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(54) **Ground crushing and screening device for a bucket, a fixed screen or other, and relative bucket or fixed screen**

(57) Ground crushing and screening device for a bucket (12), of a fixed screen or other, comprising a blade (10) having first constraint end (42) to be keyed to a rotating roller (28), a second end (44) opposite the first end (42), and an intermediate connection body (46) between the first end (42) and the second end (44), which has a development in a substantially linear direction (L), in use directed radially with respect to the roller (28) on which the blade is keyed. The second end (44) of the blade has a fragmentation profile inclined backward with respect to a direction of rotation (F) of the roller (28) having at least a segment (48) inclined by a desired first acute angle ($\alpha 1$) with respect to the direction (L) of development of the intermediate body (46).

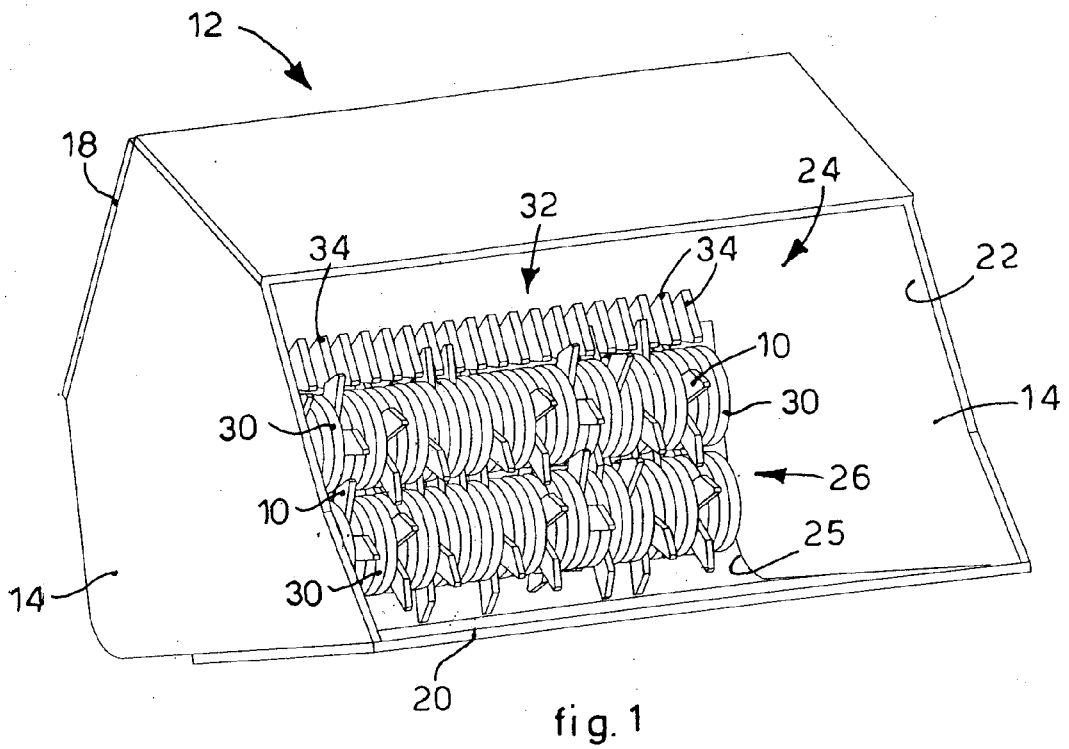

fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a ground crushing and screening device, for example used in a bucket or a fixed screen, a ground milling and grinding machine, such as for example hydro-millers or other, and the relative bucket or fixed screen. In particular, the present invention allows to obtain a fine fragmentation and desired screening of the ground treated, even damp and clayey ground.

BACKGROUND OF THE INVENTION

[0002] The European patent application EP-A-2.236.678, in the name of the present Applicant, discloses a bucket for treating earth coming from an excavation, which is provided with screening means and dosing means to deliver a desired quantity of binding material, typically in powder form, for example calcium oxide and cement, into the ground being treated, in order to stabilize it. The action of the screening means allows to separate the stones from the excavated ground and also to have a uniform distribution of the binding material in the ground.

[0003] Standard screening buckets are normally provided with screening means formed by a plurality of co-rotating parallel rollers, on each of which screening discs are keyed, disposed with a pitch between one and the other correlated to the desired screening value to be obtained. On each roller, between the discs, fragmentation elements are keyed, also called hammers, shaped as a parallelepiped, the function of which is to move the material to make it emerge through one interspace and the next between the discs, downward. The hammers cooperate with an oblong element that functions as a counter-hammer, typically comb-shaped, disposed on one side, parallel to the rollers, to fragment the material.

[0004] It is known however that, with standard screening buckets as above, it is not possible to work efficiently on damp ground with a high plasticity, for example ground with a humidity higher than 25% in weight, with a mainly clay matrix, that is, with a plasticity index of more than 10. By plasticity index we mean the difference between the liquidity limit and the plasticity limit defined by the Atterberg limits.

[0005] Indeed, when treated with the standard screening means as above, grounds of this type tend to obstruct the screening means, causing a drastic reduction in productivity. There are also fragmentation rollers, not screeners, on which only hammer-type fragmentation elements are keyed. In this case, a good fragmentation of very plastic grounds is also obtained, but the fragmentation obtained is not fine, that is, fragments are obtained with a nominal dimension of more than about 70-100 mm, whereas a fine fragmentation required, in order to cooperate effectively with the binding material as above, must normally be below about 20-30 mm.

[0006] Screening rollers are also known on which star-type blades are keyed, that is, with a plurality of lobes which, however, do not have a good fragmentation capacity with damp or clayey grounds, although they do have a fine screening capacity for dry grounds or with a mainly sandy matrix.

[0007] Screening means of the "stellar" type are also known, usually made of wear-resistant plastic material, particularly effective in treating composts and grounds with a high, vegetable component, but in this case too, with a limited fragmentation capacity with regard to highly plastic grounds.

[0008] FR-A-2.423.263 describes a crushing machine to recover metals from different materials and provided with a plurality of knives or blades.

[0009] DE-A-3345299 describes a milling machine with rotating blades to mill the ground.

[0010] US-B-7,007,877 describes a screening apparatus to screen particulate material having a frame with a bottom aperture for the passage of the particulate material screened, and a plurality of blades supported by the frame.

[0011] Purpose of the present invention is to achieve a ground crushing and screening device, for example for a bucket, a fixed screen or other, and a relative bucket or fixed screen, which allow to obtain a good fragmentation capacity of the ground even with regard to damp and clayey grounds, and also a fine fragmentation of the ground, so as to obtain nominal dimensions of the fragments of ground treated of less than about 20-30 mm.

[0012] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

[0013] Unless otherwise defined, all the technical and scientific terms used here and hereafter have the same meaning as commonly understood by a person with ordinary experience in the field of the art to which the present invention belongs. In the event of conflict, the present application shall prevail, including its definitions.

[0014] The word "comprise" and variants of the word such as "comprises" and "comprising" are used here to indicate the inclusion of a clearly expressed whole or clearly expressed wholes but not the exclusion of any other whole or any other wholes, unless in the context or in use an exclusive interpretation of the word is required.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0016] In accordance with the above purpose, a crushing and screening device for a bucket, a fixed screen or other, comprising at least a blade, or knife, that has a first constraint end to be keyed to a rotating roller of the

crushing and screening device, a second end, opposite the first end, and an intermediate body connecting the first end and the second end, which develops in a substantially rectilinear direction, in use directed radially with respect to the roller on which the blade is keyed.

[0017] According to one feature of the present invention, the second end has a fragmentation profile inclined backward with respect to a direction of rotation of the roller, having at least a segment inclined by a desired first acute angle with respect to the direction of development of the intermediate body, which allows a fine fragmentation even of damp grounds, with a high plasticity index, for example grounds with a humidity higher than 25% in weight, with a mainly clay matrix, that is, having a plasticity index higher than 10, defined as the difference in the Atterberg limits of liquidity and plasticity.

[0018] At the same time, the geometry of the blade is such as to allow to separate, that is, to screen, large size elements, such as stones or other. In fact, erratics with a nominal size of less than about 20-25 mm pass through the screening means, whereas those with sizes comprised between about 20-25 mm and a size of double this, are fragmented and reduced to the screening sizes. Larger size elements are retained in the bucket, the fixed screen or other, and possibly discharged at the end of treatment. According to some embodiments, the profile is formed by at least two segments, a first segment that extends from the intermediate body inclined by the desired first acute angle, and a second segment, which extends from the first segment inclined by a desired second angle, bigger than the first angle, which may be acute, right or obtuse, according to requirements to define a section that progressively narrows from the intermediate body toward the second end. According to some embodiments, at least the second end of the blade is coated with a hardening material. In this solution, the second coated end consequently has a substantially continuous curvilinear, pointed or beveled profile. For example, the curvilinear profile is shaped like a saber.

[0019] According to a variant, the blade is made of metal and can be subjected to a heat treatment or surface hardening, for example tempering, case-hardening or suchlike.

[0020] In other embodiments, the fragmentation profile may have at least one, preferably two or more buttons or cutters consisting of hard metal inserts, which protrude from the shape described above and thus increase the fragmentation effect of the blade.

[0021] Other embodiments may provide that the fragmentation profile of the second end is in itself substantially curvilinear, pointed or beveled, and facing backward, for example in the shape of a saber.

[0022] According to another feature of the present invention, the crushing and screening device, for example for a bucket, a fixed screen or other, comprises:

- at least a roller on which a plurality of screening discs are keyed at a desired first distance with respect to each other, defining relative first seatings with respect to each other, and a plurality of fragmentation elements. Each of the fragmentation elements is disposed, according to a desired frequency and reciprocal angular position, in a respective one of the first seatings delimited by said discs;
- a contrasting member of the oblong type, disposed parallel and in proximity with respect to said at least one roller, to cooperate with said fragmentation elements.

[0023] According to the present invention, each of the fragmentation elements of the roller is made like the blade as discussed above.

[0024] Furthermore, the contrasting member comprises a plurality of counter-blades, disposed at a desired second distance with respect to each other, in some embodiments substantially coinciding with the first distance between the discs, so as to define second seatings into which the discs are inserted.

[0025] In particular the counter-blades are disposed in a position coordinated with the screening discs to cooperate with the blades, and each has at least a contrasting wall shaped inclined in correlation, advantageously symmetrical, with the inclination of an associated blade, so as to define, during use, when the associated blade is inserted into the relative second seating, a third angle, between the blade, in particular in some embodiments, the second segment of the blade and the contrasting wall of the counter-blade, comprised between about 80° and about 100°.

[0026] in this way, the elements in the ground, generally stones and other stone aggregates, with a nominal size smaller than the distance at which the discs and the counter-blades are located with respect to each other, pass through the device and are expelled downward from the bucket, whereas elements with a bigger nominal size are repelled by the cooperation between blade and counter-blade having the specific and reciprocal inclination, toward the inside of the bucket, thanks to a sort of "flipper" effect, thus obtaining the desired screening effect.

[0027] Furthermore, the presence of the blades and counter-blades as described allows to carry out an effective fragmentation even of damp and clayey grounds, as indicated above.

[0028] In some variant embodiments, each counter-blade has a crushing portion with a length correlated to the desired screening size to be obtained; the crushing portion is configured to cooperate with a mating face of a corresponding blade, so as to crush or screen objects such as stones, erratics, stone aggregates or other, with a nominal size smaller than said length, and to reject objects with a nominal size larger than said length, in particular more than double said length.

[0029] With the present invention therefore, a good screening capacity is maintained, with regard to stones or stone aggregates of bigger sizes. For example, when the distance between the discs of the crushing and

screening device and the relative counter-blades, that is, a length of the crushing portion, is about 20-25 mm, the size of the erratics screened is about double, that is, between about 40 mm and 50 mm, whereas the stones comprised between the two measurements are crushed. The present invention also concerns a bucket or a fixed screen comprising a crushing and screening device as described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a bucket comprising a crushing and screening device according to the present invention;
- fig. 2 is a partly sectioned perspective view of the bucket in fig. 1;
- fig. 3 is a perspective view of an enlarged detail of part of the crushing and screening device according to the present invention;
- fig. 4 is a partial section of fig. 3;
- fig. 5 is a lateral view of the detail in fig. 3;
- fig. 6 is another perspective view of the detail in fig. 3;
- figs. 7 and 8 are schematic representations of the functioning of a blade of the device according to the present invention;
- figs. 9 and 10 are a lateral and a front view of a variant embodiment according to the present invention.

[0031] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0032] With reference to figs. 1 and 2, a bucket 12 according to the present invention is used to screen, or riddle, and fragment the ground resulting from excavations and comprises, for example, two lateral walls 14, a rear wall 18, a lower wall 20 that define a loading mouth 22 to access a loading compartment 24 delimited internally. At the lower part, the rear wall 18 and the lower wall 20 delimit a discharge opening 25 from which the treated ground comes out.

[0033] Typically, when the bucket 12 is lifted and the plane of the loading mouth 22 is substantially horizontal with respect to the plane on which the machine for moving the bucket 12 lies, the ground from the excavations is introduced into the loading compartment 24 and is screened, or riddled, fragmented and advantageously mixed with binding materials, and then comes out through the discharge opening 25.

[0034] To this end, a crushing and screening, or riddling, device 26 is housed in the loading compartment 24 and comprises at least a roller 28 able to be rotated around its longitudinal axis X (arrow F in figs. 3 and 5) by motor means of a known type and not shown in the attached drawings. The rollers 28 according to the present invention are configured to be co-rotating in the direction of the arrows F one with respect to the other.

[0035] The drive means are such that the rotation of the rollers 28 is reversible, in order to discharge the material separated.

[0036] In some advantageous embodiments, a plurality of rollers 28 are provided, in this case two, which develop along relative longitudinal axes X, in this case disposed aligned in the direction of greatest development of the bucket 12, even though, in variants not shown here, they could be disposed in the direction of least development of the bucket 12, that is, in a position rotated by 90°.

[0037] In the case where there are a plurality of rollers 28, according to the invention they are configured to rotate in the same direction, that is, they are co-rotating around the respective longitudinal axes X (arrows F in figs. 3 and 5).

[0038] Hereafter the description will be made with reference to two rollers 28 aligned in the direction of greatest development of the bucket 12, as in figs. 1 and 2, even though the same considerations apply to a single roller, or more than two rollers, also rotated by 90°.

[0039] A plurality of screening, or riddling, discs 30 are keyed onto each roller 28, all of which have the same diameter, disposed at a desired cadence, correlated to the screening effect to be obtained, along the longitudinal axis X.

[0040] Furthermore, a plurality of fragmentation blades, or knives, 10 are also keyed onto each roller 28, with a desired pitch along the longitudinal axis X of the same roller 28.

[0041] In particular, the discs 30 of each roller 28 are reciprocally disposed at a distance D1 (fig. 3) correlated with each other at the desired screening size to be obtained, and therefore at the average nominal size of the elements, stones or other stone aggregates in the excavated ground, which can pass through the device 26. In particular, the distance D1 is suitably sized to allow the passage and screening of elements with a nominal size less than about 20-25 mm, whereas those with sizes comprised between about 20-25 mm, and a size about double, are crushed and reduced to the screening size. Elements of a greater size are retained inside the loading compartment 24 of the bucket 12.

[0042] The spacing between one disc 20 and the other defines first seatings 29 (fig. 3) into which the blades 10 are inserted, advantageously welded or constrained in some other way, to the roller 28 (fig. 4).

[0043] Along a larger side of the discharge opening 25, downstream of the direction of rotation of the rollers 28 and on the rear wall 18, a contrasting member 32 is disposed, in substantial proximity to one of the rollers 28,

to cooperate with the discs 30 and the blades 10 so as to obtain a fine crushing of the ground treated.

[0044] In particular, the contrasting member 32 has an oblong conformation that develops parallel to the longitudinal axis X of the rollers 28 and is provided with a plurality of counter-blades 34 disposed at a second distance D2, one with respect to the other, correlated to the desired screening effect to be obtained, advantageously the same as the first distance D1 (fig. 4). The spacing between one counter-blade 34 and the next defines a comb-shaped configuration in which there are second seatings 35, into which facing blades 10 are inserted of the roller 28 closest to the contrasting member 32 when it is made to rotate in the direction of the arrow F.

[0045] In some embodiments, each counter-blade 34 is formed by a metal blade, for example parallelepiped, in this case with a triangular base (figs. 3, 4, 5 and 6), and has a first face, in this case a lateral face of the parallelepiped, which defines a contrasting wall 38 defining a direction P which cooperates, in normal use, with the blades 10 along a desired abutment plane with a direction Q to crush and screen the resultant ground, as explained more fully hereafter in the description.

[0046] Furthermore, each counter-blade 34 has a second face defining a crushing profile 39, also intended to cooperate with the blade 10. The portion 39 has a length L3 (figs. 7 and 8) correlated to the size of the stones or erratics to be crushed, advantageously comprised between about 20 mm 25 mm.

[0047] According to the present invention, each blade 10 has a cutting profile which comprises a first end 42, which is constrained to the roller 28 as indicated above, a second end 44, in the opposite position to the first end 42, and an intermediate body 46 connecting the two ends 42, 44, with a flat face 46a able to cooperate with the portion 39 of the corresponding counter-blade 34.

[0048] The intermediate body 46 develops along a substantially rectilinear direction L, that is, radial to the longitudinal axis X of the relative roller 28.

[0049] The second end 44 has a fragmentation profile inclined backward with respect to the direction of rotation F of the roller 28. In particular, the second end 44 has at least a first segment 48 that develops from the face 46a of the intermediate body 46 in a desired direction Q inclined by a determinate first acute angle $\alpha 1$ with respect to the radial direction L so as to define a section progressively narrowing from the intermediate body 46 toward the second 44. In some embodiments, the first angle $\alpha 1$ has an amplitude comprised between 30° and 50°, preferably between 35° and 45°, for example about 40°.

[0050] The inclination of the first segment 48 with respect to the face 46a, because of the way it is defined, determines an inclined conformation facing backward with respect to the direction of rotation F which, as explained more fully hereafter, allows to repel, toward the inside of the bucket 12, the elements such as stones or other stone aggregates, indicated schematically by dashes and denoted by S in fig. 5, which would otherwise be trapped between blade and counter-blade in the case of a rectilinear configuration or inclined facing forward, impeding the rotation of the rollers 28 and generating peaks of stress in the drive members that reduce their useful working life.

[0051] In this case, the second end 44 also has a second segment 50, which develops from the first segment 48 and closes again on the intermediate body 46, inclined by a second angle $\alpha 2$ with respect to the radial direction L. The second angle $\alpha 2$ can be substantially a right angle, as in the attached drawings, or it can be acute, or even obtuse, according to need.

[0052] In some embodiments, the external surface of the blades 10, in particular at least the second end 44, is coated with a hardening material, so that a substantially continuous curvilinear profile is obtained, for example like a saber facing backward with respect to the direction of rotation F.

[0053] In other embodiments, the blade 10 may have inserts made of hard metal and also a cutting profile that develops along a broken line. For example, in figs. 9 and 10 a blade 10 is shown provided with a first insert 51 made of hard metal, disposed embedded in the flat face 46a, and a second insert 53 made of hard metal, disposed in the first segment 48. In the solution shown as an example embodiment, the second insert 53 is partly embedded in the upper end of the first segment 48, protruding from it with a part that develops inclined by a desired forward angle in the direction of rotation F of the roller 28 with respect to the inclination of the flat face 46a described above, that is, with a smaller amplitude than the first angle $\alpha 1$ with respect to the radial direction L, but with the fragmentation profile still remaining, all in all, inclined backward with respect to the direction of rotation F of the roller 28. In this embodiment, the second segment 50 extends inclined downward from the second insert 53 so as to close the profile on the intermediate body 46, with a second angle $\alpha 2$ which, in the solution shown here, is obtuse.

[0054] In other embodiments, each blade 10 can be shaped directly during its production step with a curvilinear, pointed or beveled shape, facing backward.

[0055] Advantageously, the inclination at least of the first segment 48 of the second end 44 is correlated to that of the contrasting wall 38, so as to define a third angle β between direction Q and direction P (fig. 5) when the blade 10 enters into the relative second seating 35 which has an amplitude comprised between about 80° and 100°, preferably between about 82.5° and about 95°, for example 85°.

[0056] Due to this reciprocal geometric configuration of the blades 10 and counter-blades 34, the elements S, as described above, if they have a nominal size less than the distance D1 or D2, can either be fragmented or they can pass through the device 26, in particular through the first 29 and second seatings 35, and expelled from the discharge opening 25; otherwise they are pushed back inside the bucket 12 by the cooperation between the

blade 10 and the contrasting wall 38 of the relative counter-blade 34 or, if the roller 28 does not cooperate with the contrasting member 32, by the cooperation between two two discs 30 of the relative other roller 28 and the blade 10.

[0057] In particular, the compression forces exerted by the first segment 48 and by the contrasting wall 38 are split up, breaking into the two equal and opposite components and adding up to the other two components, determining a thrust on element S that is made to flip (flipper effect) toward the inside of the loading compartment 24, where it remains until the treatment of the ground is completed and the direction of rotation of the rollers 28 can be inverted, suitably discharging the separated stone material of sizes above the screening size.

[0058] In this way, by suitably sizing the distances D1 and D2, which are preferably coincident, it will be possible to obtain the desired screening size, advantageously with nominal sizes less than 20-25 mm, and also to fragment the ground, even damp and clayey grounds.

[0059] The length of each blade 10 is just a little more than the diameter of the disc 30, so that each blade 10 protrudes from the relative disc 30 by a distance equal to a little more than the radius. In this way, when the blade 10 enters rotating into the first seating 29, faced by a relative adjacent roller 28, it substantially grazes the lateral surface of the roller 28, cleaning it of the treated ground possibly present in the first seating 29.

[0060] Furthermore, the fact that each blade 10 protrudes for a prevalent part from the roller 28 on which the ground is resting, determines the fragmentation capacity of the present invention, since the blade 10 hits the ground with a determinate speed, thrusting it toward the corresponding counter-blade 34.

[0061] In this rotational movement, the first segment of the blade 10, substantially consisting of the face 46a of the intermediate body 46 that is parallel or almost parallel to the axis of the blade 10, performs an advantageous fragmentation function in cooperation with the counter-blade 34, which has its portion 39 that is substantially parallel to the face 46a when the blade 10 enters into the corresponding second seating 35 (figs. 7 and 8). Whatever is present between the face 46a and the portion 39 is therefore crushed (fig. 7) according to the principle of a rotor crusher, unless the median radius of the stone or erratic exceeds length L3, advantageously comprised between 20 mm and 25 mm, of the portion 39. In this last case, the stone is only "pinched2 (fig. 8) in the lower part and thrust upward, assisted by the inclined sides 38, 48 of the counter-blade 34 and blade 10, according to the "flipper" effect as cited above.

[0062] The length L3 of the portion 39, preferably between about 20 mm and 25 mm, has been carefully selected by Applicant after experimental testing, verifying that a greater length would also allow to crush smaller stones, as in a crusher, but requiring a much greater force from the blade 10, and therefore a slower speed of rotation and lower productivity. On the contrary, a smaller length L3 would cause a lower force applied but also a drastic drop in the fragmentation capacity with regard to plastic grounds.

[0063] The disposition of the blades 10 shown in the attached drawings is such that there are two blades 10 in each first seating 29 between the discs 30, reciprocally angularly offset by a fourth angle γ with an amplitude comprised between about 60° and 70°.

[0064] The embodiment with two blades 10 for each first seating 29 is advantageous because, considering the direction of rotation of the rollers indicated by the arrow F, a first blade of a pair of blades 10 of a determinate roller 28 cleans the treated ground that can be trapped in a determinate angular sector of a first seating 29 directly facing another roller 28 downstream with respect to the direction of rotation indicated by the arrow F. The second blade of the pair of blades 10, instead, cleans a successive angular sector of the same first seating 29, obtaining a complete cleaning of the first seating 29 and thus improving the operating conditions of the device 26. In this way it is possible to use, for cleaning a roller 28, not only a first angular sector of an adjacent roller 28 rotating and carrying a blade 10 with it, but also a successive angular sector, carrying a second blade 10, exploiting a complete rotation of the adjacent roller 28 so as to clean the successive roller 28.

[0065] In the embodiment shown, the double blade 10 is formed by a single piece, suitably shaped to define the two blades and keyed to the roller 28.

[0066] Generally, the parts of the device 26, including the blades 10 and the counter-blades 34, are made of a metal resistant to the stresses envisaged in the applications in question.

[0067] In normal use, the bucket 12 is put with the plane of the loading mouth 22 horizontal and the ground to be treated is introduced inside the loading compartment 24.

[0068] The device 26 is simultaneously driven and the co-rotating rollers 28, thanks to the action of the discs 30 and the blades 10, determine the screening and fine fragmentation of the ground, into which a desired quantity of binding material is gradually introduced.

[0069] The co-rotation of the rollers 28 determines both the screening of the ground, assisted by the fragmentation effect of the blades 10, and also the advance of the material to be treated toward the contrasting member 32 where, thanks to the cooperation of the blades 10 and the counter-blades 34 as described above, the stone material is either crushed and screened, if it is smaller than the screening size set, or, if it is bigger, is rejected and, thanks to the "flipper" effect, kept inside the loading compartment 24 until, by inverting the rotation of the rollers 28, it is suitably discharged at the end of treatment.

Claims

1. Crushing and screening device for a bucket (12), a fixed screen or other, comprising:

- at least a rotating roller (28) on which a plurality of screening discs (30) are keyed at a desired first distance (D1) with respect to each other, defining relative first seatings (29) with respect to each other, and a plurality of fragmentation elements each of which is disposed, according to a desired frequency and reciprocal angular position, in a respective one of the first seatings (29) delimited by said discs (30);
- a contrasting member (32) of the oblong type, disposed parallel and in proximity with respect to said at least one roller (28), to cooperate with said fragmentation elements;

wherein each of the fragmentation elements of the at least one roller (28) is a blade (10) comprising a first constraint end (42) to be keyed to said at least one rotating roller (28), a second end (44) opposite the first end (42), and an intermediate connection body (46) between the first end (42) and the second end (44), which has a development in a substantially linear direction (L), in use directed radially with respect to the roller (28) on which the blade (10) is keyed, wherein the second end (44) has a fragmentation profile inclined backward with respect to a direction of rotation (F) of the roller (28) having at least a segment (48) inclined by a desired first acute angle (α1) with respect to the direction (L) of development of the intermediate body (46),

wherein, moreover, the contrasting member (32) comprises a plurality of counter-blades (34), disposed at a desired second distance (D2) with respect to each other, in order to define second seatings (35) in which said blades (10) are inserted, in a position coordinated with said screening discs (30) in order to cooperate with said blades (10), and each having at least a contrasting wall (38) shaped inclined in a correlated manner with the inclination of an associated blade (10), so as to define, in use, when the associated blade (10) is inserted in the relative second seating (35), a third angle (β) between the blade (10) and the contrasting wall (38) of the counter-blade (34), comprised between about 80° and about 100°,

characterized in that each counter-blade (34) has a crushing portion (39) having a length (L3) correlated to the desired screening size to be obtained, said portion (39) being configured to cooperate with a mating face (46a) of a corresponding blade (10), so as to crush or screen objects (S) such as stones, erratics, stone aggregates or other, with a nominal dimension lower than said length (L3), and to reject objects (S) with a nominal dimension bigger than or equal to said length (L3).

2. Device as in claim 1, **characterized in that** in each first seating (29) at least two blades (10) are disposed, offset with respect to each other by a fourth angle (γ) comprised between 60° and 70°.

3. Device as in claim 1 or 2, **characterized in that** the length of each blade (10) is a little more than the diameter of a relative screening disc (30).

4. Device as in any claim hereinbefore, **characterized in that** it comprises a plurality of rollers (28) disposed adjacent.

5. Device as in any claim hereinbefore, **characterized in that** the fragmentation profile of the second end (44) of the blade (10) is formed by at least two segments (48, 50), of which a first segment (48) which extends from the intermediate body (46) inclined by said desired first acute angle (α1), and a second segment (50), which extends from the first segment (58) inclined by a desired second angle (α2), bigger than the first angle (α1), to define a section which progressively narrows from the intermediate body (46) toward the second end (44).

6. Device as in any claim hereinbefore, **characterized in that** at least the second end (44) of the blade (10) is covered with a hardening material having a substantially continuous curvilinear, pointed or beveled profile.

7. Device as in any claim from 1 to 5, **characterized in that** at least the second end (44) is in itself substantially curvilinear, pointed or beveled and turned backward.

8. Device as in any claim from 1 to 5, **characterized in that,** along its development, each blade (10) has at least one, preferably two or more cutting edges or buttons consisting of inserts (51, 53) made of hard metal.

9. Bucket or fixed screen comprising a crushing and screening device as in any claim hereinbefore.

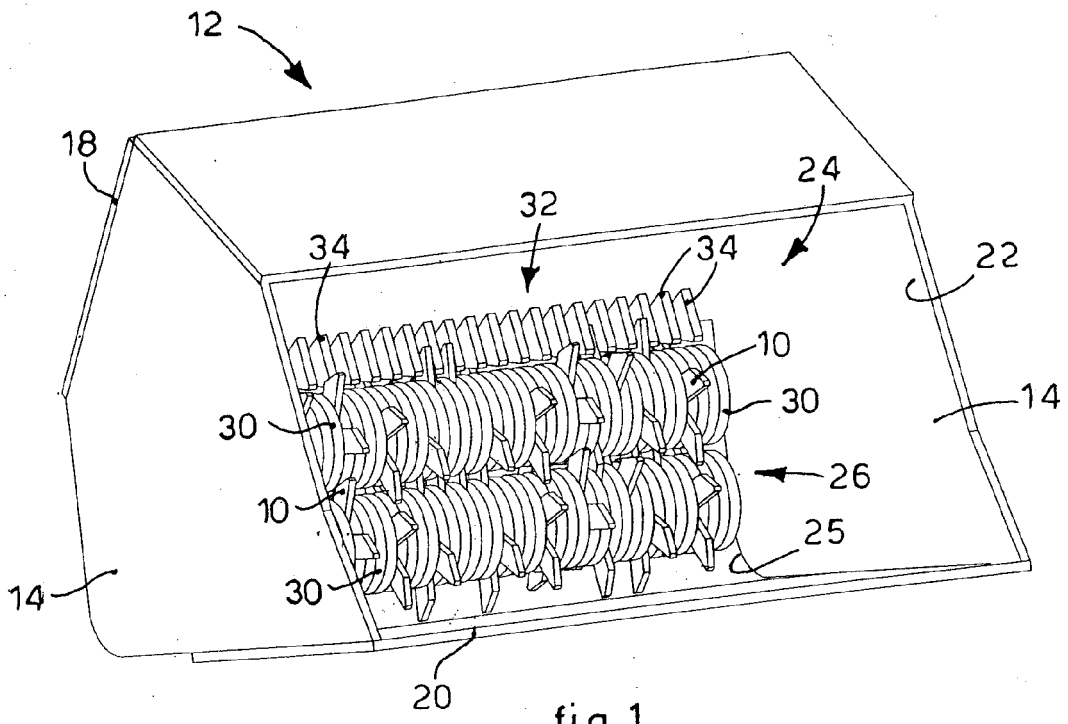
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fig. 1

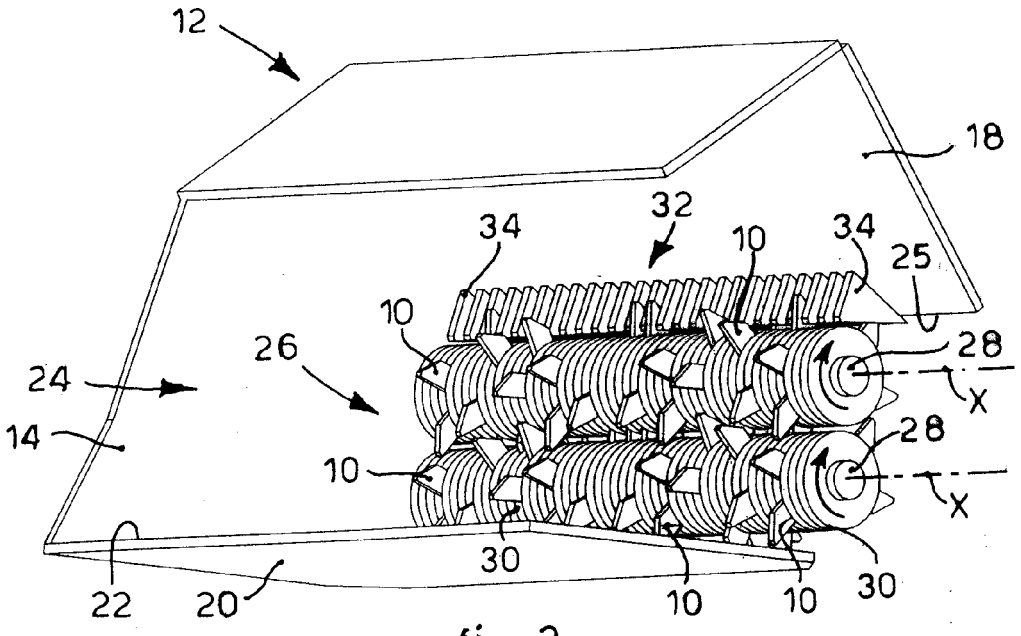
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fig. 2

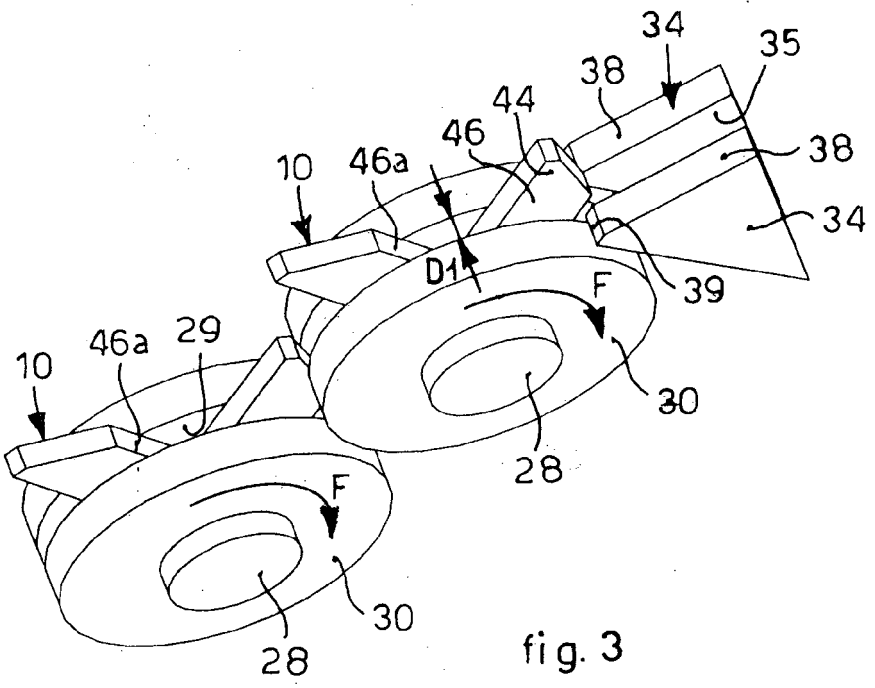
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fig. 3

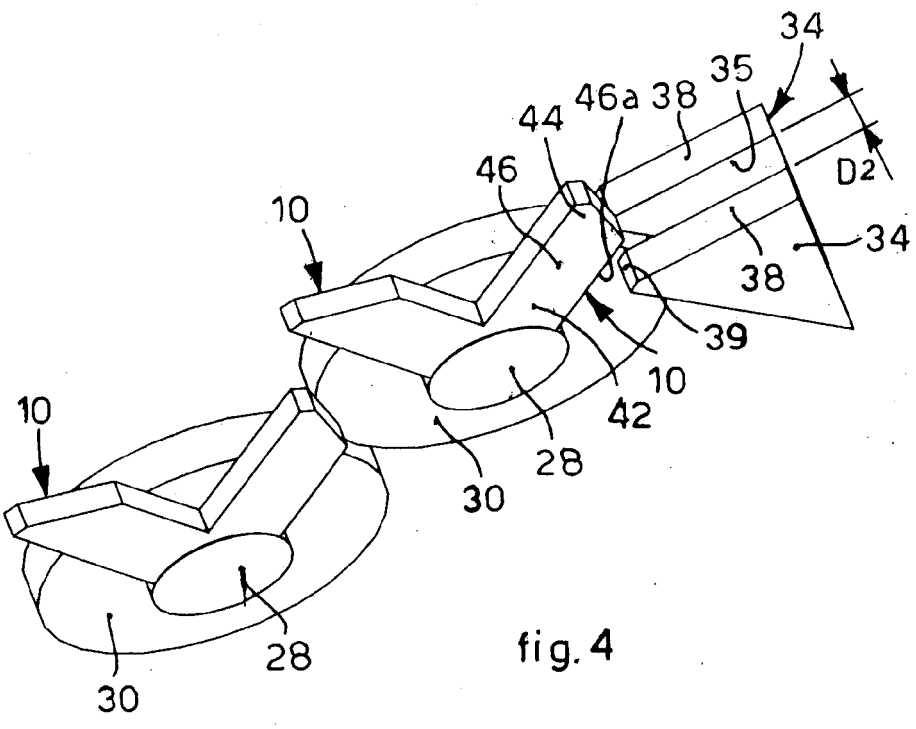
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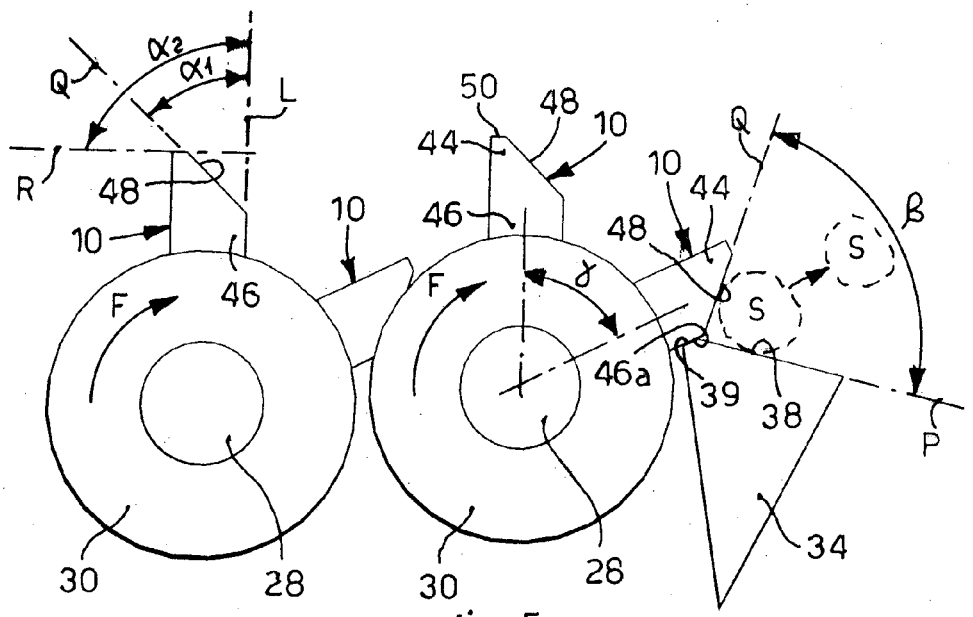
fig. 4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α1
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P
34

fig. 5

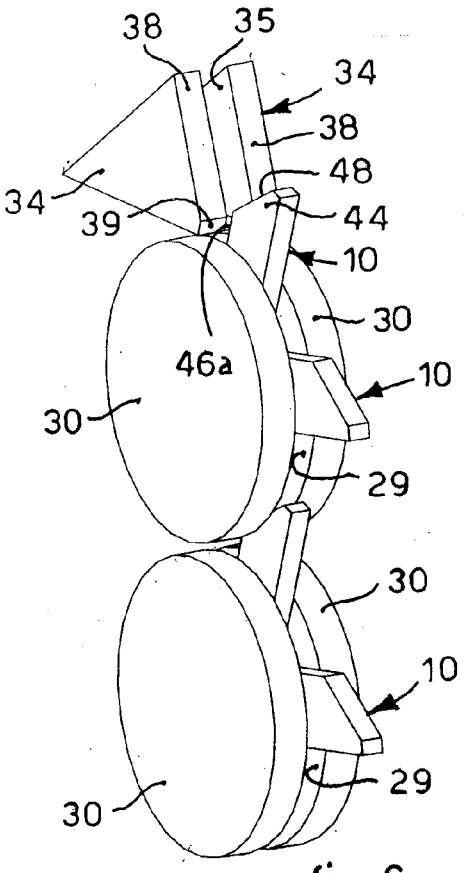
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fig. 6

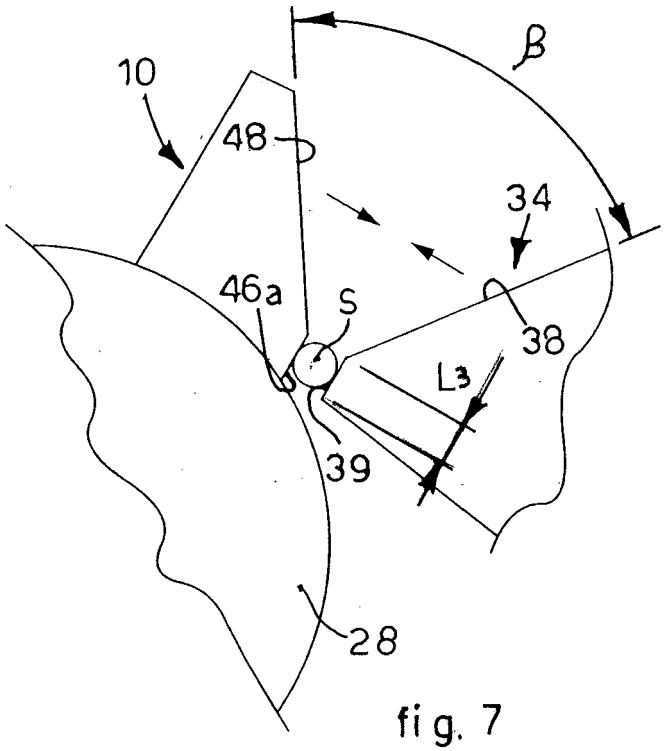

fig. 7

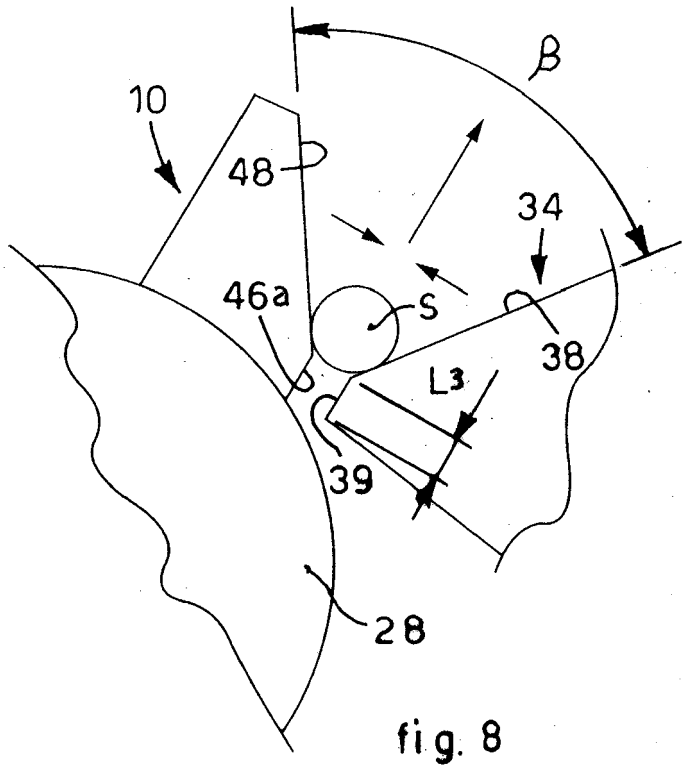

fig. 8

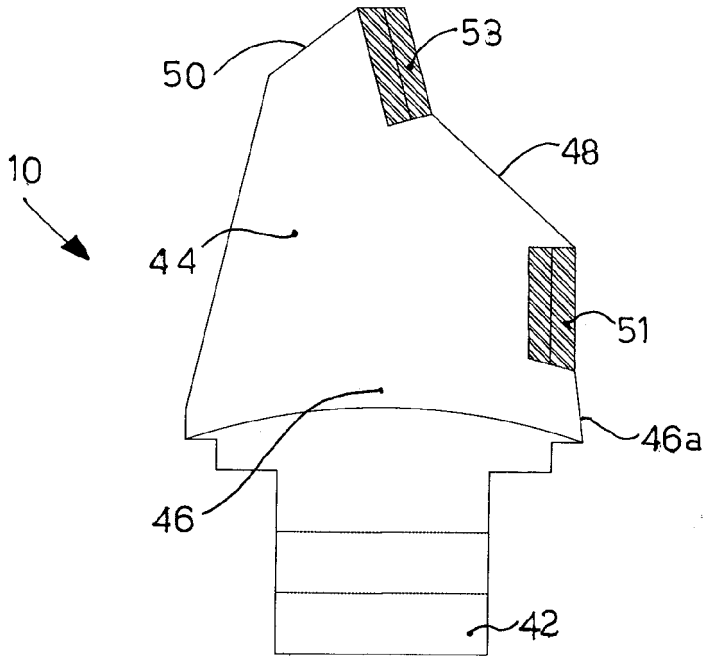

fig.9

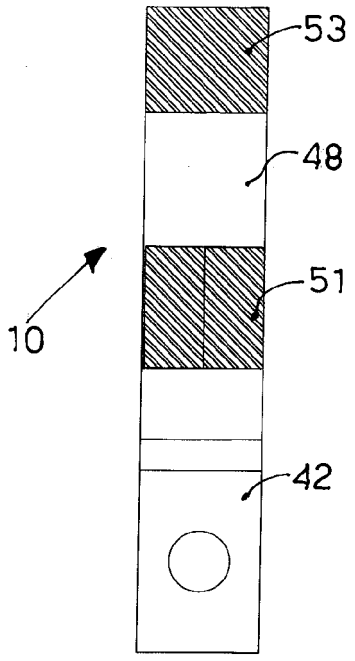

fig.10

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Application Number
EP 11 19 1108

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Place of search	Date of completion of the search	Examiner
Munich	13 March 2012	Laurer, Michael

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