ABSTRACT

Handling and digging apparatus comprises a chassis, a jib pivotally mounted on the chassis and an arm pivotally connected at one end to the jib, a digging tool and a handling tool being permanently carried by the other end of the arm, the region of attachment of one tool to the arm being close to that of the other tool to the arm.

4 Claims, 3 Drawing Figures
The present invention concerns improvements in digging and handling apparatus, particularly but not exclusively for public works. In the area of public works, it is sometimes necessary to carry out work comprising two distinct series of operations. Thus, for example, the erection of poles for supporting electric, telephone or urban lighting lines requires the digging of holes in the ground prior to the handling of each pole to remove it from its place of storage and to introduce it into the hole.

Apparatus are known for carrying out this kind of work, which are provided with two sets of working equipment which are practically independent of each other. In particular, for the erection of poles, such an apparatus generally has an auger suspended from the jib and, for handling the poles, lifting gear arranged either on a small jib pivoted on the main jib or on telescopic elements of the jib which has been designed teleoscopically for this one purpose.

It will thus be seen that these apparatus are designed for a very precise purpose, namely to perform two specific types of operations. As a result, a small number of them is manufactured and therefore at a high cost.

It is known that to carry out the digging work under good conditions, it is preferable to adopt the conventional arrangement having a jib pivoted on a frame, an arm or dipper stick pivoted on the jib and the digging tool — auger, grab or bucket — attached to the arm.

Apparatus with this arrangement already exist, certain even being provided, in addition to the digging tool, with a handling tool such as the pulley of a crane.

This is so of the apparatus described in U.S. Pat. No. 3,771,610. However, if this apparatus is to have the desired efficiency, it will be appreciated that its construction requires the adoption of a special arm permitting attachment of a first tool to one of its ends and of a second tool to the other of its ends. However the arm is already a main component, which it is preferred not to have to modify unless for the most usual uses which are made of it.

According to the present invention there is provided handling and digging apparatus comprising a chassis, a jib pivoted on the chassis, an arm pivoted by one end on the jib, a digging tool permanently attached to the other end of the arm, and a handling tool permanently fixed to the other end of the arm close to the region of attachment of the digging tool thereto.

In the preferred embodiment, the arm is a conventional arm.

As to the choice of tools, it is preferred to use a known digging tool and handling clamp. Such grouping is also already known, particularly through German Patent Application No. 1,113,547. However, here again it was found necessary to modify the conventional arrangement to make it simpler and therefore less expensive, and this while taking account of the flexibility obtained by adopting the conventional equipment — jib, arm, tool.

In fact the two tools of the apparatus of the German application are mounted on a single support which, to enable each of the tools to be used, must be mounted rotatably relative to the jib on which it is mounted. Since the invention may be used with conventional working equipment of the type mentioned above, it is then no longer necessary to resort to the costly rotary mounting of the support of the two tools.

In any case, in all the known apparatus, the handling tool is attached to the arm in a movable manner. By contrast, the arrangement provided by the present invention permits fixed attachment of the handling tool to the arm, which is also obviously the simplest mounting.

Lastly, the actual choice of handling tool is not immaterial, and it is often advantageous for the use in pole erection or in similar areas to attach a gripping clamp which enables poles to be torn out or, on the contrary, forced in.

In a preferred embodiment of the invention, the handling tool clamp comprises a clevis swivellably mounted on a piece attached to the arm by a coupling rod. A frame is swivellably mounted in the clevis and supports the bearings of the pivot axes of at least two pairs of bent levers, each of the levers of each of the pairs being connected by one end of an hydraulic ram, while a jaw is pivoted on the other end, the jaws of each of the pairs of levers facing each other.

Advantageously, the jaws are provided on their working surfaces with a flexible covering.

When the digging tool is of elongate form, means for releasably supporting the free end of the tool out of reach of the ground is provided vertically below the jib.

A better understanding of the invention will be obtained from the following description of an embodiment thereof, given by way of example only, with reference to the accompanying drawings in which:

FIG. 1 shows an embodiment of apparatus in accordance with the invention, in one mode of operation;

FIG. 2 is an enlarged front elevation view of the work handling tool with some parts removed for clarity; and

FIG. 3 is a side elevation of the work handling tool of FIG. 2 as viewed in the direction of arrow F of FIG. 2.

The apparatus shown in FIG. 1 comprises the constituent elements of an hydraulic shovel, namely a chassis comprising a base 1 on which is pivotally mounted a turret 2 and which is provided with rolling means 3 by means of which the apparatus rests on the ground 4. A jib 5 is pivotally mounted on the turret 2 while an hydraulic ram 6 is connected between the jib 5 and turret 2.

An arm 7 is pivotally mounted at one of its ends 7a about an axis 8 on the jib 5, its hydraulic control ram 9 being connected between this end 7a and the jib 5. An auger 10, driven in known manner by an hydraulic motor 10a, is suspended from the end 7b of the arm 7 and is pivotable about axis 13. The auger is shown held out of reach of the ground 4 by supporting means 11 arranged under the jib 5 and vertically below the latter. This means 11 comprises, as shown, a cord 11a attached to a bracket 11b provided under the jib 5 and wound around part of the auger 10.

A handling tool 12 is also mounted at the end 7b of the arm 7. This tool 12 is attached to the axis 13 of the auger and made fast with the arm 7 by a coupling rod 14. The construction of this tool 12, which is in the working position in FIG. 1, will be better appreciated from the following FIGS. In FIG. 1 it is shown gripping pole 15 which is engaged in a hole 16 previously bored by the auger 10.

FIGS. 2 and 3 illustrate an embodiment of this handling tool 12. The tool 12 comprises a clevis 17 mounted for swivel movement about a pivot shaft 17a on piece 18 normally pivoted at 19 on the axis 13 of the arm 7. This piece 18 has an extension 18a to which is
attached at 18b one of the ends of the coupling rod 14. The clevis 17 has two bearings 20a and 20b in which
is swivellably mounted a body 21 supporting four bearings 22a, 22b, 22c and 22d. These bearings receive
the pivot axes of four bent levers 23a to 23d. These levers are pivoted in pairs and by one of their ends, in which
an aperture is formed, at the ends of an hydraulic ram 24 controlled from the drivecab of the apparatus. Their
other ends each carry a jaw 25a to 25d which is pivotally mounted thereon.

It will have been noticed that the abovementioned levers 23a to 23d are arranged symmetrically about the
ram 24 so that the jaws, in pairs, form gripping means. Moreover, the shape of the levers is such that the plane
of movement of the jaws is in front of that in which the ram is arranged.

The following description of operation of the above described apparatus will reveal advantages of its de-
sign.

Such an appliance therefore enables a hole to be dug by means of the auger 10, which may be replaced by
any other digging means, for example a cylindrical bucket, when the auger adopts a vertical position, as
with known apparatus. It will be noticed that the arrangement of the handling tool 12 in no way hampers
boring of the hole 16. After the auger 10 has been withdrawn from the ground, it is moved to and held in the
position shown in FIG. 1 by means of the supporting means 11. The cord 11a can be wound around the
auger 10 by rotation of the auger by means of the hydraulic motor 10a which drives it.

The pole 15 is then to be gripped by the tool 12. By action on the jib 5 and the arm 7, and, where necessary,
by manoeuvring the apparatus or the current towards the area in which the poles to be erected are stored, the
tool 12 is placed in a position to grip a horizontally stored pole. In this position each of the pairs of jaws 25
is arranged to span the selected pole. Pressurized fluid is then caused to enter the ram 24, Which causes
the jaws to close on the pole. The relative movement of the piston body and the piston rods causes the ends of the
levers 23, which are pivoted on them, to be pushed out. The levers rotate about their respective axes to cause
the jaws 25 to move towards each other until they contact the pole which is thus gripped. It will be noted
that, with this arrangement, the gripping forces are advantageously evenly distributed between the pair of
jaws 25a, 25b and the pair of jaws 25c, 25d regardless of the travel of each of them. This is very advantageous
for gripping poles formed of sheet metal rolled in generally octagonal or pyramidal form and with a shallow
slope. To preserve the surface of the poles to be handled, the jaws may be covered 26 as illustrated on jaw
25c in FIG. 2 with a flexible covering.

By manoeuvring the appliance, the turret and then the jib and the arm, the pole 15 is lifted to a vertical po-
sition to be introduced into the previously dug hole 16. Once this pole has been placed in position, the pressure
is taken off the jaws to release the pole.

It will be noted that with a single apparatus it is possible to carry out the different operations required to
place a pole in position. Moreover, this apparatus is in part a conventional apparatus namely a known hydrau-
lic shovel on the arm of which a clamp is fixed in a very simple manner. It will therefore be seen that it is easy to
construct an apparatus in accordance with the invention at a relatively low cost which is less than for known
special appliances.

The invention finds advantageous applications in the area of public works.

What is claimed is:

1. Handling and digging apparatus comprising a chassis, a jib pivoted on the chassis for pivotal movement
about a horizontal axis, an arm pivoted by one end on the jib, a digging tool pivotally attached to the other
end of the arm, and a handling tool permanently fixed to the same end of the arm as the digging tool close to
the region of attachment of the digging tool to the arm.

2. Apparatus in accordance with claim 1, wherein the handling tool comprises a gripping clamp which clamp
includes a clevis mounted for swivel movement on a support piece connected to the arm by means of a cou-
pling rod, a frame mounted for swivel movement on the clevis and supporting bearings of the pivot axes of at
least two pairs of bent levers, wherein each of the levers of each of the pairs is connected by one end to a hy-
draulic ram, and a jaw is pivotally mounted on the other end of said levers, the jaws of each of the pairs of
levers facing each other.

3. Apparatus in accordance with claim 2, wherein the working surfaces of the jaws are provided with a flexi-
ble covering.

4. Apparatus in accordance with claim 1, wherein the digging tool is of elongate form, and means for releas-
ably supporting the free end of the tool out of reach of the ground is provided vertically under the jib.

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