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AN EXCAVATOR BUCKET.

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References cited :
SE-A- 8 004 769
SE-B- 454 899
US-A- 3 922 745
US-A- 4 100 688

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Description

TECHNICAL FIELD

The present invention relates generally to an excavator bucket, and more particularly to an excavator bucket which is intended to coact fixedly but detachably with the excavator arm of an excavating machine.

The bucket may advantageously be secured to the arm by means of known quick-coupling devices, and movement of the arm and movement of the bucket, through its pivotal attachment to the arm, are controlled in a known manner with the aid of hydraulically operable piston-cylinder devices, in the following abbreviated to hydraulic piston device.

BACKGROUND PRIOR ART

With regard to the constructional features of the excavator bucket applicable to the present invention, it should be mentioned that it is earlier known to mount on the arm of an excavating machine a particularly configured auxiliary implement in the form of a holder arm pivotally connected to a pivotal excavator arm or stick, where the holder arm carries on an outer part thereof a substantially circular brush which is rotatable about a rotational axis that extends substantially parallel to the pivot axis of the bucket.

The holder arm can be pivoted through an angle of 120°, between a downwardly swung position in which the brush is caused to rotate and therewith sweep away the thin layer of filling material which remains subsequent to shovelling away filling material from a buried conduit, therewith to expose the conduit, and an upwardly raised position in which the holder arm abuts the stick, thereby enabling the excavator to be used for excavating purposes when the brush is in its raised position.

This construction is described and illustrated more clearly in Swedish Patent Specification No. 454 899.

Also forming part of the known state of the art is the arrangement described and illustrated in US-A-4,100,688, which teaches a ground working implement which is rotatably connected to the stick rearwardly of and adjacent the bucket.

With regard to the significant features of the present invention, it should be mentioned that different types of excavator bucket constructions intended for different working processes are known to the art.

For instance, it is known to complement an excavating bucket intended for coaction with an excavating arm of an excavating machine with other devices which form an integral part of the bucket in general. One example in this regard is the possibility of mounting on the rear part of the bucket one or more gripping claws intended for gripping posts and the like.

It is also known to fit an excavator bucket with such implements as holders for moving pipes and the like.

SUMMARY OF THE PRESENT INVENTION

TECHNICAL PROBLEMS

When considering the present state of the art as described above, it will be seen that a qualified technical problem resides in the provision of a particularly constructed excavator bucket which incorporates a rotatable brush means intended for removing thin layers of material which remain after shovelling away filling material from above a buried conduit, so as to expose the conduit lying immediately beneath said material layer, where the risk of the brush device, when said device is attached in the manner taught by SE-B-454 899, of falling down and injuring workers in the vicinity of the brush device and the excavating bucket of the machine is eliminated.

It will also be seen that a technical problem resides in the provision of conditions which will afford a solution to the aforesaid problem without requiring to this end the attachment of an auxiliary implement to an excavating arm, by incorporating in the bucket a rotatable brush such as to form an integral unit which can be attached to the excavating arm in a manner known per se, and therewith eliminate the need of welding or drilling the arm for the purpose of attaching the auxiliary implement.

It will also be seen that a qualified technical problem is one of providing a simple solution to the aforesaid problem at very low and normally quite negligible assembly or fitting costs.

It will also be seen that a qualified technical problem is one of providing a solution for fulfilling the aforesaid purpose of removing a residual layer of material covering a conduit subsequent to shovelling away filling material, so as to expose a conduit or conduits with the aid of an excavating bucket produced as a complete unit and capable of being readily switched between different tractors with the aid of quick-coupling devices, at the same time as a special-duty bucket can be replaced with a conventional bucket when required.

It will be seen that a technical problem also resides in the provision of a solution of the aforesaid problem and therewith create conditions which will enable the bucket to be turned through 180° at its attachment to the excavating or digging arm, so as to thereby provide another and complementary action for the rotatable brush.

It will also be seen that a technical problem resides in the provision of a rotatable brush which is able to fulfil the aforesaid purpose and which in an inactive position is folded away such as to be completely out of the way when using the bucket to dig and

move coarse filling materials.

Another technical problem is one of realising the advantages which an excavating bucket having a rotatable brush will afford when the bucket is caused to coact with a so-called rotor tilt.

It will also be seen that a technical problem resides in providing a bucket construction in which a rotatable brush can be caused to take a first position in which the brush is located within the bucket and a second position in which said brush extends from said bucket, where in the first inactive position of the brush said brush is located within a rearwardly open space formed in the rear part of the bucket.

It will also be seen that a technical problem is one of realising the advantages afforded by permitting the rotatable brush to be carried by an arm, preferably by two arms, which is or are pivotally attached to the bucket wall at its upper, rear part.

It will also be seen that a technical problem lies in realising the advantages that are afforded when a hydraulic piston is mounted within the upper part of the bucket and caused to coact with the arm or arms.

Another technical problem is one of realising the technical advantages afforded when the hydraulic piston is caused to coact with the arm via a slot which enables the rotatable brush to travel freely within narrow limits, thereby to improve shovelling-away of light filling materials and therewith expose the conduit.

A further technical problem is one of providing a bucket which is constructed in a manner which will fulfil the aforesaid purpose, and to realise the significance of enabling the brush to rotate from the first to the second position in a 90° pendulating movement in a direction which conforms with a line that constitutes an extension rearwardly of the lowermost planar part of the bucket.

Another technical problem is one of realising within which angular values the first and the second position shall be selected in relation to a line that extends perpendicularly to the lowermost planar part of the bucket.

It will also be seen that a technical problem is one of realising the significance that selection of the distance between the pivot axis of the arm and the rotational axis of the brush has on the ability to fulfill the aforesaid purpose.

Finally, it will be seen that another technical problem resides in the appropriate orientation and positioning of the hydraulic piston device and to realise the significance of allowing the hydraulic piston device to coact with the arm at a point located above the pivot axis of the arm.

SOLUTION

The present invention provides an excavating bucket of particular configuration which is not only well adapted for coaction with an excavating arm

forming part of the excavating machine, via known coupling means, but which is also adapted to provide a bucket whose purpose is to remove thin layers of material that remain above a conduit subsequent to shovelling away filling material above said conduit, such as to expose one or more conduits.

To this end, the inventive construction utilizes a known rotatable brush which, in accordance with the invention, is arranged for movement between a first position in which the brush is located within the bucket and a second position in which the brush is extended from the bucket, wherein when occupying said first position, the brush is located within a rearwardly open space formed in the rear part of the bucket.

As preferred embodiments which lie within the purview of the inventive concept, it is proposed that the rotatable brush is carried by one or two arms which are pivotally connected to the upper, rear wall part of the bucket, and in that a drive motor is connected to the arm such as to cause the brush to swing in one of two directions, through the intermediary of transmission means.

It is also proposed that a hydraulic piston device is mounted within the upper part of the bucket and caused to coact with the arm or arms through the intermediary of a slot.

Furthermore, it is proposed that pivotal movement of the brush from the first to the second position is a pendulating movement with a movement direction that conforms with a line constituting an extension of the lowermost planar part of the bucket, and that the angular value between the first and the second position is smaller than 110° and greater than 60°, preferably within the range 100°-80°.

The angular values shall divide so as to be halved on each respective side of a line which extends perpendicularly to the lowermost planar part of the bucket.

It is also proposed that the distance between the pivot axis of the arm and the rotational axis of the brush is between 1.5 and 0.7 times the brush diameter, preferably between 1.0 and 0.8.

Finally, it is proposed that the hydraulic piston device is arranged to coact with the arm at a point which is located above the pivot axis of the arm and at a small distance between said point and said pivot axis, so as to obtain a large pendulum movement with a small piston movement.

ADVANTAGES

Those advantages primarily afforded by an inventive excavating bucket reside in the creation of the possibility of using the bucket for conventional digging purposes and also for removing thinner layers of material which remain above a conduit subsequent to shovelling away coarse filling material therefrom, such as to expose the conduit, by causing the rotat-

able brush to adopt one of two terminal positions or one of several available intermediate positions, depending on the desired application.

By using an excavating bucket, it is possible to connect or couple the bucket to the excavator arm in a manner known per se and with the aid of known coupling devices, thereby enabling the specially constructed bucket to be exchanged for another bucket, for instance a bucket that is intended solely for excavating purposes.

The primary characteristic features of an inventive excavating bucket are set forth in the characterizing portion of the following Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of an excavating bucket at present preferred and exhibiting the significant characteristic features of the present invention will now be described in more detail with reference to the accompanying drawings, in which

Figure 1 is a side view of a tractor whose excavating arm coacts with an inventive excavating bucket;

Figure 2 is a sectional view of the bucket, and shows a rotatable brush moved to a first position in which the brush is folded into the bucket; and Figure 3 is a corresponding sectional view of the bucket, with the bucket rotated through 45° and the rotatable brush shown in its second position in which it extends from the bucket.

DESCRIPTION OF EMBODIMENTS NOW PREFERRED

Figure 1 is a very simplified illustration of a tractor 1 having a known excavator unit comprising, inter alia, an excavating arm 2. The free end 2a of the arm 2 coacts with an excavating bucket 3 through the intermediary of a coupling 4, said bucket being constructed in accordance with the present invention.

Figure 1 illustrates the rotatable brush in a second position (Figure 3) in which it extends from the bucket for the purpose of removing a layer of material C that remains above a conduit B subsequent to shovelling away filling material A, therewith to expose the conduit B.

The conduit B may be one or more electrical conductors, or cables, one or more gas conduits, one or more water conduits, etc.

Figure 2 illustrates the bucket 3 with the rotatable brush folded into its first position, said bucket being shown in a slightly larger scale and with a part further enlarged. The rotatable brush 5 is held firmly by an arm 6 which is positioned centrally in the bucket and which coacts with a hydraulic motor 7 by means of which a transmission 8 is caused to drive the rotatable brush 5 in one of two rotational directions. The requi-

site changeover device or switch is not shown, but may be electrical.

The arm 6 is pivotally connected to the bucket by a pivot pin 9 and the arm 6 is held in the position shown in Figure 2 with the aid of a hydraulic piston device 10. Thus, the rotatable brush 5 can be moved to a first position, shown in Figure 2, in which the brush is located in the bucket, and a second position, according to Figure 3, in which the brush is extended out from the bucket. In the first brush position, shown in Figure 2, the brush is located within a rearwardly open space 3a formed in the rear part of the bucket. This space is defined forwardly by an intermediate wall 3b and separates the forwardly open space 3c of the bucket intended for shovelling filling material.

It lies within the scope of the invention to modify the extension of the edge surface 3d to an extent which will increase the loading capacity of the space 3c.

The arm 6 is pivotally mounted to the wall 3e of the bucket 3 and to its upper rear part.

The hydraulic piston device 10 is mounted within the upper part 3f of the bucket and coacts with the arm 6 at 11. The uppermost part of the arm is, in this case, provided with a pin 11. The pin 11 is located in a slot 12 and enables the brush 5 to swing backwards and forwards when the brush is used within the angular values applicable between the position shown in Figure 2 and the position shown in Figure 3. The hydraulic piston device 10 is positioned parallel with the lowermost planar part 3g of the bucket and is secured in a known manner.

In the illustrated case, rotation of the brush 5 from the first position in Figure 2 to the second position in Figure 3 is a pendulum-like movement with the direction of movement following a line that constitutes an imaginary extension of the lowermost planar part 3g of the bucket. In the case of the illustrated embodiment, the angular value between the first and the second positions is selected to 90° and the brush will swing through 45° on respective sides of a line 15 which extends perpendicularly to said extension of the planar part 3g.

The distance between the pivot axis 9 of the arm 6 and the rotational axis 16 of the brush 5 is 0.9 times the diameter of the brush.

The hydraulic piston 10 is intended to coact with the arm at a point which is located above the pivot axis 9 of the arm 6. This distance shall be small, so as to afford a large pivotal movement of the brush 5 in response to a small piston movement of the hydraulic piston device 10.

Claims

1. An excavating bucket (3) adapted for coaction with an excavating arm (2) forming part of an ex-

cavating machine (1), **characterized** in that a rotatable brush (5) which is intended to take a first position in which the brush (5) is swung into the bucket (3) and a second position in which the brush (5) is extended from said bucket (3) and in that said brush (5) is located within a rearwardly open space (3a) formed in the rear part of the bucket (3) when in its first position.

2. A bucket according to Claim 1, **characterized** in that the brush (5) is carried by one or by two arms (6) pivotally connected to the bucket (3) at its upper, rear part. 10
3. A bucket according to Claim 2, **characterized** in that a drive motor (7) coacts with the arm (6) and functions to cause the brush (5) to swing in one of two rotational directions through the intermediary of a transmission (8). 15
4. A bucket according to Claim 1 or 2, **characterized** in that a hydraulic piston device (10) is mounted within the upper part (3f) of the bucket (3) and coacts with the arm or arms (6). 20
5. A bucket according to Claim 4, **characterized** in that the hydraulic piston (10) coacts with the arm (6) through a slot (12). 25
6. A bucket according to Claim 1, **characterized** in that rotation of the brush (5) from the first to the second position takes place in the form of a pendulum-like movement in a direction conforming to an extension of a lowermost planar part (3g) of the bucket (3). 30
7. A bucket according to Claim 1, **characterized** in that the angular value for maximum movement of the brush (5) between the first and the second position is smaller than 110° and greater than 60°, preferably within the range of 100°-80°. 40
8. A bucket according to Claim 1 or 2, **characterized** in that the distance between the pivot axis (9) of the arm (6) and the rotational axis (16) of the brush (5) is between 1.5 and 0.7 times the diameter of the brush, preferably between 1.0 and 0.8 times. 45
9. A bucket according to Claim 4 or 5, **characterized** in that the hydraulic piston device (10) is intended to coact with the arm (6) at a point located above the pivot axis (9) of the arm (6). 50
10. A bucket according to Claim 2, **characterized** in that the brush (5) is carried by an arm (6) which is placed centrally in the bucket (3). 55

Patentansprüche

1. Baggerlöffel (3), der zum Zusammenwirken mit einem einen Bestandteil eines Baggers (1) bildenden Baggerarm (2) ausgeführt ist, dadurch gekennzeichnet, daß eine drehbare Bürste (5), die eine erste Position, in der die Bürste (5) in den Löffel (3) geschwenkt ist, und eine zweite Position, in der sich die Bürste (5) vom Löffel (3) weg erstreckt, einnehmen soll, und daß sich die Bürste (5) in einem nach hinten offenen Raum (3a), der im hinteren Teil des Löffels (3) ausgebildet ist, befindet, wenn sie sich in ihrer ersten Position befindet.
2. Löffel nach Anspruch 1, dadurch gekennzeichnet, daß die Bürste (5) von einem oder von zwei Armen (6) getragen wird, die mit dem Löffel (3) an seinem oberen, hinteren Teil verbunden sind.
3. Löffel nach Anspruch 2, dadurch gekennzeichnet, daß ein Antriebsmotor (7) mit dem Arm (6) zusammenwirkt und die Bürste (5) dazu veranlaßt, mittels eines Getriebes (8) in eine von zwei Drehrichtungen zu schwenken.
4. Löffel nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß eine hydraulische Kolbeneinrichtung (10) im oberen Teil (3f) des Löffels (3) angebracht ist und mit dem Arm oder den Armen (6) zusammenwirkt.
5. Löffel nach Anspruch 4, dadurch gekennzeichnet, daß der hydraulische Kolben (10) durch einen Schlitz (12) mit dem Arm (6) zusammenwirkt.
6. Löffel nach Anspruch 1, dadurch gekennzeichnet, daß eine Drehung der Bürste (5) von der ersten in die zweite Position in Form einer pendelartigen Bewegung in eine einer Verlängerung eines untersten planaren Teils (3g) des Löffels (3) entsprechenden Richtung stattfindet.
7. Löffel nach Anspruch 1, dadurch gekennzeichnet, daß der Winkelwert für die maximale Bewegung der Bürste (5) zwischen der ersten und der zweiten Position kleiner als 110° und größer als 60°, vorzugsweise im Bereich von 100° - 80°, ist.
8. Löffel nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Abstand zwischen der Schwenkachse (9) des Arms (6) und der Drehachse (16) der Bürste (5) zwischen 1,5 und 0,7, vorzugsweise zwischen 1,0 und 0,8, mal dem Durchmesser der Bürste ist.
9. Löffel nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß die hydraulische Kolbeneinrich-

tung (10) mit dem Arm (6) an einem Punkt über der Schwenkachse (9) des Arms (6) zusammenwirken soll.

10. Löffel nach Anspruch 2, dadurch gekennzeichnet, daß die Bürste (5) von einem Arm (6) getragen wird, der sich in der Mitte des Löffels (3) befindet.

Revendications

1. Pelle d'excavation (3) adaptée pour action combinée avec un bras d'excavation (2) faisant partie d'une machine d'excavation (1), caractérisée en ce qu'une brosse rotative (5) qui est prévue pour prendre une première position dans laquelle la brosse (5) est basculée dans la pelle (3) et une deuxième position dans laquelle la brosse (5) est déployée hors de ladite pelle (3) et en ce que ladite brosse (5) est située dans un espace ouvert vers l'arrière (3a) formé dans la partie arrière de la pelle (3) lorsque ladite brosse (5) est dans sa première position.
2. Pelle selon la revendication 1, caractérisée en ce que la brosse (5) est portée par un ou deux bras (6) reliés par pivotement à la pelle (3) à sa partie arrière supérieure.
3. Pelle selon la revendication 2, caractérisée en ce qu'un moteur d'entraînement (7) agit en combinaison avec le bras (6) et fonctionne pour faire basculer la brosse (5) dans une de deux directions de rotation par l'intermédiaire d'une transmission (8).
4. Pelle selon la revendication 1 ou 2, caractérisée en ce qu'un dispositif de piston hydraulique (10) est monté dans la partie supérieure (3f) de la pelle (3) et agit en combinaison avec le ou les bras (6).
5. Pelle selon la revendication 4, caractérisée en ce que le piston hydraulique (10) agit en combinaison avec le bras (6) à travers une fente (12).
6. Pelle selon la revendication 1, caractérisée en ce que le pivotement de la brosse (5) de la première à la deuxième position a lieu sous la forme d'un mouvement pendulaire dans une direction correspondant à une extension d'une partie plane la plus basse (3g) de la pelle (3).
7. Pelle selon la revendication 1, caractérisée en ce que la valeur angulaire pour le mouvement maximum de la brosse (5) entre la première et la deuxième position est plus faible que 110° et plus

forte que 60°, de préférence dans la gamme de 100° - 80°.

8. Pelle selon la revendication 1 ou 2, caractérisée en ce que la distance entre l'axe de pivotement (9) du bras (6) et l'axe de rotation (16) de la brosse (5) est entre 1,5 et 0,7 fois le diamètre de la brosse, de préférence entre 1,0 et 0,8 fois.
9. Pelle selon la revendication 4 ou 5, caractérisée en ce que le dispositif de piston hydraulique (10) est prévu pour agir en combinaison avec le bras (6) à un point situé au-dessus de l'axe de pivotement (9) du bras (6).
10. Pelle selon la revendication 2, caractérisée en ce que la brosse (5) est portée par un bras (6) qui est placé centralement dans la pelle (3).

