

Title of the invention: Cutting head for excavator, and corresponding excavator

Technical Field

5 [0001] The present invention relates to the field of soil excavation and cutting machines with rotary milling cutters, in particular for making trenches and diaphragm walls in the soil. More specifically, the present invention concerns the field of the cutting heads for such excavation machines.

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Prior Art

[0002] To make diaphragm walls, it is first necessary to dig a trench whose geometry corresponds to the wall to be made. Then, the trench is filled with grout or concrete possibly provided with reinforcement,
15 to obtain the diaphragm wall.

[0003] When the wall has a certain depth and must be made with high accuracy, excavation machines of the milling cutter type in which the cutting head is equipped with two rotary assemblies provided with excavation tools are most often used. These tools, under the effect of the
20 vertical thrust, disintegrate the soil or the rock, which produces significant amounts of cuttings. During the drilling operation, the trench is kept filled with drilling fluid. The drilling cuttings present in the drilling fluid are then discharged out of the trench through pumping.

[0004] One example is in particular described in document EP 1
25 486 620 in which a carrier, provided with a boom, comprises an excavation machine per se mounted at the end of suspension cables passing through the end of the boom. This excavation machine comprises a vertical frame at the lower end of which a cutting head is mounted. The cutting head essentially consists of two rotary cutting assemblies with horizontal axes of
30 rotation X-X' parallel to each other. Preferably, each rotary cutting assembly consists of two milling cutters or drums mounted symmetrically on the frame. The excavation machine also includes, for the purpose of bringing the cuttings to the surface, a suction inlet disposed at the lower end of the frame between the two rotary cutting assemblies, and a suction line
35 connecting the suction inlet to a suction device, for example a pump.

[0005] The excavation machine of document EP 1 486 620 comprises in particular a frame associated with a dismountable cutting head. The dismountable cutting head includes in particular the two rotary assemblies, with their associated motors, mounted on the lower part of a plate equipped with means for securing to the frame of the excavation machine. Such an excavation machine allows in particular for quick and easy replacement of the rotary assemblies of the excavation machine, thanks to the change of the cutting head, in order to be able in particular to adapt them to the type of soil to be dug.

[0006] However, such cutting heads, even if they remain easy to replace, remain difficult to modify by themselves. Particularly, due to the constraints related to the removable side of the assembly of the cutting head, their various means are not arranged appropriately and limit their dismounting or replacement, whether in the event of repair or adaptation to external constraints.

Disclosure of the invention

[0007] The present invention aims to solve the various technical problems stated above. Particularly, the present invention aims to propose an excavation machine that allows for quick and easy adaptation to different types of soil, while also facilitating the maintenance operations to be performed on the cutting head.

[0008] Thus, according to one aspect, a cutting head for an excavation machine for making vertical trenches is proposed, comprising:

- at least a first drum and a second drum positioned side by side, in the vicinity of each other and configured to rotate respectively about a first axis of rotation and a second axis of rotation, the first and second axes of rotation being different and extending substantially along a horizontal direction, and

- a support including an upper side and a lower side, the support being intended to be mounted, from its upper side, on a frame of the excavation machine, and the first and second drums being mounted on the lower side of said support,

- at least a first motor assembly and a second motor assembly, in particular hydraulic or electric motor assemblies, mounted on the upper side of the support and including respectively a first drive shaft and a second

drive shaft, said at least two drums being driven in rotation by said at least two motor assemblies, and

- means for mounting and dismounting the cutting head on the frame of the excavation machine, said mounting and dismounting means, particularly all the mounting and dismounting means, being mounted on the upper side of the support.

[0009] The mounting and dismounting means are positioned, in particular when the cutting head is viewed along said horizontal direction of the first and second axes of rotation, between the two planes defined respectively by the first drive shaft and said horizontal direction, and by the second drive shaft and said horizontal direction, for example between the two substantially vertical planes passing through said first and second axes of rotation.

[0010] Moreover, all the mounting and dismounting means are mounted, in particular fixed, on the upper side of the support. Thus, the cutting head is designed to allow easy access to its motor assemblies, while keeping its mounting and dismounting functions on the frame of an excavation machine. More specifically, the motor assemblies of the cutting head are positioned, on the cutting head, on either side of the mounting and dismounting means, that is to say on an upper side of the cutting head from which it is mounted on the frame of the excavation machine. The motor assemblies are in particular no longer positioned inside the corresponding drums, requiring a prior dismounting of the drum to access the motor assembly. The motor assemblies are therefore directly accessible after dismounting the cutting head, or even when the cutting head is mounted on the frame, the mounting and dismounting means being grouped, along with other means for interaction with the frame, in a central part on the upper side of the cutting head.

[0011] Preferably, the mounting and dismounting means are positioned, when the cutting head is viewed along said horizontal direction of the first and second axes of rotation, between said at least two motor assemblies.

[0012] Preferably, the mounting and dismounting means are provided between the two motor assemblies of the cutting head: the lateral ends on the upper side of the cutting head are therefore provided solely for the motor assemblies.

[0013] Preferably, the cutting head also comprises a suction inlet mounted between the first drum and the second drum. The mounting and dismounting means and an area of connection of the suction inlet are positioned, when the cutting head is viewed along said horizontal direction of the first and second axes of rotation, between said two motor assemblies.

[0014] Thus, the features cooperating with the frame of the excavation machine, namely the mounting/dismounting means and the area of connection of the suction inlet, are provided in the central part on the upper side of the cutting head, while the ends are occupied solely or mainly by the motor assemblies.

[0015] Preferably, the two motor assemblies are mounted on the upper side of the support so that the drive shaft, particularly rectilinear or straight, of each motor assembly intersects the axis of rotation of the corresponding drum.

[0016] In order to limit the mechanical linkages between the motor assemblies and the drums driven by said motor assemblies, the motor assemblies comprise a drive shaft, particularly rectilinear or straight, which intersects the axis of rotation of the corresponding drum. It is then sufficient to provide only a mechanical linkage between the drive shaft and the axis of rotation at the point of intersection, for example a bevel gear and/or one or more reduction gears, in particular planetary reduction gears.

[0017] Preferably, the drive shaft of each of the motor assemblies extends along a substantially vertical direction or inclined relative to the vertical direction.

[0018] In use, the excavation machine extends along a substantially vertical direction in order to make the trench: the cutting head is thus positioned under the frame, with an upper side of the support oriented above on the lower side. The motor assemblies are therefore positioned substantially above the corresponding drums, with the drive shafts extending along a substantially vertical direction or inclined relative to the vertical, while intersecting the axis of rotation of the corresponding drums.

[0019] Preferably, the drive shaft of each motor assembly extends in a plane substantially perpendicular to the axis of rotation of the corresponding drum.

[0020] Thus, in use, the drive shafts of the motor assemblies will extend in a substantially vertical plane, since the axes of rotation of the drums will be substantially parallel and horizontal. The drive shafts may be vertical or inclined relative to the vertical, while remaining perpendicular to the axes of rotation of the drums.

[0021] Preferably, the drive shafts of the motor assemblies extend in the same plane along secant directions such that the distance between the two drive shafts, at the level of the motor assemblies, is greater than the distance between the points of intersection of the drive shafts with the axes of rotation of the corresponding drums.

[0022] For example, the drive shaft of each of the motor assemblies may extend in a vertical plane along a direction inclined relative to the vertical, such that the distance between the two drive shafts decreases as moving downwards, that is to say as moving away from the motor assemblies towards the drums.

[0023] In order to increase the space provided for the mounting/dismounting means, and any other means, between the two motor assemblies, these may be provided mounted on the upper side of the cutting head in an inclined manner, so that their drive shaft is angled relative to the direction in which the excavation machine in use extends, that is to say relative to the vertical direction. The inclination of the mounting of the motor assemblies, while maintaining a drive shaft intersecting the axis of rotation of the corresponding drums, allows the motor assemblies to move away from each other, so as to free up more space between them for the mounting/dismounting means and other means cooperating with the frame of the excavation machine.

[0024] Preferably, each motor assembly comprises a drive shaft substantially perpendicular to a bearing surface of said motor assembly on the upper side of the support, and at least one motor assembly, preferably each motor assembly, is mounted inclined on the upper side of the support, for example mounted on an inclined portion of the upper side of the support.

[0025] Thus, the upper side of the support may include inclined portions intended for the mounting of the motor assemblies at a determined inclination. Such a support allows in particular mounting therein conventional motor assemblies, with a drive shaft perpendicular to the bearing surface, and determining the angle of inclination of the motor

assemblies at the level of the support, by the geometry of the inclined portions of the upper side of the support.

5 [0026] Preferably, the mounting and dismounting means comprise at least two pins or lugs extending along a substantially vertical direction, preferably perpendicularly to the upper side of the support.

10 [0027] The mounting and dismounting means may thus be mechanical means extending in a protruding manner, from the upper side of the support upwards, so as to be able to cooperate with corresponding means of the frame, for example locking means. Such mechanical means allow in particular maintaining a small footprint at the level of the upper side of the support, while being sufficiently robust to allow the mechanical linkage between the frame and the cutting head. However, the mounting and dismounting means are not limited to mechanical coupling means, but may also comprise electrical coupling means and/or hydraulic coupling means.

15 [0028] According to another aspect, an excavation machine comprising a frame and a cutting head as described above is also proposed.

[0029] Such an excavation machine thus allows to benefit from a cutting head that is both removable and easy to modify.

20 [0030] Preferably, the excavation machine also comprises a peripheral protection means positioned around the engine assemblies, between the upper side of the support and the frame.

[0031] In order to facilitate the change of one or more engine assemblies, these can be mounted on the upper side to remain accessible when the cutting head is disengaged from the frame, or even when the cutting head is mounted on the frame. However, and in order to protect the engine assemblies in use, the excavation machine may comprise a protection means surrounding the engine assemblies in use configuration, and positioned between the support and the frame. Such a peripheral protection means can in particular detach itself from the cutting head when the latter is separated from the frame, so as to make said motor assemblies easily accessible again.

35 [0032] Preferably, the frame includes locking means configured to cooperate with the means for mounting and dismounting the cutting head, for example keys actuated by motor means such as cylinders, to be

inserted into a corresponding orifice of the mounting and dismounting means.

[0033] In order to secure the cutting head to the frame, the latter may comprise locking means intended to cooperate with the means for mounting and dismounting the cutting head. For example, in case the mounting and dismounting means are pins or lugs extending perpendicularly to the upper side of the support, with a transverse through-orifice, the locking means may comprise keys with a geometry corresponding to that of the transverse through-orifice, so as to be able to cooperate with it. Thus, to mechanically lock the cutting head, it is sufficient to move the keys into the orifice of the corresponding pins or lugs, and to mechanically separate the cutting head, it is sufficient to remove the keys from the corresponding orifices.

[0034] Preferably, said keys and orifices have complementary pyramidal or conical shapes.

[0035] In order to limit the clearances between the cutting head and the frame, while facilitating the movement of the keys in the orifices, the keys and the orifices may have pyramidal or conical shapes. Such shapes provide in particular a significant clearance when the keys enter the orifices, and zero or small clearance when the keys are fully inserted into the orifices.

[0036] Preferably, said locking means move, to cooperate with the means for mounting and dismounting the cutting head, along a direction substantially parallel to said horizontal direction.

[0037] In order to free up space for the motor assemblies and possibly the area of connection of the suction inlet, the locking means may be configured to move, relative to the means for mounting and dismounting the cutting head, along a direction substantially parallel to the axis of rotation of the drums. It is thus possible to reduce the footprint along the direction passing through the two motor assemblies.

Brief description of the drawings

[0038] [Fig. 1] Figure 1 schematically represents a first embodiment of a cutting head according to the invention;

[0039] [Fig. 2] Figure 2 schematically represents a second embodiment of a cutting head according to the invention;

[0040] [Fig. 3] Figure 3 is a partially exploded schematic view of an excavation machine with a cutting head as illustrated in Figure 2;

[0041] [Fig. 4] Figure 4 is a perspective view of the cutting head schematically illustrated in Figure 2;

5 [0042] [Fig. 5] Figure 5 is an enlargement of a portion of the cutting head of Figure 4, with locking means cooperating with the mounting and dismounting means; and

[0043] [Fig. 6] Figure 6 represents a general view of a carrier including an excavation machine.

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Description of the embodiments

[0044] Figure 6 generally illustrates a tracked carrier A intended to make substantially vertical trenches with a view to make diaphragm walls, preferably of considerable depth, for example of at least 20 meters.

15 [0045] The tracked carrier A includes a boom B from which an excavation machine frame C is suspended by means of cables. The cables in particular allow the excavation machine to be lowered as the trench is made, by unwinding a reel G.

20 [0046] A cutting head 1 provided with two pairs of drums, or milling wheels, D with horizontal axes is positioned at the lower end of the frame C. The drums D are driven by electric or hydraulic motors and are equipped with teeth distributed around their periphery and intended to dig the soil.

25 [0047] A hydraulic or electric pump E is also installed on the frame C, above the drums D. This pump E allows suctioning the particles cut by the drums and discharging them to the surface via the discharge pipe F.

[0048] The cutting head 1 will be described in more detail below, with reference to Figures 1 to 5.

30 [0049] The cutting head 1 comprises a support 2 intended to allow the mounting of the various members of the cutting head 1, the support being also configured to allow connection to a frame 4 in order to form an excavation machine 6 as illustrated in Figure 3.

35 [0050] The cutting head 1 comprises in particular two drums 8, 10 mounted on the support 2 and driven by two motor assemblies 12, 14 also mounted on the support 2.

[0051] For the sake of simplicity, it will be considered in the remainder of the description that the excavation machine 6 extends along a substantially vertical direction, and that the drums 8, 10 rotate about axes of rotation that are substantially parallel to each other and substantially perpendicular to the direction of the excavation machine 6, that is to say substantially horizontal and therefore extending along the same horizontal direction. However, the description below is not limited to such a configuration, but also encompasses other geometries and their corresponding adaptations.

[0052] In the following description, it will be considered that the support 2 comprises in particular a plate 2a, an upper side 2b and a lower side 2c. Particularly, the upper side 2b of the support 2 may correspond to an upper face of the plate 2a, while the lower side 2c may comprise an extension, for example perpendicular to the plate 2a, mounted on a lower face of the plate 2a.

[0053] The first drum 8 is mounted on the support 2, and more specifically on the lower side 2c of the support 2, that is to say under the plate 2a of the support 2. The first drum 8 has a general cylindrical shape, and is configured to rotate about an axis of rotation 8a.

[0054] The first drum 8 conventionally includes a proximal end extending substantially in a plane perpendicular to the axis of rotation 8a, and a distal end opposite to the proximal end and extending substantially in a plane parallel to that of the proximal end. The proximal and distal ends substantially delimit the width of the first drum 8 in the direction of its axis of rotation 8a. Thus, since the axis of rotation 8a of the first drum 8 is intended to be substantially horizontal in use, the proximal and distal ends extend substantially vertically when the first drum 8 is mounted and used on the cutting head 1.

[0055] In order to allow the mounting and driving in rotation of the first drum 8, the cutting head 1 includes cooperation means (not represented) on which the first drum 8 is mounted. More specifically, the first drum 8 is mounted on the cutting head 1 by its proximal end, while the distal end extends opposite to the cutting head 1.

[0056] Moreover, the first drum 8 also includes, along its periphery, excavation tools, for example teeth mounted on tooth holders (see Figure 4), driven in rotation by the first drum 8 and allow digging the

soil during the excavation. The teeth and tooth holders can extend in different digging planes that are perpendicular to the axis of rotation 8a of the first drum 8 and distributed over the width of the first drum 8. The tooth holders and the teeth can form a ring 5 extending along the entire periphery of the first drum 8, or form only segments partially surrounding the first drum 8.

[0057] The teeth of the distal end thus allow digging at the level of the lateral wall of the trench made by the excavation machine, while the teeth located at the level of the proximal end or between the proximal end and the distal end allow digging inside the trench made by the excavation machine.

[0058] The first drum 8 is driven in rotation by the first motor assembly 12. The first motor assembly 12 is mounted on the support 2, particularly on the upper side 2b. The first motor assembly 12 comprises in particular a drive shaft 12a, in particular rectilinear or straight, connected to the first drum 8 and by which the motor assembly 12 drives in rotation said first drum 8. With the first motor assembly 12 thus positioned above the first drum 8, the drive shaft 12a extends in a plane R substantially vertical and perpendicular to the axis of rotation 8a of the first drum 8.

[0059] For example, the drive shaft 12a may intersect the axis of rotation 8a of the first drum 8 at a first point of intersection where the mechanical linkage may be implemented by bevel gears and/or by reduction gears, in particular planetary reduction gears. There is then a direct mechanical linkage between the motor assembly 12 and the corresponding drum 8.

[0060] The description above was made with a single drum 8 mounted on the axis of rotation 8a and driven by the motor assembly 12, but the cutting head 1 may comprise two first drums 8 mounted on the same axis of rotation 8a, on either side of the lower side 2c for example, and both driven in rotation by the first motor assembly 12.

[0061] The second drum 10 is mounted on the support 2, and more specifically on the lower side 2c of the support 2, that is to say under the plate 2a of the support 2. The second drum 10 has a generally cylindrical shape and is configured to rotate about an axis of rotation 10a.

[0062] The second drum 10 conventionally includes a proximal end extending substantially in a plane perpendicular to the axis of rotation

10a, and a distal end opposite to the proximal end and extending substantially in a plane parallel to that of the proximal end. The proximal and distal ends substantially delimit the width of the second drum 10 in the direction of its axis of rotation 10a. Thus, since the axis of rotation 10a of the second drum 10 is intended to be substantially horizontal in use, the proximal and distal ends extend substantially vertically when the second drum 10 is mounted and used on the cutting head 1.

[0063] In order to allow the mounting and driving in rotation of the second drum 10, the cutting head 1 includes cooperation means (not represented) on which the second drum 10 is mounted. More specifically, the second drum 10 is mounted on the cutting head 1 by its proximal end, while the distal end extends opposite to the cutting head 1.

[0064] Moreover, the second drum 10 also includes, along its periphery, excavation tools, for example teeth mounted on tooth holders (see Figure 4), which are driven in rotation by the second drum 10 and used to dig the soil during the excavation. The teeth and the tooth holders can extend in different digging planes perpendicular to the axis of rotation 10a of the second drum 10 and distributed over the width of the second drum 10. The tooth holders and the teeth can form a ring extending along the entire periphery of the second drum 10, or they can form only segments partially surrounding the second drum 10.

[0065] The teeth of the distal end thus allow digging at the level of the lateral wall of the trench made by the excavation machine, while the teeth located at the level of the proximal end or between the proximal end and the distal end allow digging inside the trench made by the excavation machine.

[0066] The second drum 10 is driven in rotation by the second motor assembly 14. The second motor assembly 14 is mounted on the support 2, particularly on the upper side 2b. The second motor assembly 14 comprises in particular a drive shaft 14a, in particular rectilinear or straight, connected to the second drum 10 and by which the motor assembly 14 drives in rotation said second drum 10. The second motor assembly 14 thus being positioned above the second drum 10, the drive shaft 14a extends in a plane R substantially vertical and perpendicular to the axis of rotation 10a of the second drum 10.

[0067] For example, the drive shaft 14a can intersect the axis of rotation 10a of the second drum 10, at a first point of intersection where the mechanical linkage can be implemented by bevel gears. There is then a direct mechanical linkage, via a single gear, between the motor assembly 14 and the corresponding drum 10, without requiring other mechanical linkages that could limit the transmission of the forces and/or be likely to break.

[0068] The description above was given with a single second drum 10 mounted on the axis of rotation 10a and driven by the motor assembly 14, but the cutting head 1 may comprise two second drums 10 mounted on the same axis of rotation 10a, across the lower side 2c for example, and both driven in rotation by the second motor assembly 14.

[0069] The first and second drums 8, 10 are mounted side by side on the support 2, that is to say their respective rotation axes of rotation are substantially parallel to each other and in the same horizontal plane.

[0070] The cutting head 1 is removably mounted on the frame 4. Thus, the cutting head 1 comprises mounting/dismounting means 16, in particular mechanical means, for reversibly securing the cutting head 1 to the frame 4. Particularly, such mounting/dismounting means 16 allow rapidly changing the cutting tools used for digging the soil, in particular depending on the type of the soil, by simply changing the cutting head 1 instead of dismounting and replacing the various drums and/or teeth of the cutting head 1.

[0071] The mounting/dismounting means 16 may for example comprise two lugs, or pins, 16a, 16b, intended to cooperate with corresponding locking means 18 (see Figures 3 and 5) provided on the frame 4. In order to facilitate the cooperation of the pins 16a, 16b in the corresponding locking means 18, the pins 16a, 16b may have a generally conical shape, providing a greater displacement clearance at the beginning of the insertion than at the end of the insertion. The pins 16a, 16b may also comprise a transverse through-aperture 20a, 20b (see Figure 4) for locking with the locking means 18 of the frame 4.

[0072] The lower part of the frame 4 includes the locking means 18. Such locking means 18 may thus comprise lower apertures intended to receive the pins 16a, 16b. In the vicinity of such lower apertures, the locking means 18 may also comprise cylinders, for example hydraulic cylinders, 22

configured to move a metallic key 24 fixed to the rod of each cylinder. The metal keys 24 may have a width substantially less than the width of the transverse through-aperture 20a, 20b of the corresponding pins 16a, 16b, and a length extending along the same horizontal direction as the axes of rotation 8a, 10a of the drums 8, 10.

[0073] In addition to the mounting and dismounting means 16, the cutting head 1 may also comprise a suction inlet opening out, on the lower side 2c of the support 2, between the two drums 8, 10, to suction the cuttings formed by the drums 8, 10, and connected, on the upper side 2b of the support 2, to a connection area 26 located between the two motor assemblies 12, 14, to allow 25 a connection of the suction layer to a suction pump mounted in the frame 4, via a suction line.

[0074] Finally, in order to protect the motor assemblies 12, 14 of the cutting head 1, the excavation machine 6 may comprise a peripheral protection means 28 configured to be positioned between the frame 4 and the cutting head 1 locked on said frame 4, and to extend over at least part of the peripheral perimeter of the motor assemblies 12, 14. Such a peripheral protection means 28 thus allows protecting the motor assemblies 12, 14 without complicating their dismounting from the support 2 or their replacement, since said peripheral protection means 28 is blocked between the frame 4 and the cutting head 1, and can therefore be held in place in the complete excavation machine without requiring additional fixing means.

[0075] In a first embodiment illustrated in Figure 1, the drive shafts 12a, 14a are oriented substantially vertically. Thus, the drive shaft 12a of the first drive assembly 12 extends in a first vertical plane P comprising the axis of rotation 8a, while the drive shaft 14a of the second drive assembly 14 extends in a second vertical plane P' comprising the axis of rotation 10a. The motor assemblies 12 and 14 each include a bearing surface 12b, 14b from which they are mounted on the upper side 2b of the support and which is substantially perpendicular to the corresponding drive shaft 12a, 14a.

[0076] In order to facilitate the replacement of the motor assemblies 12, 14, these are provided on the distal ends of the support 2, while the mounting and dismounting means 16, as well as the area of connection 26 of the suction inlet, are provided in a central area of the support 2.

[0077] More specifically, the mounting and dismounting means 16, that is to say all the means for mounting and dismounting the cutting head on the frame, as well as the area of connection 26 of the suction inlet to a suction line, can be disposed on the upper side 2b of the support 2, between the vertical planes P and P' passing through the axes of rotation 8a, 10a of the drums, and can in particular be fixed. The mounting and dismounting means 16, as well as the area of connection 26 of the suction inlet, are thus grouped at the center of the support 2, while the motor assemblies remain positioned on the sides for easy access.

[0078] However, depending on the size of the motor assemblies 12, 14, such a space between the planes P and P' may be too small to be able to allow positioning the mounting and dismounting means 16 therein, as well as the area of connection 26 of the suction inlet.

[0079] In a second embodiment illustrated in Figure 2, the drive shafts 12a, 14a are inclined relative to the vertical direction, while remaining in a vertical plane R and intersecting the corresponding axes of rotation 8a, 10a. Thus, the drive shaft 12a of the first drive assembly 12 defines, with the substantially horizontal direction of the first axis of rotation 8a of the first drum 8, a first plane Q inclined relative to the vertical, while the drive shaft 14a of the second drive assembly 14 defines, with the substantially horizontal direction of the second axis of rotation 10a of the second drum 10, a second plane Q' inclined relative to the vertical. The drive shafts 12a, 14a of the drive assemblies 12, 14 extend substantially in the same vertical plane R perpendicular to the axes of rotation 8a, 10a, but are secant such that, at the level of the upper side 2b of the support 2, the distance between the two drive shafts 12a, 14a of the two motor assemblies 12, 14 is greater than the distance between the two axes of rotation 8a, 10a. The space thus left free on the upper side 2b of the support 1, between the two motor assemblies 12, 14, is therefore larger, which facilitates the positioning of the mounting and dismounting means 16.

[0080] For example, the upper side 2b of the support 2 may comprise two inclined portions on which the motor assemblies 12, 14 are intended to be mounted by their bearing surface 12b, 14b. Such inclined portions are also provided so that the mounting of a motor assembly on them allows positioning the drive shaft in a direction intersecting the axis of rotation of the corresponding drum.

[0081] Particularly, the inclined portions of the support 2 allow installing conventional motor assemblies, that is to say with a bearing surface perpendicular to the drive shaft, on the cutting head 1, while also improving the available space for the mounting/dismounting means in particular. This facilitates maintenance of the motor assemblies of the cutting head, both for easy installation and removal of the motor assemblies, but also for the use of standard motor assemblies.

[0082] Thus, thanks to the cutting head according to the present invention, it becomes possible to have both a removable and interchangeable cutting head easily and quickly to adapt the excavation machine to the specificities of the soil to be dug, while keeping a cutting head that is easy to repair or maintain. Particularly, the arrangement of the various elements on the cutting head, and particularly of the motor assemblies, facilitates access to the different members of the cutting head for their possible replacement or maintenance.

CLAIMS

1. A cutting head (1) for an excavation machine (6) for making vertical trenches, comprising:

5 - at least a first drum (8) and a second drum (10) positioned side by side, in the vicinity of each other and configured to rotate respectively about a first axis of rotation (8a) and a second axis of rotation (10a), the first and second axes of rotation being different and extending substantially along a horizontal direction, and

10 - a support (2) including an upper side (2b) and a lower side (2c), the support being intended to be mounted, from its upper side, on a frame (4) of the excavation machine, and the first and second drums being mounted on the lower side (2c) of said support,

15 - at least one first motor assembly (12) and a second motor assembly (14), in particular hydraulic or electric assemblies, mounted on the upper side (2b) of the support and including respectively a first drive shaft (12a) and a second drive shaft (14a), said at least two drums (8, 10) being driven in rotation by said at least two motor assemblies (12, 14), and

20 - means for mounting and dismounting (16) the cutting head on the frame of the excavation machine, said mounting and dismounting means (16) being mounted on the upper side (2b) of the support,

characterized in that the mounting and dismounting means (16) are positioned, in particular when the cutting head (1) is viewed along said horizontal direction of the first and second axes of rotation (8a, 10a),
25 between the two planes (Q, Q') defined respectively by the first drive shaft (12a) and said horizontal direction, and by the second drive shaft (14a) and said horizontal direction, for example between the two substantially vertical planes (P, P') passing through said first and second axes of rotation (8a, 10a).

30 2. The cutting head (1) according to claim 1, wherein the mounting and dismounting means (16) are positioned, when the cutting head is viewed along said horizontal direction of the first and second axes of rotation, between said at least two motor assemblies (12, 14).

35 3. The cutting head (1) according to claim 1 or 2, also comprising a suction inlet mounted between the first drum and the second drum (8, 10), and wherein the mounting and dismounting means (16) and an area

of connection of the suction inlet are positioned, when the cutting head (1) is viewed along said horizontal direction of the first and second axes of rotation, between said two motor assemblies (12, 14).

4. The cutting head (1) according to any of the preceding claims,
5 wherein the two motor assemblies are mounted on the upper side (2b) of the support so that the drive shaft of each motor assembly intersects the axis of rotation (8a, 10a) of the corresponding drum, and wherein the drive shafts of the motor assemblies extend in the same plane (R) along secant directions such that the distance between the two drive shafts (12a, 14a),
10 at the level of the motor assemblies (12, 14), is greater than the distance between the points of intersection of the drive shafts with the axes of rotation (8a, 10a) of the corresponding drums.

5. The cutting head (1) according to any of the preceding claims,
15 wherein the mounting and dismounting means (16) comprise at least two pins (16a, 16b) extending along a substantially vertical direction, preferably perpendicularly to the upper side (6b) of the support.

6. An excavation machine (6) comprising a frame (4) and a cutting head (1) according to any one of the preceding claims.

7. The excavation machine (6) according to claim 6, also
20 comprising a peripheral protection means (28) positioned around the motor assemblies (12, 14), between the upper side (2b) of the support and the frame (4).

8. The excavation machine (6) according to claim 6 or 7, wherein
25 the frame (4) includes locking means (18) configured to cooperate with the means for mounting and dismounting (16) the cutting head (1), for example keys (24) actuated by motor means such as cylinders (22), to be inserted into a corresponding orifice (20a, 20b) of the mounting and dismounting means (16).

9. The excavation machine (6) according to claim 8, wherein said
30 keys (24) and orifices (20a, 20b) have complementary pyramidal or conical shapes.

10. The excavation machine (6) according to claim 8 or 9,
wherein said locking means (18) move, to cooperate with the means for mounting and dismounting (16) the cutting head, along a direction
35 substantially parallel to said horizontal direction.