

April 6, 1965

R. W. LARSON
PULPWOOD GRAPPLE

3,177,029

Filed Feb. 18, 1963

2 Sheets-Sheet 1

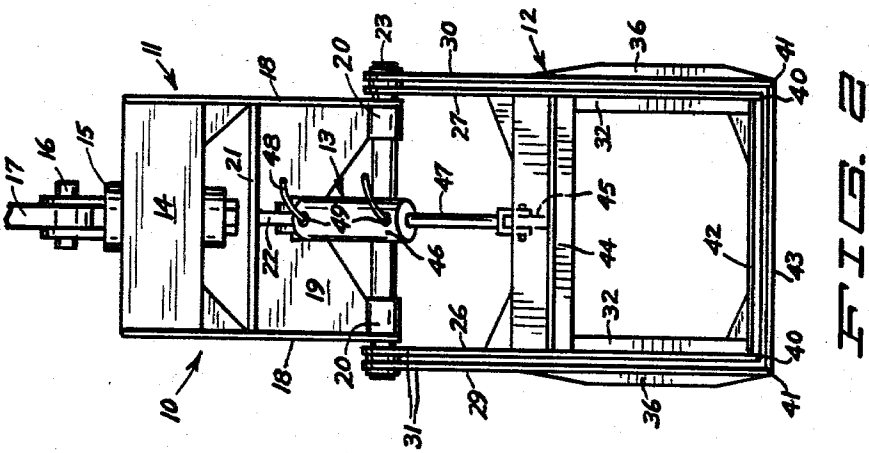


FIG. 2

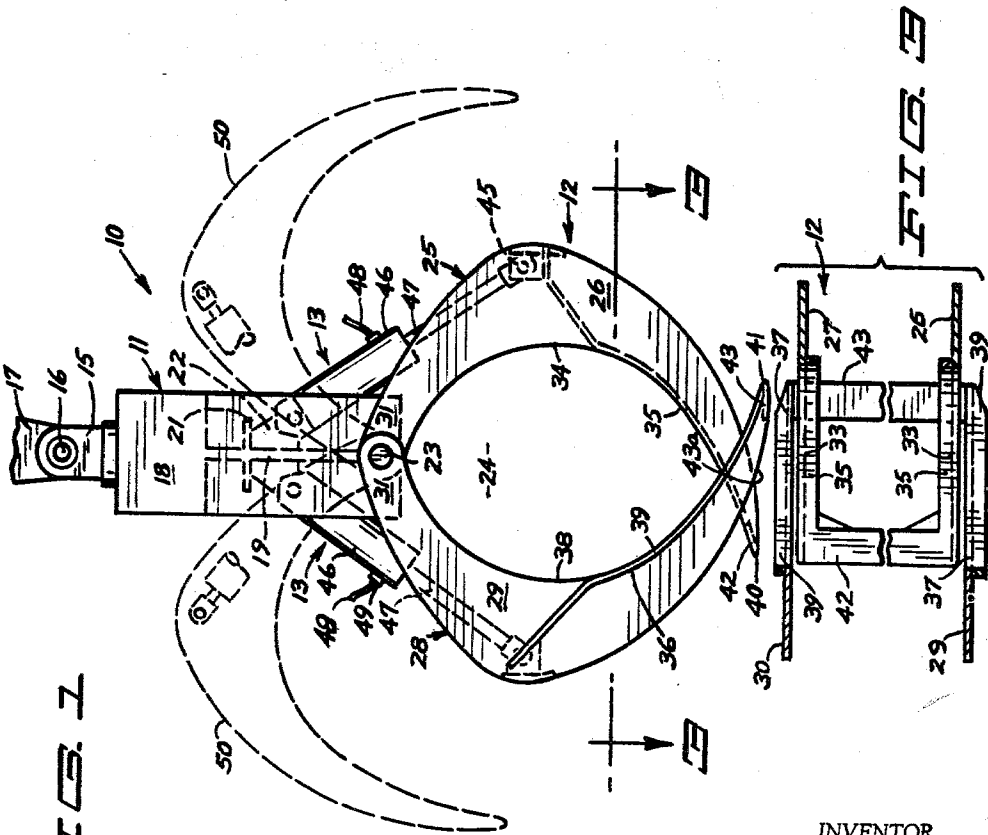


FIG. 1

FIG. 1

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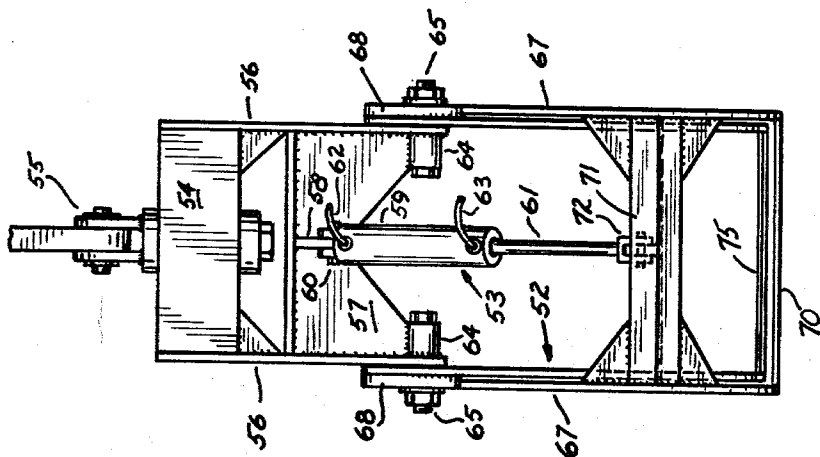


FIG. 5

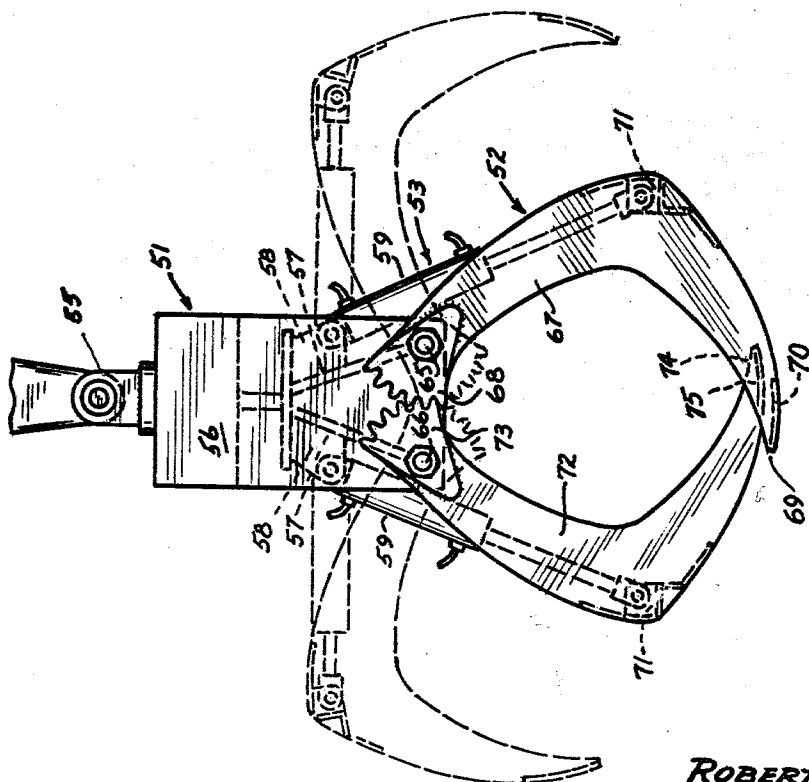


FIG. 4

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PULPWOOD GRAPPLE

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Filed Feb. 18, 1963, Ser. No. 259,048
5 Claims. (Cl. 294-88)

This invention relates to grapples and more particularly to improvements in grapples used for lifting and carrying of pulpwood logs and the like.

This invention is particularly concerned with improvement in my previously awarded patent on Pulpwood Grapple, Patent No. 2,862,756, issued December 2, 1958 and is a continuation-in-part of my co-pending United States patent application Serial No. 196,079, filed May 21, 1962, now abandoned. The grapple jaws of the present invention are designed to intermesh so that the grapple will positively grasp any size load being carried whether it be a single log of pulpwood or several logs.

It is thus an object of this invention to provide a grapple with cooperating jaws that intermesh upon closing whereby to provide a positive and efficient securement to various sized clusters of pulpwood logs and sticks having varying cross sectional dimensions. Thus, the grapple may be efficiently used for moving a single log or several logs.

Another object is to provide a grapple which may be used to positively and forcefully grasp one or more logs or sticks at one end only, thus avoiding the necessity of grappling the wood intermediate the ends or essentially at its balance point.

Another object of the invention is to provide a grapple of the class described which will be capable of exerting a digging force into a plurality of logs, the jaws of the grapple exerting and maintaining a substantially balanced condition at all times with regard to the force applied to the respective jaws and with respect to the angle and direction of the digging force.

A further object is to achieve in a pulpwood grapple the foregoing objectives with respect to the balancing of forces, yet to render the grapple jaws operative from a wide open condition through a closed, and into a crossed-over, condition.

A further object is to provide a grapple which is simple and easy to operate through avoidance of a cumbersome and complicated structure.

These and other objects and advantages of my invention will more fully appear from the following description, made in connection with the accompanying drawing, wherein like reference characters refer to the same or similar parts throughout the several views and in which:

FIGURE 1 is a side elevation view of the improved pulpwood grapple showing in solid line the manner in which the jaws intermesh;

FIGURE 2 is a front view of FIGURE 1;

FIGURE 3 is a top cross sectional view of FIGURE 1 taken on line 3-3;

FIGURE 4 is a side elevation of an alternate form of the invention; and

FIGURE 5 is another side view of the alternate form taken from the right of FIGURE 4.

The improved pulpwood grapple, referred to generally as 10, consists of three main parts, namely a supporting structure 11, a pair of confronting and cooperating jaws 12, and a pair of powered extensible and retractable means 13 which are connected between the supporting structure and the jaws.

The supporting structure 11 has an anchor housing 14 through which a pivotal hoist connector 15 passes and is secured to. The housing 14 may contain gearing and the like which is necessary for rotating the grapple about a

vertical axis. The hoist connector carries a hoist pin 16 which engages with a hoist 17 (partially shown). Secured to the ends of the housing are a pair of side plates 18 which extend downwardly to where a bearing plate 19 is firmly secured in endwise relation therebetween. The bearing plate 19 has formed at the lowermost portions a pair of bearing sleeves 20 and has secured across the upper edge thereof a transverse plate 21 which gives the bearing plate structural rigidity. Referring to FIGURE 1, a cylinder plate 22 is secured at right angles to the corner jointer of the bearing plate 19 and transverse plate 21 on each side of the bearing plate for purposes which will become apparent subsequently.

Slidably journaled through both of the bearing sleeves 20 is a pivot shaft 23 from which the jaws 12 freely and pivotally depend. The jaws 12 each have a pair of essentially C-shaped frame members which are both of the same size and shape, one difference being that one pair of frame members is shorter and narrower than the other pair whereby the shorter and narrower pair will intermesh with the longer and wider pair. Thus, there is formed a variably sized open ended cradle area, referred to by numeral 24, in which the logs or sticks are secured during transfer from one location to another.

More particularly, and with reference to FIGURES 1 and 2, the shorter and narrower jaw 25 consists of frame members 26 and 27, and the other jaws 28 consists of frame members 29 and 30. The frame members of each pair are positioned in parallel planes and are pivotally secured at the upper ends 31 to the pivot shaft 23, as indicated above. The frame members are each provided with a bearing brace to provide added rigidity as well as an increased bearing surface area which will avoid cutting of the frame member into the log when grappled. As may be seen in each view, the shorter frame members 26 and 27 each have a bearing brace 32 which is secured to the inside surfaces at joints 33 by welding, for example, (see FIGURE 3) and along the curvilinear inner edges 34 of the frame members to form the bearing surfaces 35. Likewise, the longer frame members 29 and 30 each have a bearing brace 36 which is secured to the outside surfaces at joints 37 by welding, for example, and along their curvilinear inner edges 38 to form the bearing surfaces 39.

Secured across the lower ends 40 and 41 of jaws 25 and 28 is an inner transverse lip plate or strip 42 and an outer transverse lip plate or strip 43, respectively. The inner lip plate 42 is positioned adjacent the inner edge 34 of the shorter frame members 26 and 27 and the outer lip plate 43 is positioned adjacent the outer edges 43a of the frame members 29 and 30. With this location of each transverse lip plate, a minimum of clearance is required between intermeshing jaws but with a maximum of length of the shorter frame members. It is pointed out that the lip plates provide structure to maintain the frame members integral and rigid as well as providing a transverse lip for grasping logs and the like. It will be noted that the curvature of the jaw frame members 29 and 30 is such that the lower lip plate 43 lies substantially normal to the line of radius extended therethrough from the axis of rotation of pivot shaft 23. In other words, the plane of the lower lip plate lies at the circumference of arcuate swing of the outer jaw 28 and presents the lip edge 41 in the same circumference, making it possible for the lip 42 and its edge 40 to substantially oppose lip 42 and its edge 40, yet permit the latter to pass by the former in very close clearance. Any binding action between the jaws as they dig into the pulpwood is thereby minimized. Also, as can be seen from the solid line relationship pictured in FIGURE 1, the jaws 12 curve or incline upwardly from the strips or narrow lip plates 42, 43 to form a notch

at the bottom of the area 24 that moves upwardly as the jaws become progressively intermeshed, becoming narrower and narrower in so doing. Stated somewhat differently, the lip members 42 and 43 traverse paths forming closely spaced concentric arcs in moving from the solid line position of the jaws in FIGURE 1 to the phantom line position and vice versa, the jaws extending inwardly of and from the paths of these arcs as they incline upwardly from said lip members 42, 43.

Secured between each pair of frame members is a transverse brace structure 44 which carries an anchor bracket 45. The brace structure 44 receives the drive forces from the extensible and retractable means 13 for closing and opening of the jaws 12.

The extensible and retractable means 13 consists of a hydraulically driven system having a hydraulic cylinder 46 and an axially movable ram 47. The cylinder 46 has one end pivotally secured to the cylinder plate 22 and the ram 47 has one end thereof pivotally connected to the anchor bracket 45. The cylinders are provided with the usual pressure hoses 48 (partially shown) and connectors 49.

Referring now to FIGURES 4 and 5, an alternate form of the invention is there shown wherein the jaws always function in a balanced condition while the pulpwood is being loaded and elevated.

As in the first form of the invention, the pulpwood grapple has three main parts, a supporting structure 51, a pair of confronting and cooperating jaws 52, and extensible and retractable means 53 which are connected between the supporting structure and the jaws. In the form of FIGURES 4 and 5, only one of the extensible and retractable means need be employed because of the linkage which exists between the jaws as will be subsequently described. The supporting structure 51 is also provided with an anchor housing 54 which is connected to a hoist as through the pivotal connection 55 details of which have been more fully described hereinabove. A pair of side plates 56 are braced transversely by means of plates 57 which may be welded or otherwise secured in place as shown. Bracket means 58 extend outwardly from the plates 57 on at least one side of the grapple to provide a mount for the extensible and retractable means 53. Thus, the hydraulic cylinder 59 may be pivotally mounted at 60 to bracket 58 at one or both sides of the grapple, the embodiment of FIGURES 4 and 5 showing two such hydraulic systems, each having a piston rod 61 extending downwardly therefrom and being operated alternately through the hydraulic lines 62 and 63.

At the lower edge of each of plates 57 there are respectively secured a pair of aligned bearing sleeves 64 as shown in FIGURE 5. A pair of pivot pins 65 are mounted at one side of the side plates 56 as shown in FIGURE 4 and a corresponding pair of pivot pins 66 are located at the other side of the plates 56, all of the pivot members being mounted in the sleeve bearings 64 as shown in FIGURE 5. A pair of jaw frame members 67 are secured at their upper ends to the pivot pins 65 where they are provided with a linking means such as the gear segment 68. The jaw frame members 67 are sharply bent so that their lower termini 69 are directed inwardly as shown in FIGURE 4. Across the ends 69 of the jaw frame members 67 is secured a flat lip plate or strip 70. This flat plate or strip is so oriented as to present a flat surface substantially normal to a radius extending therefrom to the axis of the pivot pins 65.

A transverse brace 71 also extends across the jaw frame members 67 and has a pivot mount 72 for securing the lower end of the cylinder rod 61 as shown in FIGURES 4 and 5.

In a similar manner, jaw frame members 72 are respectively mounted upon their pivot pins 66 and have gear segments 73 at their upper ends which mesh with the gear segments 68 of the frame members 67. Across the lower ends 74 of the jaw frame members 72 is supplied

another lip 75. This lip 75 passes in very close clearance with the lip 70 and provides substantially opposed forces upon pulpwood when the grapple is employed. A similar cross brace structure 71 may be employed for the jaw frame members 72 and a duplicate hydraulic extensible and retractable means can be employed upon the jaw frame 72. It will be noted that since the jaws are geared together, a hydraulic ram or other extensible and retractable means need be employed at only one side to produce a concurrent action of the jaws.

Referring now to FIGURE 5, it will be seen that the jaw defined by the frame members 67 and lip 70 is slightly wider and longer than the corresponding jaw frame members 72 and lip 74 and hence the previously mentioned intermeshing relation can be established if desired. The transverse brace 71 is positioned so as to create an open space between the jaw frame members 67 and extending from the transverse brace down to the lip 70. Such arrangement makes it possible for the lower terminus and lip 75 to move past and into the space for grasping a single log or a plurality having a small collective diameter.

In the use and operation of the form of this invention shown in FIGURES 1-3, the jaws 12 are hydraulically raised to the position shown in FIGURE 1 as represented by the broken lines 50. The entire grapple 10 is then dropped upon a stack of logs once the transverse lips 42 and 43 are positioned parallel therewith. As pressure is applied to the hydraulic cylinders 46, the ram 47 is forced axially outward and the jaws then firmly grasp the logs. If only one log is being transferred in location, then the jaws will be allowed to intermesh, as shown in solid line in FIGURE 1, to the extent necessary to firmly and positively grasp the log. Thus, the log will not be allowed to slide endwise out of the open ended cradle if it is not evenly balanced therein such as would be the tendency if the lower ends 40 and 41 merely met and the jaws were not allowed to intermesh. Thus, the usual desirable grappling characteristics are retained and in addition the novel feature of being able to transfer only one log at a time in a secured and positive manner is provided.

With respect to the alternate form shown in FIGURES 4 and 5, balanced force is assured and the respective lips 70 and 75 will dig in equally and firmly to load a plurality of pulpwood logs. With this form of the invention, there will be no tendency for one of the extensible and retractable means to operate independently of the other or to exert a greater influence on one or the other of the jaws. For clarity, the lips 70 and 75 are illustrated with exaggerated clearance. It will, however, be understood that this clearance is minimized so as to utilize to the fullest benefit the opposed grappling forces without unnecessary torque or binding between the jaw members and the logs which are being grappled.

It will be understood that because of the proximal relationship of the pins 65 and 66 with respect to each other, particularly as compared with the distance the lip strips or narrow lip plates are located from these pins, the lip members 70, 75 are constrained to traverse arcs which are substantially concentric. In other words, the lips 70, 75 follow paths generally similar to those traversed by the previously-mentioned lips 42, 43. As can be seen from FIGURE 4, the jaws extend inwardly of and from the paths of the generally concentric arcs as they incline upwardly from said lip members or strips 70, 75 in the same fashion as do the jaws of FIGURE 1.

It will, of course, be understood that various changes may be made in the form, details, arrangements, and proportions of the parts without departing from the scope of my invention as set forth in the appended claims.

What is claimed is:

1. A pulpwood grapple comprising:

(a) a supporting structure adapted to be pivotally secured to a hoist;

5

- (b) a pair of confronting and cooperating jaws both of which are pivotally secured at their upper ends to said supporting structure,
- (c) each of said jaws comprising a plurality of jaw frame members positioned in parallel planes and a relatively narrow lip strip secured transversely across the jaw frame members of each jaw at only the lowermost ends thereof,
- (d) said pair of jaws further having one shorter and narrower jaw than the other jaw such that one will swing through the other to cause said lip strips to traverse paths forming closely spaced substantially concentric arcs,
- (e) the jaw frame members of each jaw inclining upwardly from said lip strips and extending inwardly of and away from the paths of said arcs to provide angled bearing surfaces which form an upwardly and narrowing notch as said jaws are progressively intermeshed with each other, and
- (f) powered extensible and retractable means secured between said supporting structure and said jaws,
- (g) whereby when said powered means is extended said jaws are progressively intermeshed with each other to cause said angled bearing surfaces to cam against varying quantities of pulpwood, including as little as a single log, to positively clamp said pulpwood and to release said pulpwood when said powered means is retracted.
2. A pulpwood grapple as set forth in claim 1 including:
- (a) a single pivot pin carried by said supporting structure,
- (b) both of said jaws being pivotally connected to said pin.
3. A pulpwood grapple comprising:
- (a) a supporting structure adapted to be raised and lowered by a hoist;
- (b) a pair of confronting and cooperating jaws secured on spaced axes at their upper ends to said supporting structure,
- (c) each of said jaws comprising a plurality of jaw frame members positioned in parallel planes and a relatively narrow strip secured transversely across the jaw frame members of each jaw at only the lowermost ends thereof,
- (d) said pair of jaws further having one shorter and narrower jaw than the other jaw such that one will swing through the other to cause said lip strips to traverse paths forming closely spaced substantially concentric arcs,
- (e) said spaced axes being relatively close together compared to the spacing of said lip strips from said axes,
- (f) the jaw frame members of each jaw inclining upwardly from said lip strips and extending inwardly of and away from the paths of said arcs to provide angled bearing surfaces which form an upwardly and narrowing notch as said jaws are progressively intermeshed with each other, and

6

- (g) powered extensible and retractable means secured between said supporting structure and said jaws,
- (h) whereby when said powered means is extended said jaws are progressively intermeshed with each other to cause said angled bearing surfaces to cam against varying quantities of pulpwood, including as little as a single log, to positively clamp said pulpwood and to release said pulpwood when said powered means is retracted.
4. A pulpwood grapple comprising:
- (a) a supporting structure adapted to be raised and lowered by a hoist;
- (b) a pair of confronting and cooperating jaws pivotally secured at their upper ends to said supporting structure,
- (c) each of said jaws comprising a plurality of jaw frame members positioned in parallel planes and a relatively narrow lip strip secured transversely across the jaw frame members of each jaw at only the lowermost ends thereof,
- (d) said pair of jaws further having one shorter and narrower jaw than the other jaw such that one will swing through the other to cause said lip strips to traverse paths forming closely spaced substantially concentric arcs,
- (e) the jaw frame members of each jaw inclining upwardly from said lip strips and extending inwardly of and away from the paths of said arcs to provide angled bearing surfaces which form an upwardly and narrowing notch as said jaws are progressively intermeshed with each other;
- (f) means linking the upper end of said pair of jaws so as to cause simultaneous convergence and divergence thereof, and
- (g) powered extensible and retractable means secured to said supporting structure and being operatively connected to said jaws for urging said pair of jaws toward one another in timed relation.
5. The pulpwood grapple set forth in claim 4 in which:
- (a) said jaws are secured on closely spaced parallel axes, and in which
- (b) said linking means includes gear segments lying in meshed relation to produce said simultaneous convergence and divergence.

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