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(71) Applicant *(for all designated States except US)*: MASCHIO, Antonio [IT/IT]; Via Marcello, 71, I–35011 Campodarsego (IT).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: BARATO, Paolo [IT/IT]; Via Zante, 10, Isola di Torre, I–35100 Padova (IT).

(74) Agent: BENETTIN, Maurizio; Via Sorio, 116, I–35141 Padova (IT).

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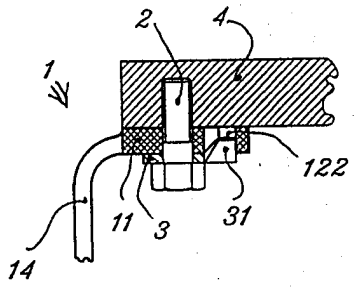
(57) Abstract

The invention is a new knife (1) for rotating harrows on vertical axles having notchings (12) on the connection part (11) placed from the normal position of the holes for the screws to one of the edges of said connection part (11). The knife (1) is assembled inserting it to "bayonet connection" between the fastening screwheads, which have been loosened, and the plain part of the rotor on which the knife (1) is fixed. The notchings (12) can have rectilinear, arcuate or stairs shape; the shape of the notchings (12) can, in combination with the bent stop plates (3) which are placed on the stairs of the notchings (12) or on the slots of the connection part of the knife (1), prevent the knife from unscrewing.



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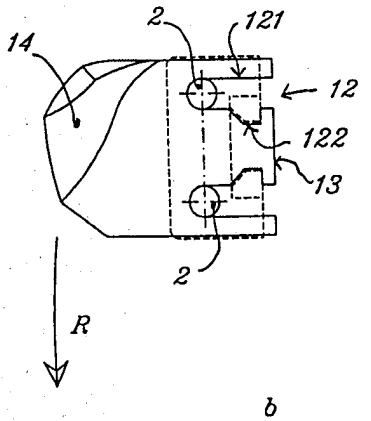

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DESCRIPTION

KNIFE FOR ROTATING HARROWS ON VERTICAL AXLES WITH QUICK COUPLING AND UNCOUPLING

The present invention relates the field of the agricultural machines and in particular it concerns rotating harrows to vertical axles.

At the present, rotating harrows to vertical axles receive the motion from the agricultural machine and, through an opportune transmission, they transfer the spin to a series of rotores to vertical axles provided with tools called knives.

The rotores generally consist of discs or flanges; the knives are provided with a working part (the blade of the knife) and a fastening part usually perpendicular to the working part.

Owing to the frequency and to the entity of the impacts and to the efforts to which the knives are subordinates during the working phase, a connection with the particularly rigid flange is required. Normally the knives are fixed to the flange of the rotor by means of screws with nuts; to such scope both the flange and the parts for fastening the knives are drilled to allow passage of said screws. The normal working phase demanded to the knives of a harrow involves a fast usury of the same knives, the more difficult is the land to work the faster the usury is.

In order to replace the worn knives it is necessary to clean the harrow, at least where the fastening screw of the knives are placed, to insert a wrench and a counter-wrench in the inner side of the rotor on the screw and on the fastening nut of the knife

placing around the protections of the screw and the nut. Then, it is necessary to unscrew completely each screw and put it in a safety place, to replace the worn knife with a new one, to reapply the screw and the nut on the flange and on the new knife, to tighten the screw and the nut strongly so as to assure firmily the knife to the flange. Apart from the general initial cleaning, the other necessary operations for the replacement of the knives take a long time for unscrewing and positioning the screw through the knife and in the hole of the flange and, in particular, screwing the screws on the flange involves the possibility to lose the screws and/or the nuts of fastening.

A common harrow is usually provided with many couples of knives so their replacement requires a long machine stopping which increases time of effective working of the land. In order to eliminate all the above mentioned inconveniences, it has been designated and implemented a new type of knife for harrows which can be assemblied and disassemblied quickly and safetely. The new knife for harrows can be used for forging or successive workings from laminated shape and is identical to well-known knives for harrows except for the fact that its part of connection is conformed for a "bayonet connection".

On the connection part of the new knife for harrows, in place of the holes for fastening screws, there are some notchings placed from the normal position of the holes for screws to one of the edges of the connection part. Such notchings can be right angle

shaped, arcuate shaped or stairs shaped or a combinations of all the above mentioned shapes; they mostly have radial direction from the connection part towards the center in respect to the sense of spin of the knife.

Substantially, the above mentioned notchings allow the connection and the disconnection of the knife between the flange and the screwhead, that is unscrewing a little the screws it is possible to unscrew the worn knife and to insert a new one.

When the screws are unscrewed the attachment part of the knife slides between the flange of the rotor and the screwhead while the body of the screws slides inside the notchings of said part of the attachment of the knife. When the body of the screws leans against the bottom of the notchings, the knife is exactly in the correct position to be used. In view of the forces acting on the knife, the screws are not sufficient to maintain the knife in the right position, so it is necessary, for example, to resort to particular means or devices such as a particular shape of notchings and/or stop plates. The stop plates are placed between the screwhead and the connection part, they are provided with tongues or edges or tooth-bended extremities so that they can be inserted in slots or profiles with stairs shape placed on the connection part of the knife.

When the fastening screws are tightened they screw tight also the stop plates, its tongues or tooth-bended extremities press on the slots or profiles of the connection part of the knife preventing

them from being unscrewed.

In case the locking of the unscrewing is due to the shape of the notchings, these must have a shape or a combination of shapes as to prevent the knife from having a contrary movement to the working phase spin and from having a spin around the posterior screw regarding the direction of spin.

In fact the forces of reaction of the land, which act on the knife, have both a component in inverse direction to the spin and a radial centrifugal component on the cutting edge the knife. The most relevant component turns out to be that one in inverse direction to the spin of the knife.

A new knife for harrows, as it has been exposed above, which allows to avoid the use of the nuts and to use only the fastening screws inserted in the threaded holes, eventually blind, of the bracket the rotor.

The new knife can be provided with shaped notchings or it can be prevented from unscrewing by means of a stop plate, in both cases it is always sufficient a slight unscrewing of the fastening screws of a such measure not to tighten the connection part of the knife and to remove the stop plate from it.

The time necessary for replacing the new knife is considerably reduced since it is not necessary to unscrew completely the screws, there is no possibility to lose screws and nuts since they are never removed from the flange of the rotor if not for periodic overhauls, and it is impossible that a knife can be unscrewed by

chance.

The following is just an example among many of a practical application of the invention in question, illustrated in the attached drawing.

The figures 1a and 1b show an example of the new knife (1) obtained from rolled shapes and following workings. The two views are respectively a partial vertical section and a bottom view. The "R" arrow shows the spin direction of the knife (1).

The connection part (11) of the knife (1) has two notchings (12) placed between the position of the screws (2) and the edge (13) of the connection part which is opposite to the blade (14); the notchings (12) have a linear side (121) and a stair or undercut shaped side (122). A stop plate (3, dotted in figure 1b) is placed between the screwhead (2) and connection part (11) of the knife (1). The stop plate is provided with two toothed tongues (31) placed on the stair or undercut shaped side (122) of the notchings (12).

When the fastening screws (2) are completely tightened they hold on the flange of the rotor (4) both the connection part (11) of the knife (1) and the stop plate (3); the toothed tongues (31) of the stop plate (3) are placed inside the stairs or undercuts (122) of the edges of the notchings (12).

In order to remove and replace the knife (1) it is sufficient to unscrew the screws (2) until the teeth (31) of the stop plate (3) release the stairs or undercuts (122) of the edges of the notchings

(12).

The figures 1a and 1b show a second example of the new knife (1) obtained from rolled shapes and following workings.

The two views are respectively a partial vertical section and a bottom view. The "R" arrow shows the spin direction of the knife (1).

The connection part (11) of the knife (1) has two notchings (12) placed between the position of the screws (2) and the edge (13) of the connection part which is opposite to the blade (14); in proximity of such edge (13) of the connection part (11), on the opposite surface to the flange of the rotor (4), a slot (15) is present.

A stop plate (3, dotted in figure 2b) is placed between the screwhead (2) and the connection part (11) of the knife (1). It has an edge (32) bent towards the flange of the rotor (4).

When the fastening screws (2) are completely tightened they hold on the flange of the rotor (4) both the connection part (11) of the knife (1) and the stop plate (3); the edge (32) of the stop plate (3) is placed inside the slot (15) of the connection part (11).

In order to remove and to replace the knife (1) it is sufficient to unscrew the screws (2) until the bent edge (32) of the stop plate (3) releases the slot (15) of the connection part (11).

In the figures 3a and 3b a further example of the new knife (1) obtained from forging is shown.

The connection part (11) of the knife (1) is provided with two

notchings (16a, 16p) placed between the position of the screws (2a, 2p) and the edge (13) of the connection part which is opposite to the blade (14).

In this example the two notchings (16a, 16p) have arcuate and/or multiarcuate shape which would be sufficient, by themselves, to prevent the knife (1) from unscrewing from the screws (2a, 2p) and from the flange of rotor (4).

In fact, as explained above, the notchings (16a, 16p) have to hold up both the friction of the land which make the knife (1) to reverse in the opposite direction to its spin (R), and the centrifugal force (L) due to the penetration of the blade (14) of the knife (1) in the land which make the knife (1) to rotate around the back screw (2p).

The friction of the land is hold up by both the notchings (16a, 16p) which are arranged in a perpendicular direction to the spin of the knife (1).

The particular arcuate shape with stairs (16s) of the front notching (16A) prevent the centrifugal force of the spin of the knife (1) around the back screw (2p).

In order to avoid the screwing out of the knife (1) it is possible to apply a stop plate (3, dotted in figure 3b) with bent tongues (33) on one or more of its edges so as to wind the connection part (11) of the knife (1).

When the fastening screws (2a, 2p) are completely tightened they hold in a safety way the connection part (11) of the knife (1) on

the flange of the rotor (4).

If also the stop plate (3) has been added it helps to assure that the knife (1) will not be unscrewed.

In order to remove and to replace the knife (1) it is sufficient to unscrew the screws (2a, 2p) until the knife (1) can be rotated aruond the front screw (a2) so that the back screw (2p) slides in the rear nothching (16p) and then the knife (1) can be unscrewd from the front screw (2a) through the front notching (16a).

If there is a safety stop plate (3) it is only necessary to unscrew a little more the screws (2a, 2p) and to proceed as explained in the previous paragraph.

The above are the basic outlines of the invention, on the basis of which the technician will be able to provide for implementation; therefore, any change which may be necessary upon implementation is to be regarded as completely protected by the present invention.

With reference to the above description and the attached drawings, the following claims are put forth.

CLAIMS

1. Knife for rotating harrows on vertical axles characterized in that it has notchings on the connection part placed from the normal position of the holes for the screws to one of the edges of said connection part.

2. Knife for rotating harrows on vertical axles according to claim 1, characterized in that the notchings have an arcuate shape and/or a stairs shape and/or combinations of arcs and stairs such to prevent the unscrewing of the knife in the opposite direction to the spin of the rotor and to prevent as well the spin of the knife around the posterior screw with respect to the spin direction.

3. Knife for rotating harrows on vertical axles according to claim 1, characterized in that it has stop plates placed between the screwheads and the connection part of the knife, and the said stop plates are provided with toothed bent tongues or edges so that they can be inserted in slots or sections with stairs placed on the connection part of the knife.

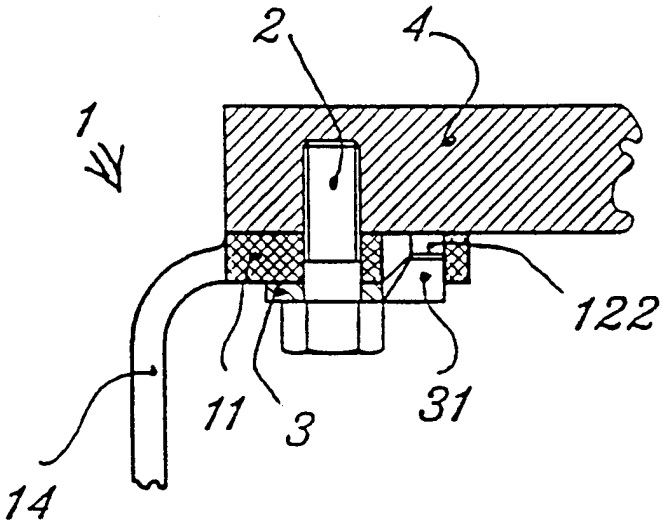

Fig. 1a

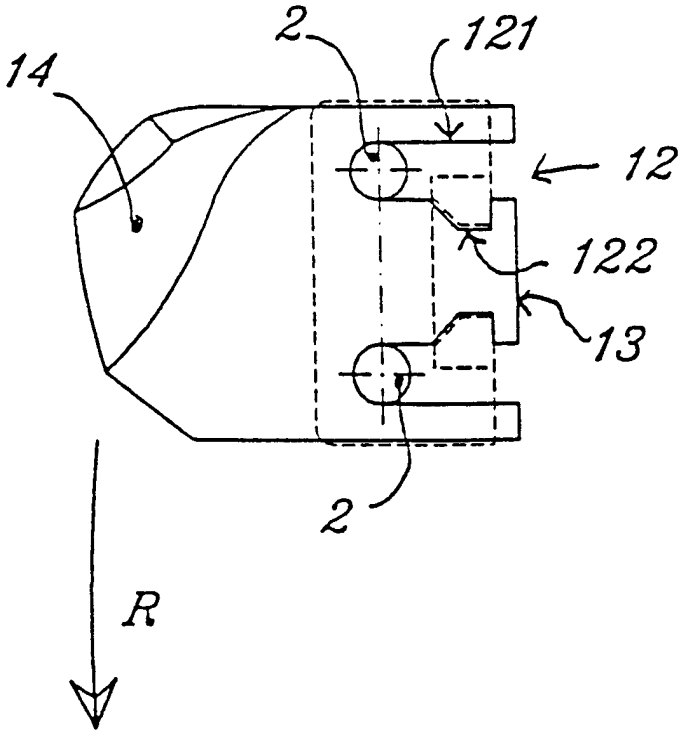

Fig. 1b

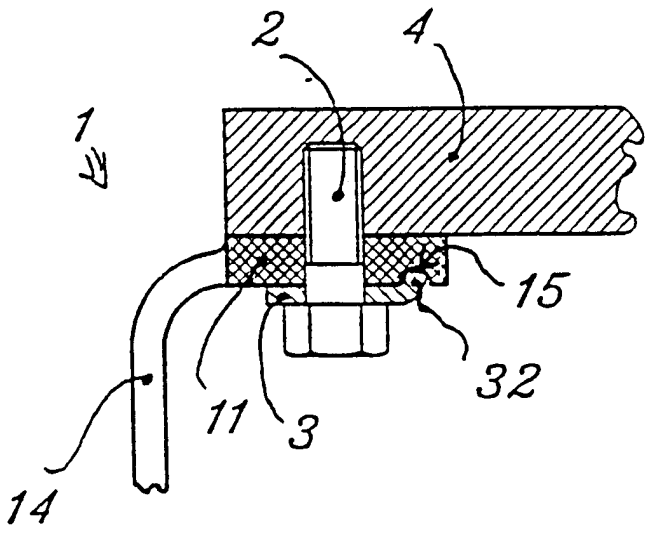

Fig. 2a

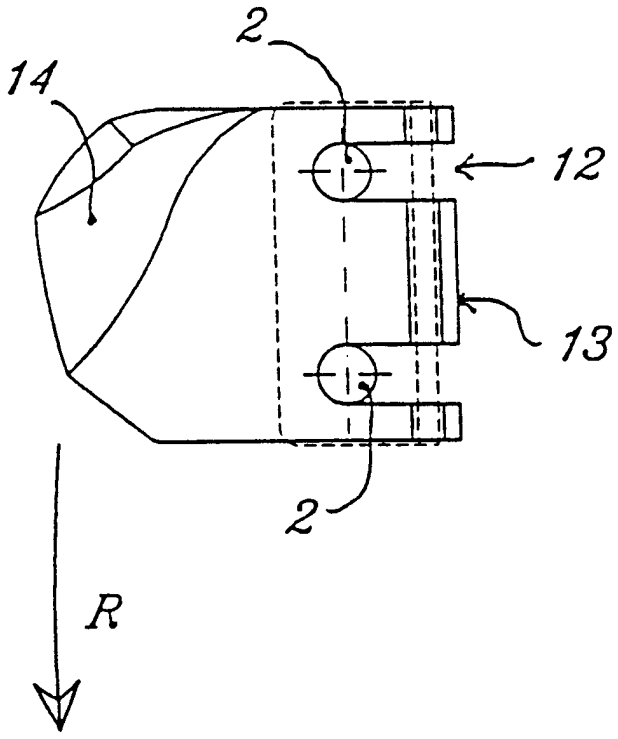

Fig. 2b

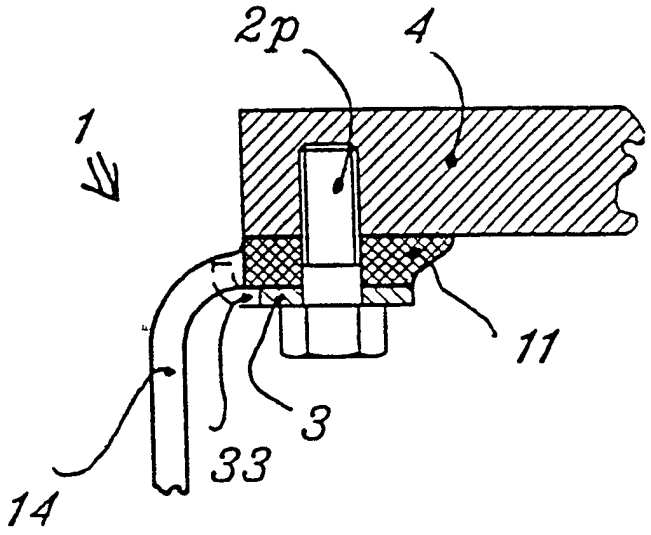

Fig. 3a

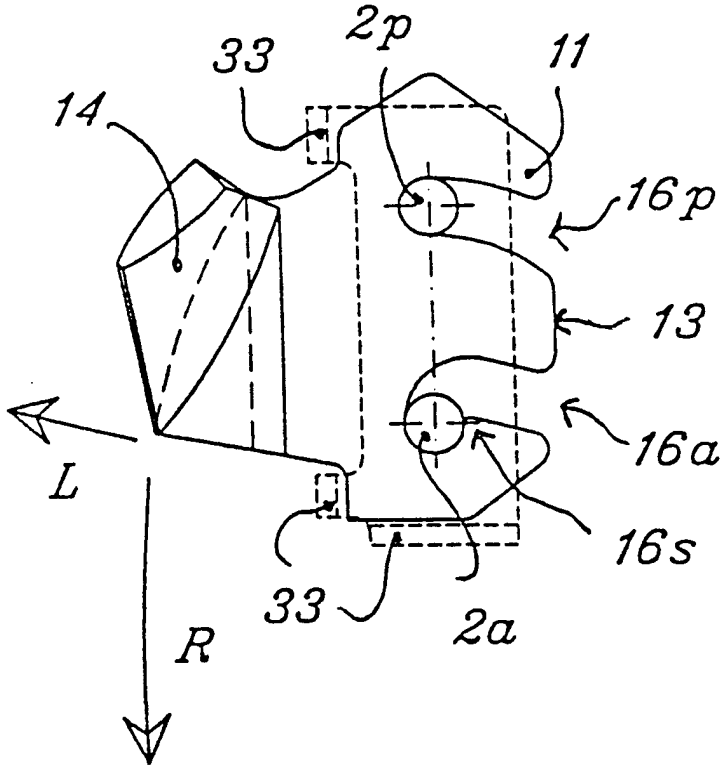

Fig. 3b

INTERNATIONAL SEARCH REPORT

Ir ational Application No
PCT/IT 98/00119

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01B33/14

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01B

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 330 295 A (HUARD) 3 June 1977 see page 1, line 1 - line 4; figures see page 1, line 35 - page 2, line 35	1-3
X	GB 2 200 826 A (DOWDESWELL) 17 August 1988 see abstract; figures see page 4, line 10 - line 15	1
A	FR 2 531 600 A (MAE) 17 February 1984 see page 1, line 1 - line 28; figures	1-3
A	DE 25 03 254 A (VAN DER LELY) 7 August 1975 see figures	1
A	EP 0 407 726 A (AMAZONEN-WERKE) 16 January 1991 see figures	1

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☒ Patent family members are listed in annex.

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