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GB-A- 1 147 236

DESCRIPTION

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to a mowing device for the treatment of vegetations.

BACKGROUND ART OF THE INVENTION

[0002] Several kinds of mowing devices and equipments are known in practice for mowing or mulching grasslands, small natural seeded shrubs, or similar vegetations and areas.

[0003] Mowing devices of a multi-rotor mowing machine, cutting devices for mowing machines, rotary mowing devices, rotary disc mowing devices, etc. are known. Document GB 1 147 236 discloses a mowing device according to the preamble of claim 1.

[0004] Disadvantages of the existing above mentioned mowing devices consist mainly in relatively large energy demands of a drive due to large friction losses at the cutting drums or cutting rotors.

[0005] Another disadvantage consists in the impossibility of their universal use for mowing or mulching.

[0006] None of the existing producers can provide mowing or mulching in the same build-up of the mowing device.

[0007] There is always necessary to amend an existing mowing device, or to install additionally components, or even to replace the mowing device to meet the required type of mowing.

[0008] The task of the invention is to overcome the above mentioned disadvantages of the prior art and to develop a mowing device that will be able to provide a wide array of an alternative mowing or mulching, especially grass areas, small natural seeded shrubs or similar vegetations, namely in the build-up of a single mowing device without interventions of a machine operator or replacement of the mowing device.

SUMMARY OF THE INVENTION

[0009] The above mentioned task has been met by the development of a mowing device according to the present invention for treating vegetations, which is adapted for the attachment to a carrier and for the connection to a drive unit.

[0010] The mowing device in question comprises a frame on which mowing spindles are attached, bearing on one side mowing blades and on the opposite side distributing members for the connection to the transmission members, wherein a transmission mechanism for driving the mowing spindles is also mounted upon the frame.

[0011] The solution according to the present invention is particularly characterized by the following features.

[0012] The mowing spindles are arranged in two mutually parallel rows, defined by longitudinal lines, located in a mutual distance separation L.

[0013] The mowing spindles of each row are interconnected via transmission members.

[0014] The centres of the mowing spindles of the first row are placed in a mutual spacing P.

[0015] The centres of the mowing spindles of the second row are placed in a mutual spacing P.

[0016] The centres of the mowing spindles of the second row are offset in the longitudinal direction by a one-half P/2 of the spacing P with respect to the centres of the mowing spindles of the first row.

[0017] A connecting line of the centre of each mowing spindle of the first row with the centre of an immediately adjacent mowing

spindle of the second row forms with parallel longitudinal lines an acute angle α, for which the following applies:

$$tg\ \alpha = \frac{L}{P/2}\ .$$

[0018] The size of the angle α is in the range from 15 ° to 60 °.

[0019] The transmission mechanism for driving the mowing spindles comprises two interconnected transmission devices mounted side by side on the frame.

[0020] The first transmission device is arranged for the rotation in one rotational direction and is connected via transmission members with the mowing spindles of the first row.

[0021] The second transmission device is configured as a reverse one for an optional rotation of an output shaft of a gearbox in both rotational directions, and the second transmission device is associated via transmission members with the mowing spindles of the second row.

[0022] The first transmission device is preferably formed by an angular gearbox, wherein the second transmission device is preferably formed by a reverse angular gearbox.

[0023] The transmission devices are preferably selected from the group consisting of an angular gearbox, a reverse angular gearbox, electric motors, hydraulic motors and the like.

[0024] The distributing members are preferably selected from the group consisting of pulleys, toothed pulleys, chain gears, toothed gears and the like.

[0025] Transmission members are preferably selected from the group consisting of belts, V-belts, toothed belts, transmission chains, toothed gears and the like. In a preferred embodiment of the invention, the mowing spindles of first row are provided with cross mowing blades, while the mowing spindles of the second row are provided with bidirectional mowing blades above which double-acting fork-shaped mowing blades are mounted.

[0026] The mowing spindles of the second row can advantageously be provided with double-sided angular mowing blades, above which the double-acting fork-shaped mowing blades are mounted.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The invention will be further explained in the form of an unlimited example of its practical embodiment, the description of which will be given with reference to the accompanying drawings, in which:

Figure 1 shows an isometric view of a mowing device according to an exemplary embodiment of the present invention,

Figure 2 shows a top view of the mowing device of Figure 1,

Figure 3 shows a bottom view of the mowing device of Figure 1,

Figure 4 shows a front view of the mowing device of Figure 1,

Figure 5 shows a double-acting fork-shaped mowing blade,

Figure 6 shows a bidirectional mowing blade,

Figure 7 shows a fork-shaped mowing blade,

Figure 8 shows a double-sided angular mowing blade,

Figure 9 shows a cross mowing blade,

Figure 10 shows a mower spindle with a pulley and a mowing blade,

Figure 11 shows the cutting device with a carrier,

Figure 12 shows the extreme positions of the lever 21 of the reverse running.

DETAILED DESCRIPTION OF THE INVENTION

[0028] In terms of the unambiguous clarity, it is to be noted that for the purpose of the explanation of the features of the present invention, the common expressions and technical terms used in the description and in the claims have generally the following meanings:

- the carrier is a device or a machine, a tractor, a working four-wheeler, a carries of working tools, usually a mower and so on, on which the mowing device is mounted,
- the drive unit is a device for providing a driving torque for the mowing device, usually an combustion engine, a hydraulic motor, an electric motor or other similar device,
- the distributing members represent mechanical machine members to allow a torque transmission, selected from the group consisting of pulleys, toothed pulleys, chain gears, toothed gears, etc.,
- the transmission members represent mechanical machine members to allow a torque transmission, selected from the group consisting of belts, V-belts, toothed belts, chains, toothed gears, etc.,
- the transmission mechanism comprises two transmission devices, selected from the group consisting of angular gearboxes, reverse angular gearboxes, electric motors, hydraulic motors, etc.

[0029] On the accompanying drawings, a preferred embodiment of the present invention is shown.

[0030] As shown in Figures 1-4, the mowing device comprises a frame 22 on which two rows of mowing spindles 7a and 7b . on parallel lines 8 and 9, and two angular gearboxes 1 and 2, representing the transmission devices, are mounted.

[0031] The mowing spindles 7a and 7b are provided on the lower side with the mowing blades 14, 15 and 16, and on the upper side with the pulleys 12 and 13.

[0032] On the reverse angular gearbox 2, an input pulley 3 of a gearbox 2 is placed, through which the gearbox 2 is connected via a transmission belt 17 with the angular gearbox 1, which is provided for this transmission with an input pulley 4 of the gearbox 1.

[0033] The pulley 4 is also arranged as an input pulley of the mowing device, because the drive torque is conveyed upon the same from the drive unit of the carrier of the present mowing device, namely by this particular exemplary embodiment from an internal combustion engine of the mowing machine (see Figure 11).

[0034] On the output side of the gearbox 1, an output pulley 6 of the gearbox 1 is installed, which is connected via a driving belt 18 for driving the first series of mowing spindles 7a on the line 8 with a drive pulley 10 of the first row of the mowing spindles 7a on the line 8.

[0035] The pulley 10 is connected over timing belts 20 with individual mowing spindles 7a of the first row on the line 8 via relevant pulleys 12 of the first row of the mowing spindles 7a on the line 8.

[0036] The mowing spindles 7a of the first row are arranged in a frame 22 of the mowing device on the longitudinal line 8.

[0037] The centres of the mowing spindles 7a of the first row are placed in the mutual spacing P (see Figure 2 and Figure 3).

[0038] The centre of each mowing spindle 7a of the first row is created by the intersection of the axis of rotation of the mowing spindle 7a to the plane defined by the lines 8 and 9.

[0039] The spacing P in the preferred embodiment represents a fixed constant distance.

[0040] The mowing spindles 7a of the first row on the line 8 are preferably provided with a cross mowing blade 14 (see Figure 9

and Figure 10).

[0041] On the output side of the reverse angular gearbox 2, an output pulley 5 of the gearbox 2 is positioned, which is connected via a drive belt 19 for driving the second row of the mowing pulleys 7b on the line 9 with a drive pulley 11 of the second row of the mowing pulleys 7b on the line 9.

[0042] The drive pulley 11 is connected via timing belts 20 with individual mowing pulleys 7b of the second row on the line 9 by means of relevant distributing pulleys 13 of the second row of the mowing spindles 7b on the line 9.

[0043] The mowing spindles 7b of the second row are arranged in a frame 22 of the mowing device on the longitudinal line 9.

[0044] The centres of the mowing spindles 7b of the second row are placed in the mutual spacing P (see Figure 2 and Figure 3).

[0045] The centre of each mowing spindle 7b of the second row consists of the intersection of the axis of rotation of the mowing spindle 7b to the plane defined by the lines 8 and 9.

[0046] The spacing P in the preferred embodiment is a fixed constant distance.

[0047] The mowing spindles 7b of the second row on the line 9 are preferably provided with a double acting fork-shaped mowing blade 15 and a double-sided mowing blade 16 (see Figure 5 and Figure 6), or a double-sided angular mowing blade 24 and a fork-shaped mowing blade 23 (see Figure 7 and Figure 8).

[0048] The longitudinal line 9 is parallel to the longitudinal line 8, and both lines 8 and 9 are positioned in a mutual distance separation L.

[0049] A construction of the reverse angular gearbox 2 is a prior art and it is arranged to allow a reversion of the rotational direction.

[0050] The reversion of the rotational direction takes place using a two-position lever 21 of the reverse running, which is equipped with the reverse angular gearbox 2 (see Figure 12).

[0051] In the position 0, the output shaft of the gearbox 2 rotates in the identical manner as the input shaft thereof, and in the position I the output shaft 2 rotates in the opposite sense of rotations than the input shaft of the gearbox, thereby changing the rotation direction of mowing spindle 7b of the second row on the line 9.

[0052] The centres of the mowing spindles 7b of the second row on the line 9 are located in a plan view (see Figure 2 and Figure 3) between the centres of the mowing spindles 7a of the first row on the line 8 in such a way that they are offset relative to each other by a one-half P/2 of the spacing P.

[0053] The longitudinal lines 8 and 9 are parallel to each other. Between the line 8 of the first row of the mowing spindles 7a and the line 9 of the second row of the mowing spindles 7b is the distance L.

[0054] In a plan view (see Figure 2 and Figure 3), the connecting line of the centre of each mowing spindle 7a of the first row on the line 8 with the centre of the directly opposite mowing spindle 7b of the second row on the line 9 forms with the parallel lines 8 and 9 an acute angle α, for which the following applies:

$$\operatorname{tg} \alpha = \frac{L}{L / 2} .$$

[0055] The angle α is preferably selected in the range from 15° to 60°.

[0056] In this particular preferred embodiment, the mowing device is driven by an internal combustion engine of the mowing machine, carrying the mowing device in question, and the driving torque is transmitted to the input pulley 4 of the gearbox 1.

[0057] In other exemplary embodiments, the drive unit, consisting of an internal combustion engine, can be preferably replaced with another source of driving torque for the mowing device, such as an electric motor, a hydraulic motor, or the like.

[0058] In another exemplary embodiments, the transmission devices formed by the angular gearboxes, can be preferably replaced by electric motors, hydraulic motors, or other devices capable to independently drive the two rows of the mowing spindles and to change the rotational direction.

[0059] The function of the mowing device according to this invention is as follows.

[0060] The driving torque from the drive unit is conveyed to the input pulley 4 of the angular gearbox 1.

[0061] From the angular gearbox 1, the driving torque is transmitted via the system of the transmission members and the distributing members on individual mowing spindles 7a of the first row on the line 8.

[0062] This ensures the rotation of the mowing spindles 7a of the first row on the line 8 in one rotational direction.

[0063] The reverse angular gearbox 2, which is provided with an input pulley 3 is connected via the connecting belt 17 with the angular gearbox 1, which is provided with an input pulley 4, whereby the delivery of the driving torque across the input pulley 3 is secured to the reverse angular gearbox 2 as well.

[0064] A construction of the reverse angular gearbox 2 is a prior art, and it allows to reverse the sense of the output rotation by means of a lever 21 of the reverse running of the gearbox 2.

[0065] From the reverse angular gearbox 2, the driving torque is transmitted through a system of transmission members and distribution members to individual mowing spindles 7b of the second row on the line 9.

[0066] This ensures the rotation of the mowing spindles 7b of the second row on the line 9 in both rotational directions, i.e. to the right clockwise, or to the left anticlockwise, namely optionally according to the requirements.

[0067] The transmission members and distributing members in this preferred embodiment comprise mainly:

the output pulleys 5 and 6,

the drive pulleys 10 of the first row on the line 8 and the drive pulleys 11 of the second row on the line 9,

the system of distributing pulleys 12 and 13 of the first and second row, and

the system of distributing belts 20 of the mowing spindles 7a and 7b and drive belts 18 and 19.

[0068] In the event that the user selects the rotation of the mowing spindles 7a of the first row on the line 8 to the right in a clockwise direction through the angular gearbox 1, the output pulley 6, the drive belt 18, the drive pulley 10, the distributing belt 20, and the distributing pulley 12, while simultaneously the mowing spindles 7b of the second row on the line 9 are rotating in the same direction, that is to the right in a clockwise direction through the angular gearbox 2, the output pulley 5, the drive belt 19, the drive pulley 11, the distributing belt 20, and the distributing pulley 13, thus a mulching is performed by which the grass or other vegetation are cut into small pieces through the special mowing blades and incorporated into the mown turf, where it acts as a fertilizer.

[0069] The mulching occurs when the lever 21 is turned to the position 0.

[0070] In the event that the user selects the rotation of the mowing spindles 7a of the first row on the line 8 to the right in a clockwise direction through the angular gearbox 1, the output pulley 6, the drive belt 18, the drive pulley 10, the distributing belt 20, and the distributing pulley 12, while simultaneously the mowing spindles 7b of the second row on the line 9 are rotating in the counter direction, that is to the left in an anticlockwise direction through the angular gearbox 2, the output pulley 5, the drive belt 19, the drive pulley 11, the distributing belt 20, and the distributing pulley 13, thus a mower of a grassland or other vegetation is performed, by which the grass or other vegetation are left laying on the spot, and they are not cut into small pieces as it is the case when mulching.

[0071] The simple mower of the vegetation occurs when the lever 21 is turned into the position I.

[0072] Under operation, the mowing device is moving in such a way that in the first instance the first row of the mowing spindles 7a on the line 8 performs its function and immediately afterwards the second row of the mowing spindles 7b on the line 9.

INDUSTRIAL APPLICABILITY

[0073] According to the present invention, the mowing device having two mowing functions of a grassland or other vegetation without unnecessary power losses and without mechanical adjustments or retrofitting or replacement of mowing blades has been developed, with the possibility of a simple change of the mowing function.

[0074] The invention may replace two different types of cutting devices, i.e. a mulching and mitring device.

[0075] The' invention has solved the arrangement of the mowing spindles in the device frame, their drive and the rotational direction of individual mowing spindles, bearing the respective mowing blades.

[0076] The mowing device is characterized by a low power consumption with a large cut, as well as a high-quality mowing or mulching, it guarantees a low energy demand, a lower fuel consumption and thus a lesser emission of exhaust gases.

[0077] In this design, there is no need of a large volume aggregate to drive the present mowing device.

[0078] The small diameter of the mowing blades is manifested by low friction losses, and thus a less energy consumption.

[0079] The objective mowing device is preferably developed in such a way that within one structural solution fulfils the role of two types of mowing devices, because the said device in one build-up performs mulching or mowing, namely without complicated adjustments.

[0080] The applicability of the invention relates especially to all machines for garden or farm machinery, for treating parklands, public or private grassy or wooded areas, as well as for other similar cases.

List of reference characters

[0081]

1
- angular gearbox

2
- reverse angular gearbox

3
- input pulley 3 of the gearbox 2

4
- input pulley 4 of the gearbox 1

5
- output pulley 5 of the gearbox 2

6
- output pulley 6 of the gearbox 1

7a
- mowing spindles 7a of the first row on the line 8

7b
- mowing spindles 7b of the second row on the line 9

8
- line 8 of the first row of the mowing spindles 7a

9
- line 9 of the second row of the mowing indles 7b

10
- drive pulley 10 of the first row of the mowing spindles 7a

11

- drive pulley 11 of the second row of the mowing spindles 7b

12
- distributing drive pulley 12 of the first row of the mowing spindles 7a

13
- distributing drive pulleys 13 of the second row of the mowing spindles 7b

14
- cross mowing blade 14 of the first row of the mowing spindles 7a

15
- double-acting fork-shaped mowing blade 15 of the second row of the mowing spindles 7b

16
- double-sided mowing blade 16 of the second row of the mowing spindles 7b

17
- connecting belt 17 of the gearbox 1, 2

18
- drive belt 18 of the first row of the mowing spindles 7a

19
- drive belt 19 of the second row of the mowing spindles 7b

20
- distributing belt 20 of the mowing spindles 7

21
- lever 21 of the reverse running for the change of a rotational direction of the reverse angular gearbox

22
- frame 22 of the mowing device

23
- fork-shaped mowing blade

24
- double-sided angular mowing blade

L
- distance

P
- spacing

P/2
- one-half P/2 of the spacing P

0
- position

I
- position

A
- angle

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB1147236A [0003]

P A T E N T K R A V

1. Slåindretning til behandling af vegetationer, indrettet til fastgørelse til en bærer og til forbindelse til en drivenhed, hvor slåindretningen omfatter en ramme (22), på hvilken slåspindler (7a, 7b) er monterede, som på én side er tilvejebragte med slåblade og på den anden side med fordelingselementer til forbindelsen til transmissionselementer, hvor der på rammen (22) desuden er positioneret en transmissionsmekanisme til at drive slåspindlerne (7a, 7b), hvor

- slåspindlerne (7a, 7b) er anbragte i to indbyrdes parallelle rækker defineret af langsgående linjer (8, 9) anbragt i en indbyrdes afstandsadskillelse (L),
- slåspindlerne (7a, 7b) af hver række er indbyrdes forbundne ved hjælp af transmissionselementerne,
- centrene af slåspindlerne (7a) af den første række på en linje (8) er anbragt i en indbyrdes afstand (P),
- centrene af slåspindlerne (7b) af den anden række på linjen (9) er anbragt i den indbyrdes afstand (P),
- centrene af slåspindlerne (7b) af den anden række er forskudt i retningen af linjerne (8, 9) med halvdelen (P/2) af afstanden (P) i forhold til centrene af slåspindlerne (7a) af den første række på linjen (8),
- en forbindelseslinje af centret af hver slåspindel (7a) af den første række på linjen (8) med centret af den umiddelbart tilgrænsende slåspindel (7b) af den anden række på linjen (9) danner med parallelle langsgående linjer (8, 9) en spids vinkel (α), for hvilken det følgende gælder:

$$tg\ \alpha = \frac{L}{P/2},$$

- størrelsen af vinklen (α) er i intervallet fra 15° til 60°,

k e n d e t e g n e t ved, at

- transmissionsmekanismen til at drive slåspindlerne (7a, 7b) omfatter to transmissionsindretninger monteret side ved side på rammen (22) og forbundet indbyrdes,
- den første transmissionsindretning er anbragt til rotation i én rotationsretning, og den er forbundet via transmissionselementer med slåspindlerne (7a) af den første række på linjen (8),
- den anden transmissionsindretning er anbragt som en reversibel indretning til en valgfri rotation af outputakslen af transmissionen (2) med begge rotationsretninger, og den er tilknyttet via transmissionselementer til slåspindlerne (7b) af den anden række på linjen (9).

2. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at den første transmissionsindretning er dannet af en vinkeltransmission (1), og den anden transmissionsindretning er dannet af en reversibel vinkeltransmission (2).

3. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at transmissionsindretningerne fortrinsvis er valgt fra gruppen bestående af en vinkeltransmission, en reversibel vinkeltransmission, elektriske motorer, hydrauliske motorer og lignende.

4. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at fordelingselementerne fortrinsvis er valgt fra gruppen bestående af trisser, fortandede trisser, kædedrev, tandhjul og lignende.

5. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at transmissionselementerne fortrinsvis er valgt fra gruppen bestående af remme, V-remme, tandremme, transmissionskæder, tandhjul og lignende.

6. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at slåspindlerne (7a) af den første række på linjen (8) er tilvejebragt med krydsslåblade (14).

7. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at slåspindlerne (7b) af den anden række på linjen (9) er forsynede med dobbeltsidede slåblade (16), oven over hvilke dobbeltvirkende gaffelformede slåblade (15) er monteret.

8. Slåindretning ifølge krav 1, k e n d e t e g n e t ved, at slåspindlerne (7b) af den anden række på linjen (9) er forsynede med dobbeltsidede vinkelslåblade (24), oven over hvilke gaffelformede slåblade (23) er monteret.

DRAWINGS

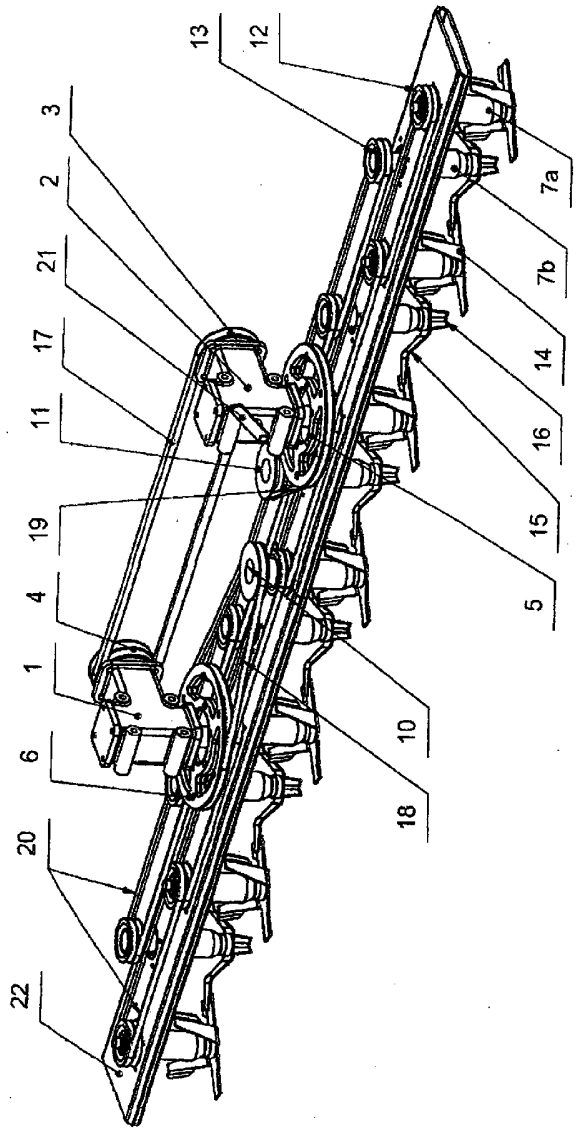

Fig. 1

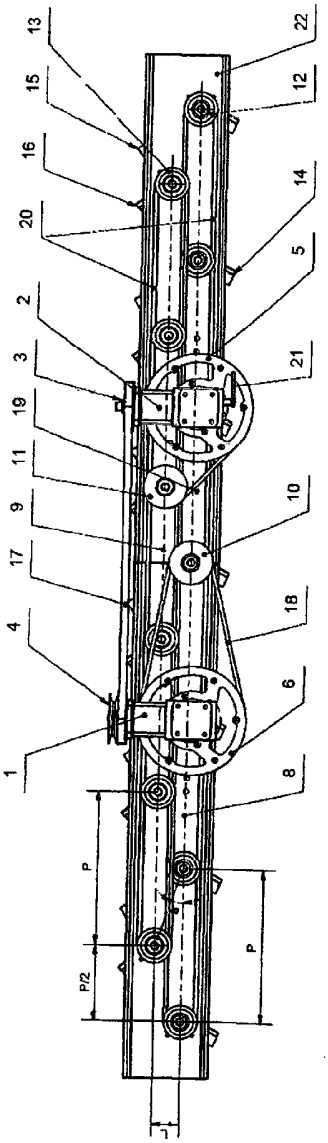

Fig. 2

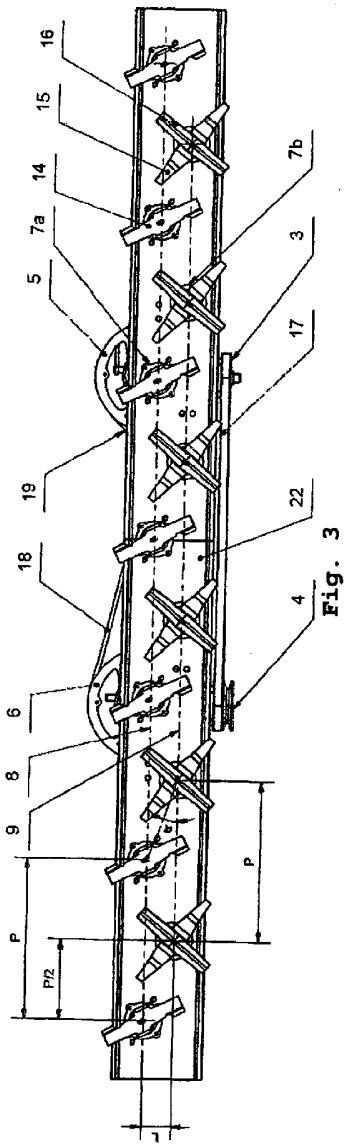

Fig. 3

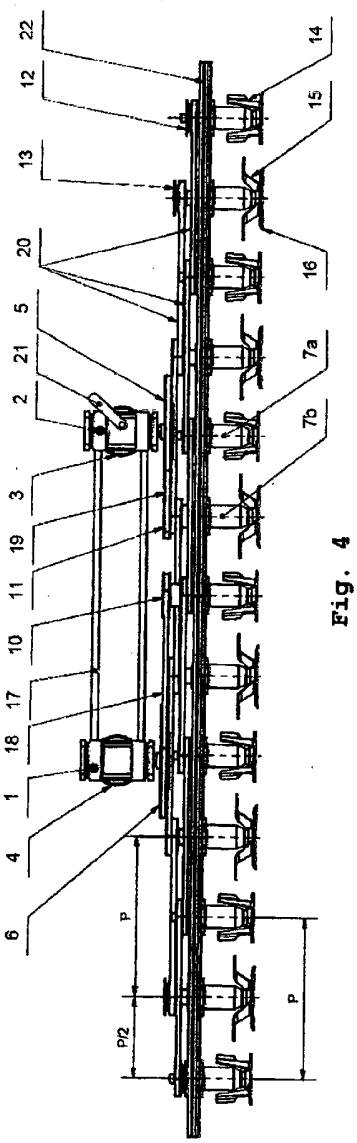

Fig. 4

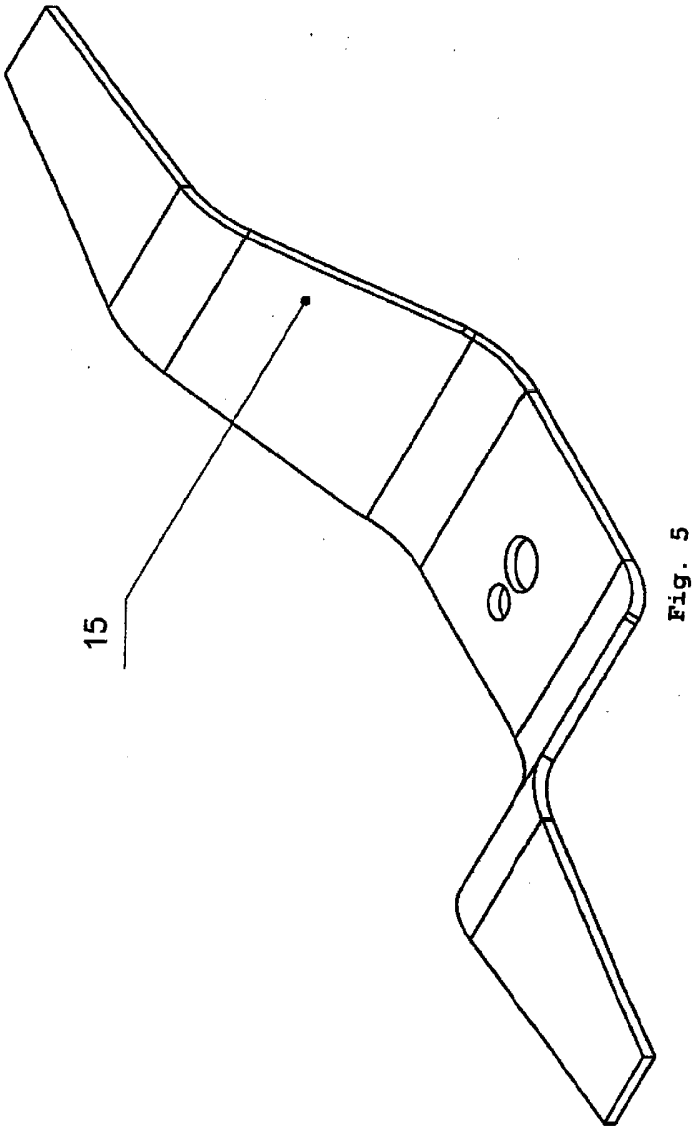

Fig. 5

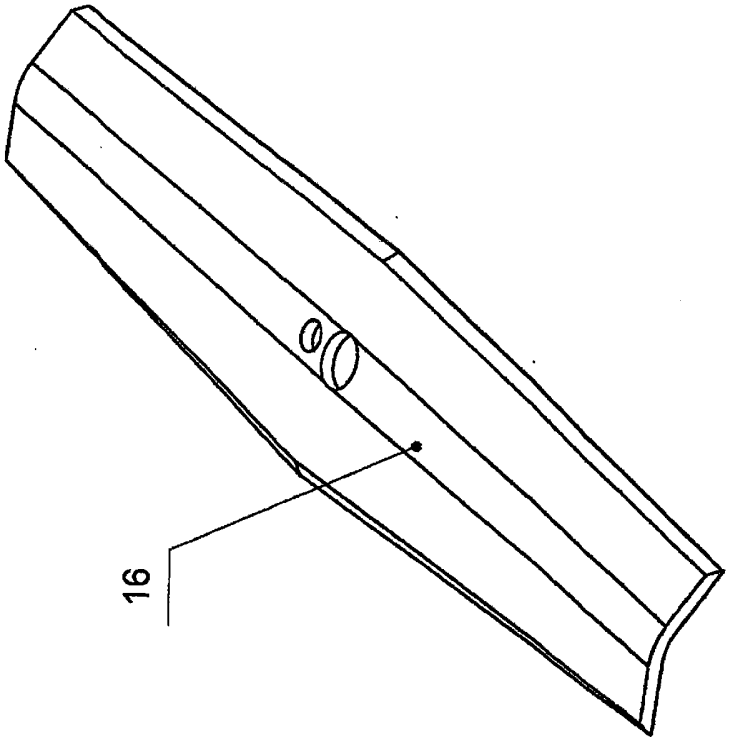

Fig. 6

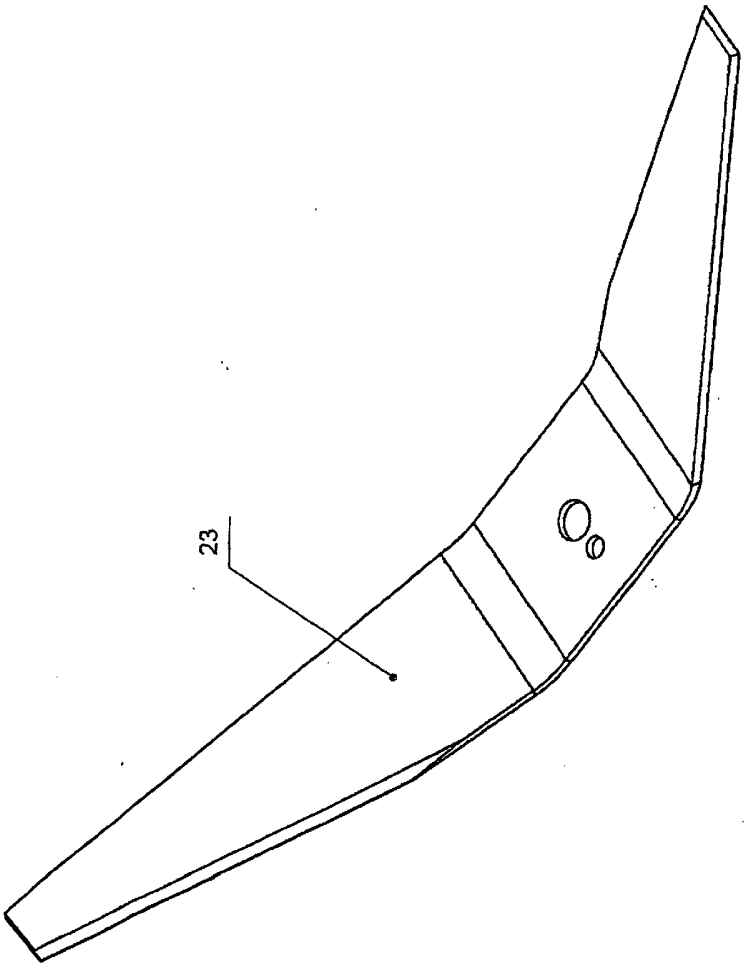

Fig. 7

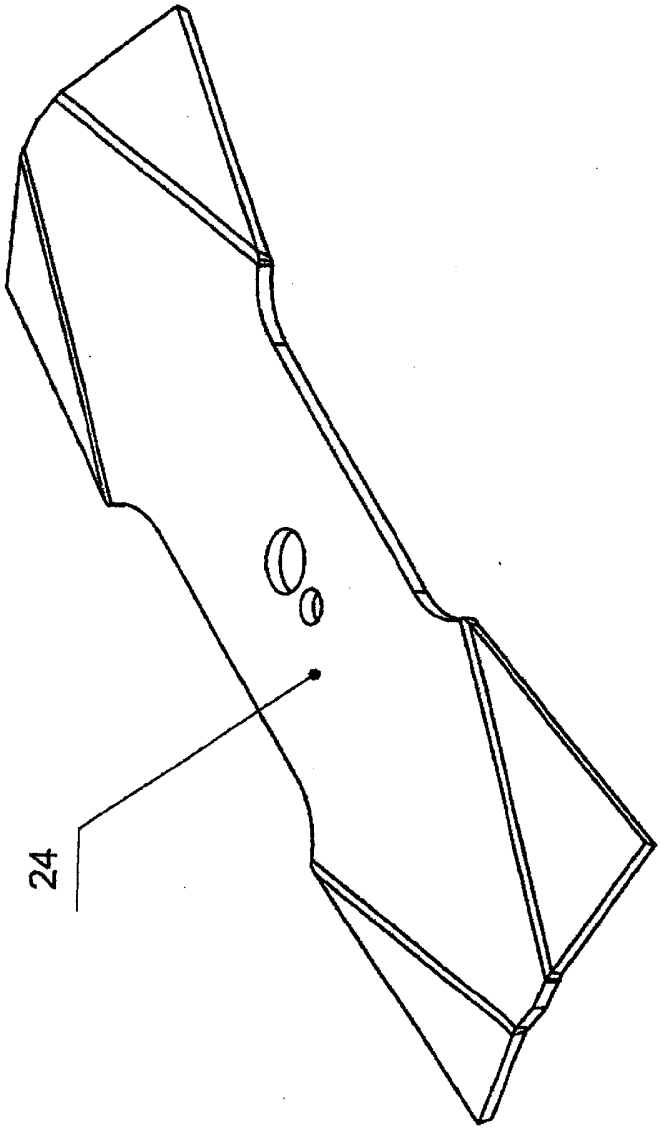

Fig. 8

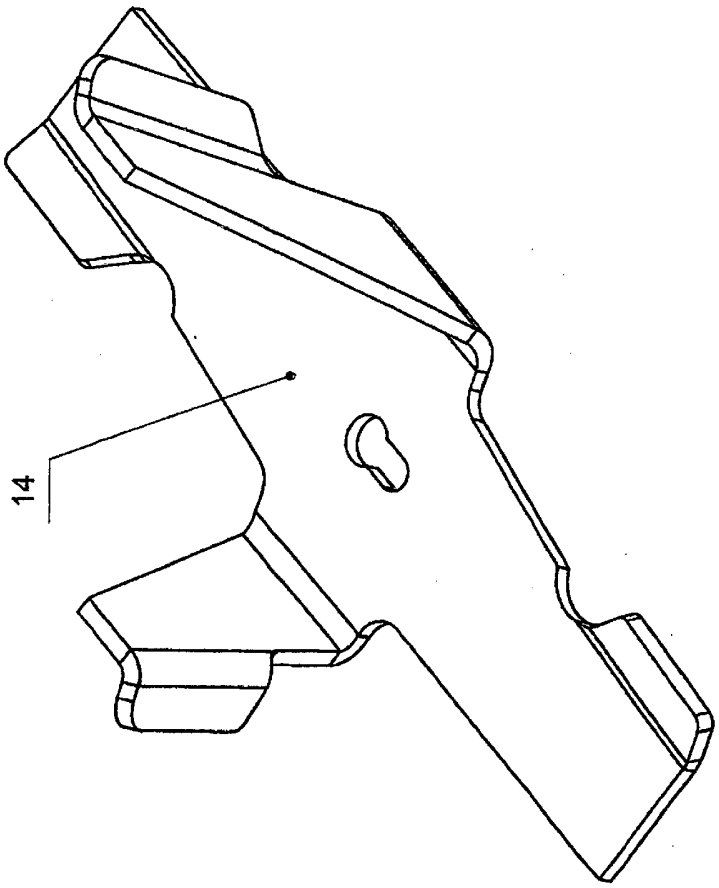

Fig. 9

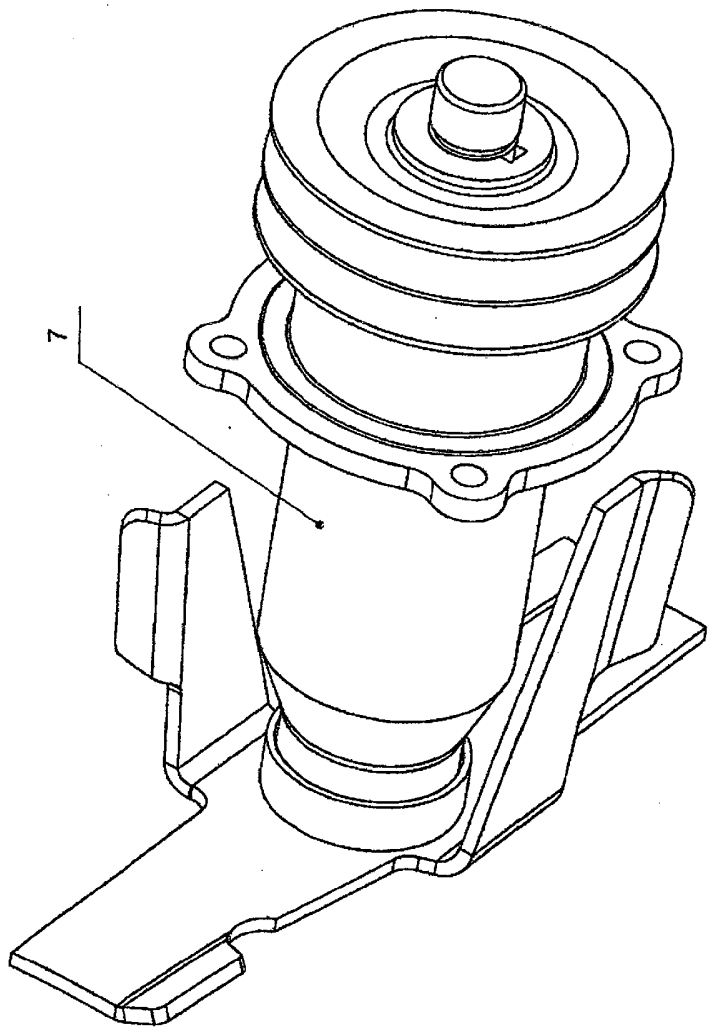

Fig. 10

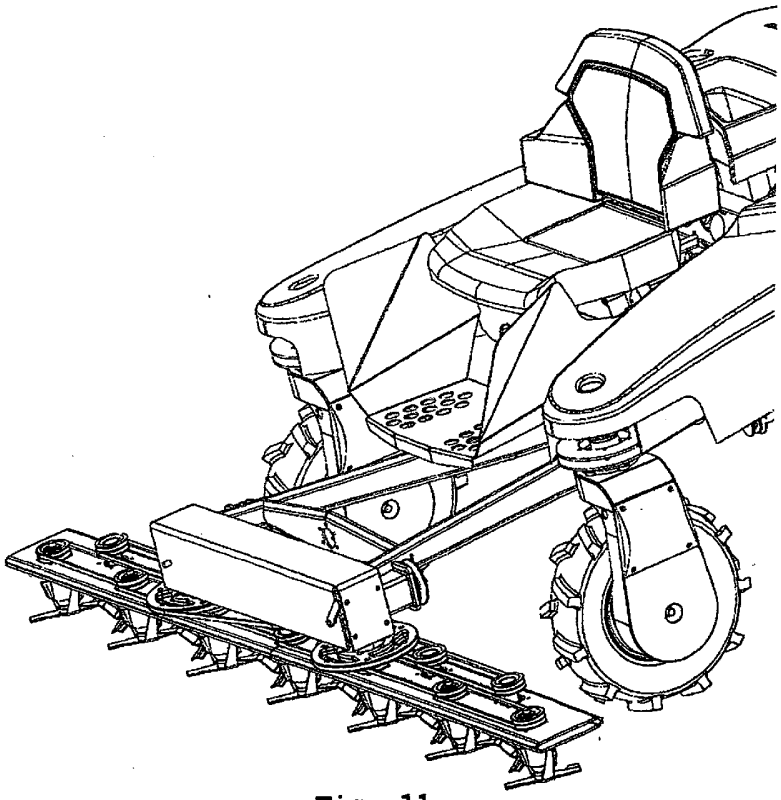

Fig. 11

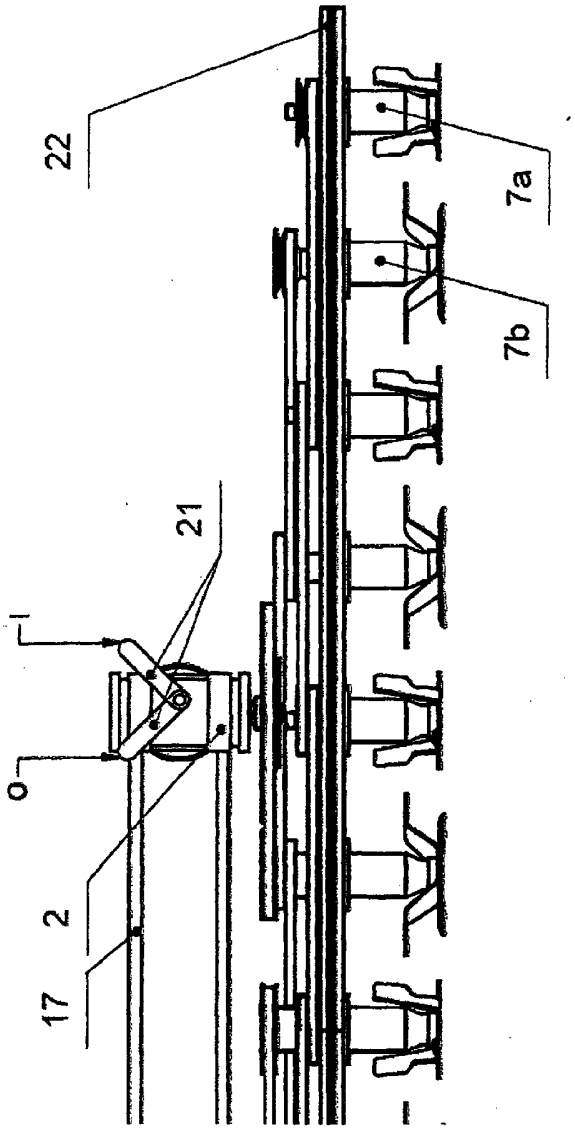

Fig. 12