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2,676,837

GRAPPLE HOOK

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Fig. 2

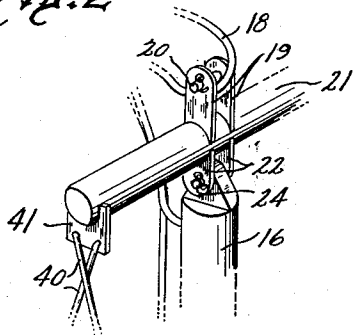


Fig. 5

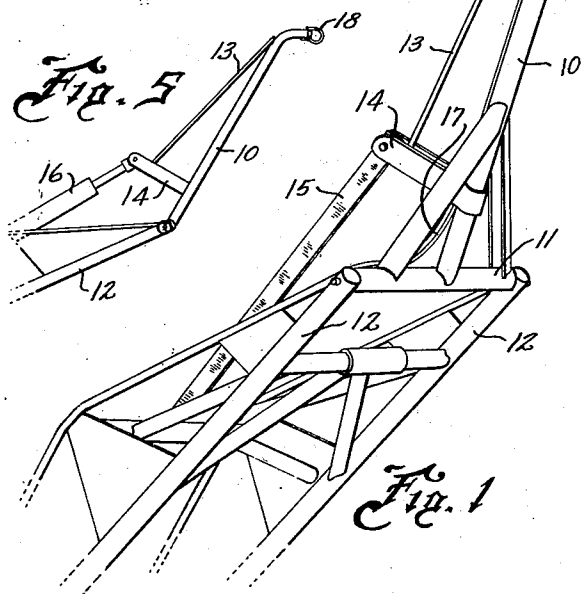


Fig. 1

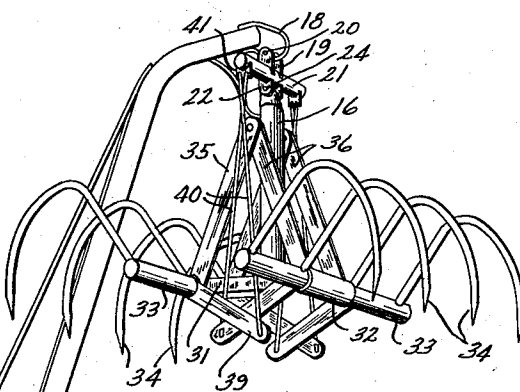
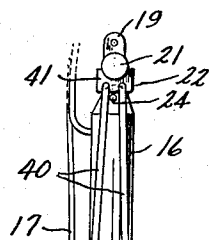


Fig. 3

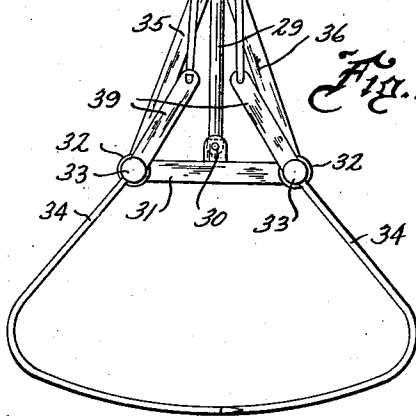
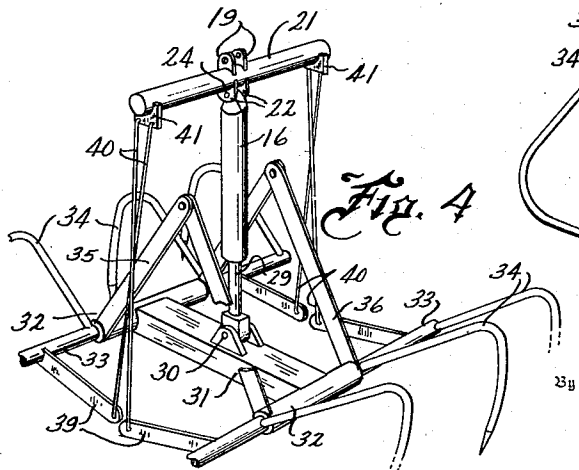


Fig. 4



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GRAPPLE HOOK

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4 Claims. (Cl. 294-88)

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This invention relates to improvements in grapple hooks.

Although the invention has application to any one of a variety of power operated cranes, it has particular application to a crane arm associated with the boom tractor attachment disclosed in our co-pending application entitled "Materials Handling Equipment for Tractors," Serial No. 148,963, filed March 10, 1950.

The primary object of the invention is to provide a hydraulically actuated grapple hook which may be hung from the end of a crane arm and which may be remotely actuated from the operator's seat to manipulate the grab hooks or tines. In this connection it is an important object of the invention to provide a grapple hook structure with which the hydraulic cylinder normally used to articulate the crane arm on the boom may, upon removal from the boom and replaced by a fixed link or the like, be associated for the purpose of remotely controlled hydraulic actuation of the hooks.

A further object of the invention is to provide a grapple hook having novel linkage and motion transmitting connections between a hydraulic cylinder and the hooks, whereby the hooks are made to coact upon the application of hydraulic pressure to the cylinder. All of the apparatus is mounted on a hanger which may be conveniently attached to and removed from the crane arm by manipulating a single pin. The novel structure is such that hydraulic pressure applied to close the hooks also forces the entire hook structure into the mass to be lifted, to take a deep bite, while hydraulic pressure applied to open the hooks withdraws the hook structure from the deposited mass to clear the tines.

Other objects will be more apparent from an examination of the following disclosure.

In the drawings:

Fig. 1 is a perspective view of a portion of a boom having a crane arm with a grapple hook embodying the invention attached thereto.

Fig. 2 is an enlarged perspective view of the connection between the crane arm and the grapple hook.

Fig. 3 is an enlarged side elevation of the grapple hook of Fig. 1, the extensible parts of the cylinder, motion transmitting connections, and hooks, being shown in a different position.

Fig. 4 is a top three-quarter perspective view of a grapple hook embodying the invention.

Fig. 5 is a perspective view on a reduced scale of an alternative position of the hydraulic cylinder when the grapple hook is not in use.

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As best shown in Fig. 1 the grapple hook may be suspended from a crane arm 10 which, as more fully disclosed in our co-pending application aforesaid, is pivotally attached upon a bearing tube 11 to the respective ends of boom arms 12. The boom is swingably attached to a tractor (not shown). The crane arm 10 is braced by means of a strut 13 which connects to an intermediate link 14, which provides a connection between the crane arm and the boom alternatively through a link 15 (Fig. 1) or a hydraulic cylinder (Fig. 5). The hydraulic cylinder 16 is positioned as shown in Fig. 5 when the crane arm is used without the grapple hook and at such times as the powered articulation of the arm respecting the boom is desired. The hydraulic fluid lines 17 lead to a control within the tractor operator's reach. However, when the crane arm is to be fixed respecting the boom to constitute an extension thereof (as is ordinarily the case when the grapple hook is to be used) the hydraulic cylinder 16 may be transferred from the boom to structural association with the grapple hook, and replaced by the link 15 (Fig. 1), the same control then being effective to manipulate the grab hooks as hereinafter explained.

As best shown in Figs. 1 and 3 the crane arm 10 is provided with a clevis 18 from which the grapple hook is freely suspended by means of the apertured bracket ears 19 and a removable pin 20. The bracket ears 19 carry a transverse rod or hanger 21 from which depends additional apertured bracket ears 22 between which the hydraulic cylinder 16 is suspended by means of a removable pin 24.

When the cylinder 16 is associated with the grapple hook the hydraulic fluid lines 17 are extended to lead along the crane arm 10 and boom to the manual control aforesaid.

As best shown in Fig. 4, the cylinder is provided with a projecting piston rod 29 which is pivoted at 30 to a cross member 31 which fixedly connects with spaced parallel bearing sleeves 32. The respective bearing sleeves rotatably carry rock shafts 33 upon which the respective grab hooks or tines 34 are mounted to oscillate with the rock shafts in the bearing sleeves. Sleeves 32 are further provided with upwardly converging stabilizing links 35, 36, a set of these being disposed at opposite sides of the cylinder 16. The members 35, 36 move with and laterally brace and guide the sleeves.

Beyond the ends of the bearing sleeves 32 the respective rock shafts 33 are provided with cranks 39 and with rod-like links 40 of fixed length

which are pivotally connected to the cranks and to depending brackets 41 at the respective outer extremities of the transverse rod or hanger 21.

The links 40 react through the cranks 39 to oscillate the rock shafts 33 within the sleeve bearings 32 when the piston rod 29 is extended or retracted in its cylinder 16. In this manner the tines 34 are made to coact with each other in response to hydraulic pressure throughout a range of tine position, the extremes of which are indicated in Fig. 1 and Fig. 3.

An important feature attributed to the novel structure disclosed is that piston movement results in a complementary movement of the entire grapple hook structure including the bearing sleeves 32, shafts 33, and the tines 34, only the link rods 40 remaining relatively fixed. In this manner the axis of tine oscillation is shifted during the course of piston movement. When the grapple hook is brought down upon a mass to be lifted, (this normally comprising hay or other light but bulky fibrous matter) and the tines are closed, the entire hook structure and tines will be forced into the mass so as to take a deep bite. In this manner larger loads than heretofore thought possible may be picked up by a single bite of the hooks.

Depositing of the load is likewise accomplished by complete withdrawal of the hook structure from the entangled mass, thus clearing the grapple hook from the load as it is deposited.

All of the apparatus, including the bearing sleeves 32, rock shafts 33, cranks 39 and rods 40 are assembled about the cylinder 16 which is suspended from the hanger 21 which is in turn suspended from the clevis 18. Manipulation of a single pin 20 is all that is required to attach or remove the entire grapple hook from the crane arm.

From the foregoing description taken in connection with the accompanying drawings it is to be noted that an improved grapple hook having a remotely controlled hydraulic power mechanism has been provided. The grapple hook is of such novel structure as to make a deep bite into the load during the tine closing operation, and to retract itself from the load during the depositing operation. Furthermore, the novel provisions for utilizing the same hydraulic cylinder in the grapple hook as is customarily supplied with the crane arm attachment for the boom results in an economy of hydraulic cylinder equipment required for successful operation of the device.

We claim:

1. In a device of the character described a grapple hook comprising a hydraulic cylinder having an extensible piston rod, mutually spaced bearing sleeves connected for movement with the piston rod, rock shafts rotatable in said sleeves and extending beyond said sleeves, said rock shafts being provided with tines and cranks beyond said sleeves, and links connected at their respective ends to the cranks and to the cylinder whereby to oscillate the shafts in the sleeves upon movement of the piston rod in the cylinder, and a hanger having a coupling, said hanger being elongated in the direction of sleeve and shaft extent and providing a mutual connection for the cylinder and the ends of the links.

2. The device of claim 1 wherein the hanger is provided with a releasable cylinder coupling diametrically opposed to the coupling to which the cylinder is detachably connected, said hanger and cylinder providing mountings from which the sleeves, shafts, cranks and links are supported.

3. A grapple hook attachment for a crane, said hook comprising means for suspending the hook from the crane, a hanger rod connected to said means, a hydraulic motor mounted on said rod, said motor having a reciprocable part, a transverse member connected to said reciprocable part, said transverse member being provided at its ends with elongated bearing sleeves parallel to said hanger rod, rock shafts rotatable in said bearing sleeves, coacting tines mounted on said rock shafts, cranks mounted on said rock shafts outwardly of the opposite ends of said bearing sleeves, and links from said cranks to said hanger rod whereby on actuation of said motor the bearing sleeves move with said reciprocable part and the rock shafts oscillate in said sleeves.

4. The device of claim 3 in which said bearing sleeves are provided with stabilizing members spanning the space between said sleeves.

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