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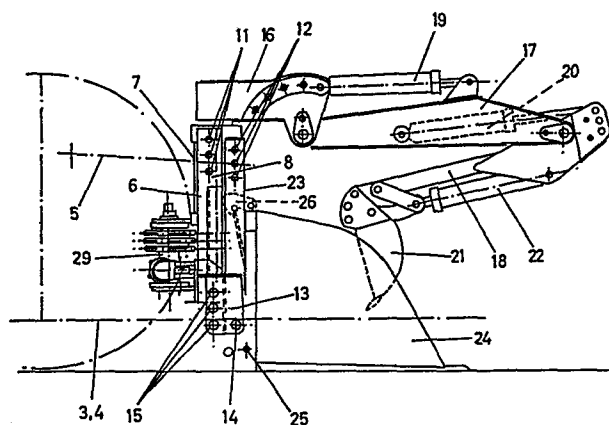
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54 **Tractor-mounted excavator assembly.**

57 An excavator assembly having an articulated excavator arm and a rotatable post (7), mounted on a tractor. The excavator is secured to the three-point suspension of the tractor, i.e., two lower draw bars (3, 4) and a top stay (5), via a vertical frame (6) which is fastened to the vertical post (7) of the excavator. A rearwardly facing, tippable tractor shovel is fastened to the frame (6).



The present invention relates to an excavator assembly with an articulated power arm and a rotatable post mounted at the rear end of a tractor.

5 Most farms of any size have a tractor which is utilized for a number of purposes in connection with agriculture and forestry work. There is often a need in this connection for an excavator for digging ditches, excavating topsoil, digging into mounds of frozen earth, silage or fertilizer,
10 etc. If the excavated mass is to be moved to another location, the tractor-mounted excavators require a second tractor with a trailer or shovel into which the mass can be emptied from the excavator for further transport. If an extra tractor is not available, the excavator has to be
15 detached and a tractor shovel mounted on the tractor's three-point suspension. The mass must then be loaded into the tractor shovel manually, with a spade. If one has a front-mounted tractor shovel in addition to a rear-mounted excavator, it will still be difficult to drive the shovel
20 into the mass, especially if the ground is slippery or soft or if one is driving uphill.

The object of the present invention is to provide an excavator assembly with an articulated arm and a rotatable
25 post, mounted on the three-point suspension of a tractor, i.e., with two lower draw bars and a top stay, wherein a tippable tractor shovel can also be mounted simultaneously on the three-point suspension, and both the rotatable excavator post and the tractor shovel can be attached and
30 detached from the tractor in a simple manner, thus allowing the tractor to be used as needed with both the excavator and tractor shovel mounted thereon or with only one of the attachments, and/or with another tool instead of the shovel or in addition to it.

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When the excavator and tractor shovel are both mounted on the tractor, it will be possible to dig up hard mass from ditches and mounds, for example frozen silage, fertilizer

and the like, and empty the mass into the tractor shovel. The shovel can then be elevated in the normal manner by means of the three-point suspension and be tipped and emptied at the desired location.

- 5 This is obtained according to the invention with an excavator assembly of the type defined above which is disposed between the draw bars and is mounted on the tractor by means of a vertical frame which is fastened to the rotatable post of the excavator, characterized in that a rearwardly facing, tippable tractor shovel is attached to the frame.
- 10 In a preferred embodiment, the lower part of the frame has a downwardly open recess to allow a drag to be coupled to the tractor hitch. A practical embodiment of the invention is characterized by the provision of two sets of fastener holes in the frame for both the top stay and the two draw bars, the sets of holes being disposed in different
- 15 vertical planes.

Another characterizing feature of this practical embodiment of the invention is that the rotary device for the excavator post consists of a horizontally mounted hydraulic cylinder, which at one end is fastened

20 to lugs on the excavator frame and at the other end is fastened to an arm which in turn is secured to a shaft that is rotatably attached to the excavator frame, and a sprocket wheel is rigidly attached to the shaft over which one or more chains drive a sprocket wheel on the rotatable post of the excavator.

- 25 A further feature of the invention is that the excavator post is situated to one side of the tractor's centerline. The purpose of this is to permit the top stay to be utilized for fastening the tractor shovel, and to make room for release of the latching hook, so that
- 30 the tractor shovel can be emptied. This arrangement also provides sufficient space for a simple and robust shovel pivoting means between the draw bars. The driver also has a better view of the area being excavated, and when a trailer also is attached to the tractor, he can complete the entire excavation job in essentially one work
- 35 operation. This arrangement also permits the excavator arm to reach farther out to the side making it easier to excavate alongside a wall or fence.

The invention will be explained in greater detail in the following with reference to the accompanying drawings, which show a preferred embodiment of the invention.

Figure 1 shows the assembly of the invention in plan view, and Figure 2 shows the assembly in side view.

5 The drawings show the rear part 1 of a tractor with a rear wheel 2. Mounted in the conventional manner on the tractor are two draw bars 3 and 4 and a top stay, indicated by a centerline 5. The draw bars are tiltable by means of hydraulic arms in a vertical plane, while the top stay is
10 normally a conventional tie rod which can be arranged to be easily adjustable.

The excavator consists of a vertical frame 6 which is rigidly fastened to the excavator post 7. The frame 6 is
15 substantially T-shaped with an upright member 8 and two lower, projecting legs 9 and 10. Two sets of holes 11 and 12 for the top stay 5 are arranged at the upper part of the vertical member 8. The two rows of holes also permit the excavator post to be positioned diagonally. Lugs 13 with
20 two sets of holes 14 and 15 for fastening the draw bars 3,4 are secured to the outer ends of the legs 9 and 10. If the fastener holes 11 and 15 are used, the excavator will be located farther away from the tractor, and if the holes 12 and 14 are used, the excavator will be mounted closer to
25 the tractor. This position is precisely the position which the tractor shovel will have when it is being utilized without the excavator. In this case the tractor shovel is fastened to the same three bolts as those to which the excavator is fastened. Attached to the upper end of the
30 rotatable post 7 is a bracket 16 with an inner arm 17 hinged to the outer end thereof, and an outer arm 18 is hinged to the outer end of the inner arm 17. The two arm members are moved by means of hydraulic cylinders 19 and 20. An excavator shovel 21 is pivotally fastened to the
35 outer end of the arm 18, and it can be pivoted by means of a hydraulic cylinder 22. An additional frame 23 is secured to the vertical frame 6, which can be a standard frame, and a tractor shovel 24 is secured to the frame 23.

The tractor shovel is hinged to the frame at 25 and secured at the upper edge thereof by means of a latching hook 26.

5 The post 7 of the excavator is pivotable by means of a special assembly which requires little space, and this assembly consists of a hydraulic cylinder 27 which is secured to the frame 6 by means of lugs 28 and which turns a rotatable shaft 29 fastened to the frame via lugs 30. A sprocket wheel 31 is secured to the shaft and via a chain 10 32 it drives a sprocket wheel 33 on the rotatable post 7. With a gear ratio of 2:1 between the wheels, the excavator arm can be pivoted 180° with a relatively short cylinder 27.

15 By means of the embodiment illustrated in the drawings, the excavator and tractor shovel can both be mounted on the tractor at the same time. The tractor shovel can retain its normal position and perform its normal functions, i.e., be raised, lowered and tipped.

20 The excavator shovel can excavate mass, for example frozen earth, frozen fertilizer and the like, and empty it into or push it onto the tractor shovel. The tractor shovel can then be elevated by means of the three-point suspension, transported in the normal way and emptied by releasing the 25 latching hook 26.

The tractor shovel can also be used as a support foot for the excavator. It could also in that case be filled with mass, to make it even sturdier. Optionally, additional 30 support feet can also be arranged at the rear corners of the shovel, for use in especially difficult terrain. These must in that case be disposed so as not to hinder normal use of the shovel.

35 When mass is being dug into with the tractor shovel, the shovel will force its way into the mass owing to the work done by the excavator, so that the tractor will stand firm even if the ground is very slippery.

The excavator can also operate as a normal excavator, digging both rearwardly and to both sides of the tractor shovel. It can also dig a ditch even if the tractor shovel is mounted. The excavator can of course also be used as a
5 normal digger. The shovel is then removed, which permits greater excavation depths and excavation closer to the tractor.

When excavating without the tractor shovel, the projecting legs 9 and 10 can be extended and provided with mechanical
10 or hydraulic support feet.

The excavator is so small that the tractor's own hydraulic pump will have sufficient oil capacity for the excavator's hydraulic cylinders. An automatically closing hydraulic
15 oil outlet is found at the rear of the tractor. Oil can be led from the outlet to the various hydraulic cylinders via an extra valve block, etc. This permits one to avoid the conventional method requiring the use of an extra pump driven from the tractor's power outlet. This also saves
20 space, so that there will be room for the excavator's frame, post and rotating means between the tractor and the shovel.

By means of the frame configuration described above, a
25 tractor trailer could for example be connected to the tractor hitch. The excavator frame can optionally be elevated into a somewhat higher position. One could then excavate on both sides of the trailer and optionally empty the excavated mass directly into the trailer. The trailer can be driven away and
30 emptied even with the excavator mounted.

The invention is not restricted to the exemplary embodiment described hereinabove and illustrated in the drawings. For example, instead of the shovel on the end of the excavator arm, a grab could be provided for loading timber and the
35 like.

As mentioned previously, the lower part of the frame has a downwardly-open recess. This is necessary to provide space for connecting/disconnecting a trailer, and also to provide the

necessary clearance between the frame and the trailer hitch when the machine is in the normal excavating position.

5 The extension bracket 16 is provided so that the arm, when being pivoted, will clear the upper shovel bracket. The extension bracket is also important because the arm will then more easily clear the shovel, allowing one to excavate to a greater depth at the sides of and in back of the shovel.

10 The excavator of the invention, when utilized strictly as an excavator, can perform the same work as other types of small three-point-mounted excavators. In addition, the excavator of the invention can perform the following tasks, which cannot be done with the prior art machines:

- 15 1) A rear-mounted tractor shovel, rock carrier or trailer can be attached to the tractor which has the excavator mounted at the front thereof, thus allowing the driver, using a single tractor, to excavate mass, deposit it in a container, transport it and dump it out.
- 20 2) Together with the excavator, a scraper or clearing hook can also be mounted on the tractor.
- 3) A hook or grab can also be attached for loading timber into trailers which also are connected to the same tractor.
- 25 4) The excavator of the invention can also be utilized in connection with a two-wheeled tractor or other vehicle and tractor shovels and other implements can be attached in the same way as to a four-wheel tractor at the same time as the excavator is mounted on the vehicle.
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By means of the excavator of the invention, therefore, it is possible using a conventional tractor or the like to perform entirely new combinations of tasks. This will be of particular importance in steep terrain. The fact that the excavator can remain attached to the tractor even when one needs to attach another implement to the rear of the tractor or to replace one rear-mounted implement with another is very

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important. On many farms, the farmer will be able to get by with one tractor less than he would need if he were using a conventional tractor-excavator.

5 The excavator post does not necessarily have to be placed to one side of the tractor's centerline. By using a special shovel, the excavator post could be placed on the tractor centerline.

10 The tractor's own hydraulic pump would not necessarily have to be used; a separate pump operated from the tractor's power outlet could also be utilized.

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Patent Claims

1. An excavator assembly with an articulated excavator arm and a rotatable post, mounted on a tractor, wherein the excavator is fastened to the tractor's three-point suspension, i.e., two lower draw bars (3,4) and a top stay (5), and where the excavator is disposed between the draw bars (3,4) and mounted by means of a vertical frame (6) which is secured to the vertical post (7) of the excavator, c h a r a c t e r - i z e d in that a rearwardly facing, tippable tractor shovel (24) also is fastened to the frame (6).
2. An excavator assembly according to claim 1, characterized in that the lower part of the frame (6) has a downwardly open recess permitting a drag to be connected to the tractor's normal hitch.
3. An excavator assembly according to claims 1 or 2, characterized in that the frame (6) has two sets of fastener holes for both the top stay and for the two draw bars, the sets of holes being disposed in different vertical planes.
4. An excavator assembly according to one or more of the preceding claims, characterized in that the rotation means for the excavator post (7) consists of a horizontally mounted hydraulic cylinder (27), one end of which is fastened to lugs (28) on the frame (6) and the other end to an arm (30) on a shaft (29) that is rotatably fastened to the frame (6), and that a sprocket wheel (31) is pivotally fastened to the shaft (29) and via a chain (32) it drives a sprocket wheel (33) on the post (7) of the excavator.
5. An excavator assembly according to one or more of the preceding claims, characterized in that the excavator post (7) is situated to one side of the tractor's centerline.

