member (29) and reduced to fragments as the machine advances, and whereby one of the rear roadwheels (15) is steered such that the machine is controlled to resist and/or counteract a tendency to crabbing when the machine advances. 10 15 20
5. A method according to claim 4, in which the kerbstone restraint member (29) comprises a raisable and lowerable leg including a bottom plate or pad (30). 25

Patentansprüche

1. Straßendeckenfräsgerät (10), das eine Frästrommel (17) umfaßt, wobei die Maschine ein Fahrwerk mit vorderen Straßenrädern (13) zum Bereitstellen der Lenkfähigkeit und Antriebsstraßenräder (14, 15) für das Unterstützen der Frästrommel, in welcher das Antriebsrad (15) auf der Trommelseite der Maschine hinter der Trommel bezüglich der Fahr- richtung der Maschine positioniert wird, aufweist, wobei eine Vorrichtung für eines der hinteren Antriebsräder (15) selektiv Mittel (23) umfaßt, um deren Winkel auf beiden Seiten einer Ebene parallel mit der Längsachse der Maschine zu verändern, **dadurch gekennzeichnet, daß** ein Schneidrad (18) koaxial mit und zu einer Seite der Frästrommel montiert wird und ein Randsteinrückhalteelement (29) vor dem Schneidrad für die Bewegung zwischen der angehobenen und der abgesenkten Position montiert wird, wodurch das Element in Gebrauch in der abgesenkten Position wirkt, um die Randsteine gegen die anhebende Wirkung des Schneidrads zurückzuhalten. 30 35 40 45 50
2. Straßendeckenfräsgerät nach Anspruch 1, in welchem das Randsteinrückhalteelement einen anhebbaren und absenk- baren Schenkel umfaßt, welcher eine Bodenplatte oder Bodenunterlage (30) für das Berühren des Randsteins umfaßt, wenn der 55

Randstein durch das Schneidrad nach oben bewegt wird.

3. Straßendeckenfräsgerät nach Anspruch 1 oder 2, in welchem das hintere Straßenrad (15) vertikal bezüglich des Fahrwerks der Maschine verstellbar ist.
4. Verfahren des Entfernens der Randsteine, wobei das Verfahren das Vorwärtsbewegen eines Straßendeckenfräsgeräts (10) nach Anspruch 1 längs einer Straße mit Randstein mit dem Schneidrad (18) und schneidender Wechselbeziehung mit den Randsteinen umfaßt und das Randsteinrückhalteelement (29) über den Randsteinen und vor dem Schneidrad (18) anwendet, wodurch die Randsteine oder Teile davon, die durch das Schneidrad (18) herausgenommen und nach oben bewegt wurden, durch das Rückhalteelement (29) zurückgehalten und in Bruchstücke zerkleinert werden, so wie sich die Maschine vorwärts bewegt, und wodurch eines der hinteren Straßenräder (15) so gelenkt wird, daß die Maschine gesteuert wird, um einer Neigung zum Glätten zu widerstehen und/oder entgegenzuwirken, wenn sich die Maschine vorwärts bewegt.
5. Verfahren nach Anspruch 4, wobei das Randsteinrückhalteelement (29) einen anhebbaren und absenk- baren Schenkel umfaßt, der eine Bodenplatte oder Bodenunterlage (30) enthält.

Revendications

1. Equipement pour le fraisage de chaussées (10) comprenant un tambour (17), la machine ayant un châssis à deux roues avant (13) pour assurer une fonction de guidage et des roues principales (14, 15) pour supporter le tambour de nivelage, dans lequel la roue principale (15) sur le même côté que le tambour de la machine est positionnée derrière le tambour par rapport au sens de déplacement de l'équipement, un montant pour une des roues arrière (15) comprenant un moyen pour modifier sélec- tivement l'angle de celles-ci sur l'un ou l'autre côté d'un plan vertical parallèle à l'axe longitudinal de l'équipement, **caractérisée en ce qu'**un disque de coupe (18) est monté coaxial au tambour de nive- lage et d'un côté de celui-ci et un élément de rete- nue de bordure (29) est monté en avant du disque de coupe pour être déplacé entre une position rele- vée et une position abaissée, par lequel en utili- sation dans la position abaissée l'élément agit pour retenir les bordures contre l'action de levage du dis- que de coupe.
2. Equipement pour le fraisage de chaussées selon la revendication 1, dans lequel l'élément de retenue de bordure comporte une jambe pouvant être rele-

vée et abaissée qui comprend une plaque ou un patin de sol (30) pour entrer en contact avec la bordure lorsque la bordure est forcée vers le haut par le disque de coupe.

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3. Equipement pour le fraisage de chaussées selon la revendication 1 ou 2, dans laquelle la roue arrière (15) peut être réglée verticalement par rapport au châssis de l'équipement.

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4. Procédé d'enlèvement de bordures, le procédé comprenant l'avance d'un équipement pour le fraisage de chaussées (10) selon la revendication 1 le long d'une route à bordures, le disque de coupe (18) étant en interaction de coupe avec les bordures et déployant l'élément de retenue de bordure (29) au-dessus des bordures et en avant du disque de coupe (18), par lequel les bordures ou des parties de celles-ci délogées par le disque de coupe (18) et forcées vers le haut sont retenues par l'élément de retenue (29) et réduites en fragments tandis que l'équipement avance, et selon lequel une des roues arrière (15) est guidée afin que l'équipement soit commandé pour résister et/ou contrer une tendance à se déplacer en crabe lors de l'avance.

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5. Procédé selon la revendication 4 dans lequel l'équipement pour le fraisage de chaussées (29) comporte une jambe pouvant être relevée et abaissée comprenant une plaque ou un patin de sol (30).

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