

[54] **HYDRAULIC GRAPPLE AND SHEAR**

[76] Inventor: **Franklin J. Boers, Box 12, Lacon, Ill. 61540**

[22] Filed: **Oct. 7, 1971**

[21] Appl. No.: **187,304**

[52] U.S. Cl. **144/34 R, 92/31**

[51] Int. Cl. **A01g 23/02**

[58] Field of Search **144/3 D, 34 R, 34 E, 144/309 AC; 83/453, 456, 390; 214/3, 147 R, 147 G; 212/42, 44**

References Cited

UNITED STATES PATENTS

1,516,976	11/1924	Mardel.....	212/44
2,814,396	11/1957	Neale.....	214/3
2,882,941	4/1959	Pope.....	144/34 A
3,191,780	6/1965	Updegrave.....	212/66
3,227,295	1/1966	Hamilton et al.....	214/77

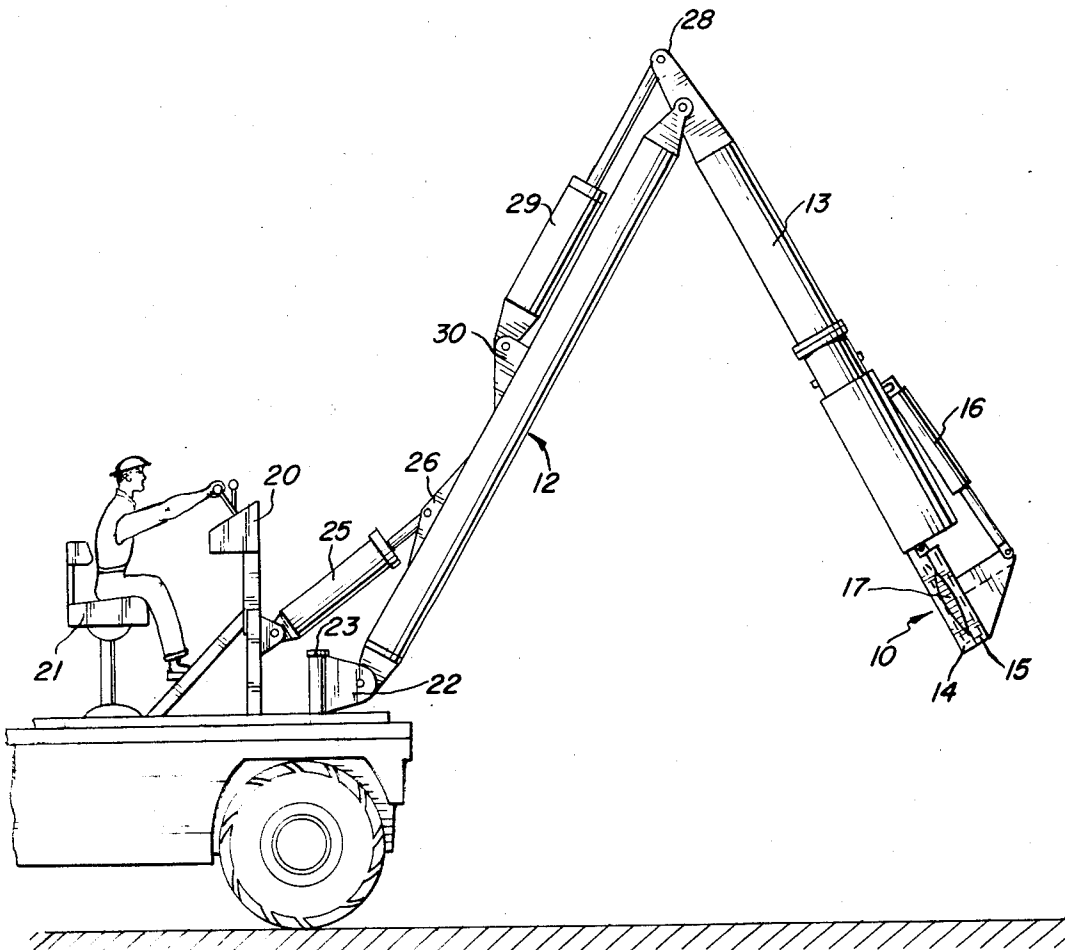
3,294,131	12/1966	Larson	144/34 E
3,319,813	5/1967	Beya	214/147 G
3,443,611	5/1969	Jorgensen.....	144/2 Z
3,540,501	11/1970	Jonsson.....	144/34 E
3,591,024	7/1971	Runge.....	214/147 G

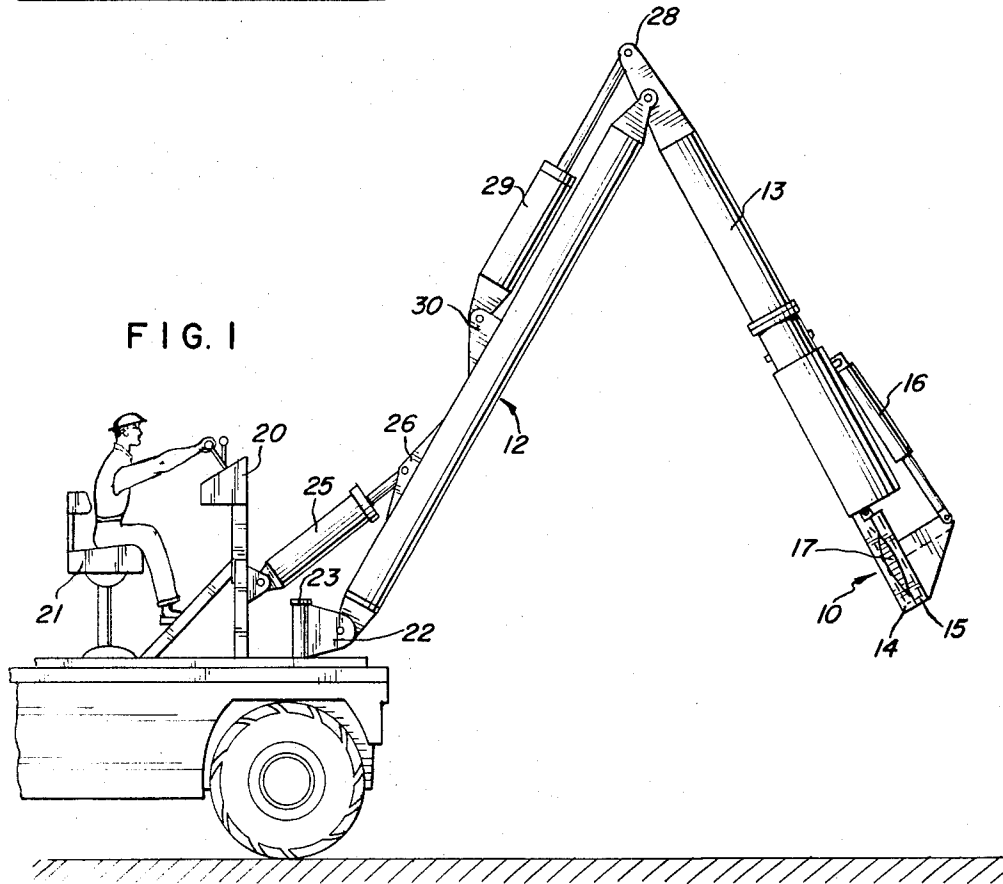
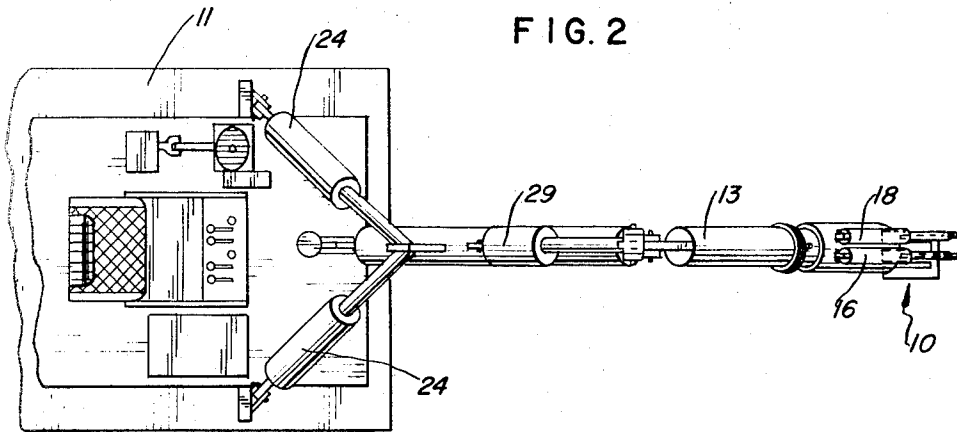
Primary Examiner—Gerald A. Dost
Attorney—Hofgren, Wegner, Allen, Stellman and McCord

[57] **ABSTRACT**

A mobile grapple and shear with a boom mounted on a carrier and having an arm which carries the grapple and shear mechanism. The grapple and shear are movable axially and rotatably with respect to the arm to hold, carry or cut objects, as desired. A piston and cylinder actuator for the grapple and shear has a piston rod with a spiral cam engaged by a fixed follower, causing the piston rod to rotate as it reciprocates.

10 Claims, 6 Drawing Figures





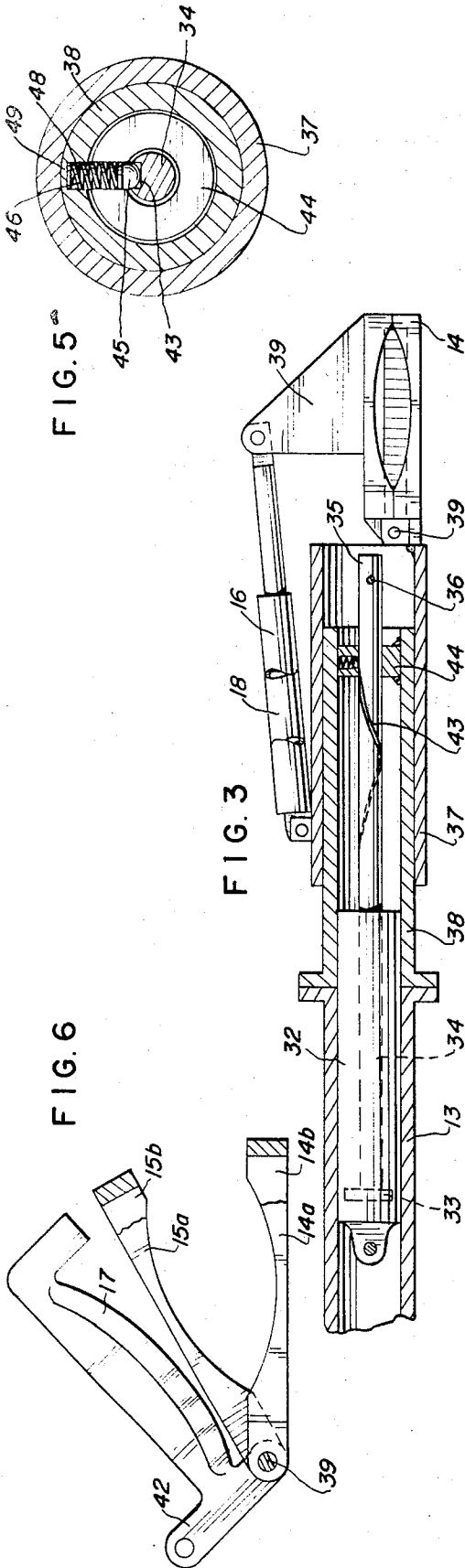


FIG. 5

FIG. 6

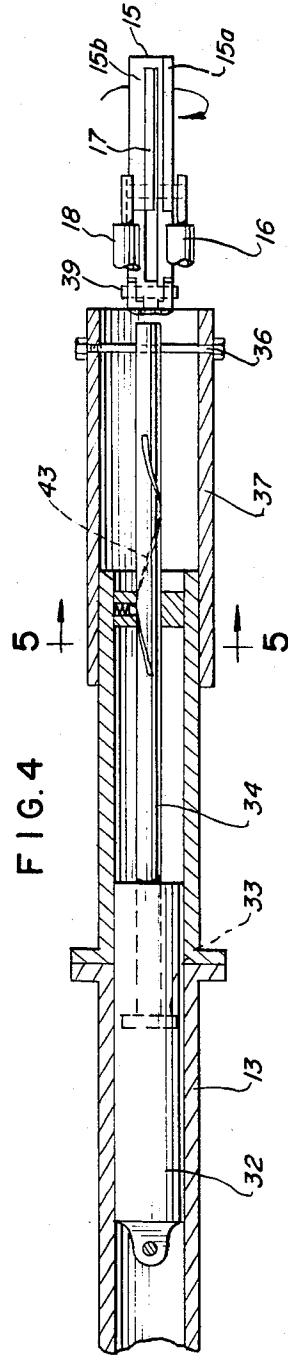


FIG. 4

HYDRAULIC GRAPPLE AND SHEAR

This invention is concerned with a grapple and shear and with a piston and cylinder used therein to position the grapple and shear axially and rotationally with respect to the arm on which it is mounted.

The grapple and shear of this invention provide a means for holding an object, moving it about and for cutting it. The grapple and shear is a versatile tool which has many uses. For example, victims of an automobile accident are often trapped within the automobile and it is necessary to cut away part of the automobile body in order to release them. This is generally done with a cutting torch or with a power saw, both of which present a danger of igniting gasoline and causing a fire or explosion. With the grapple and shear of this application, the automobile can be righted, if it is not upright, and a portion of the body cut away without danger of causing a fire. The grapple and shear may also be used to cut and stack small trees, clear away brush or the like. Many other uses will readily be apparent.

One feature of the invention is the provision of a grapple mounted at the end of an arm which is movably carried on a support, together with a shear operably associated with the grapple.

Another feature of the invention is that the grapple and shear are movable axially and rotatably with respect to the arm on which they are mounted.

A further feature is the grapple has a fixed member with a movable member pivoted thereto, both of which have transversely spaced apart grapple surfaces. The surfaces of the fixed movable members are aligned and the shear blade is pivoted for movement between them.

Still another feature is that a piston and cylinder are mounted on the grapple supporting arm with the grapple secured to the piston rod for movement with respect to the arm. A sleeve around the cylinder moves with the grapple and a grapple actuator is connected between the grapple and the sleeve. Similarly, where a shear blade is provided, the shear actuator is connected between the blade and the sleeve.

Still a further feature of the invention is that the piston and cylinder actuator which moves the grapple with respect to the mounting arm has a spiral cam surface on the piston rod together with a cam follower mounted on the cylinder and engaging the cam surface to cause rotation of the rod and the grapple as the rod moves axially with the piston.

Further features and advantages of the invention will readily be apparent from the following specification and from the drawings, in which:

FIG. 1 is a side elevation of a grapple and shear embodying the invention;

FIG. 2 is a plan view thereof;

FIG. 3 is an enlarged fragmentary elevation of the end of the mounting arm for the grapple and shear, with a portion of the arm broken away to show the piston, cylinder and cam mechanism with the grapple retracted;

FIG. 4 is a view similar to FIG. 3 with the grapple extended;

FIG. 5 is a section taken through the arm along line 5—5 of FIG. 4, illustrating the cam follower; and

FIG. 6 is a detailed view of the grapple and shear showing the shear blade retracted and the grapple open.

The grapple and shear, indicated generally at 10, are illustrated in FIGS. 1 and 3 mounted on a mobile platform 11, which may be the bed of a truck. A boom 12 extends generally upwardly from the platform 11 and has mounted thereon an arm 13 which carries the grapple, shear and associated operating mechanism. The grapple has two jaw members 14 and 15 with jaw member 15 pivoted to jaw member 14 and operated by a piston and cylinder actuator 16. Shear blade 17 is also pivoted to grapple jaw 14 and is operated by piston and cylinder actuator 18. Further details of the grapple and shear will be described below.

An operator's control pedestal 20 is mounted on truck bed 11 and the operator is provided with a seat 21. Boom 12 is pivotally secured to a link 22 rotatably mounted on a pin 23 extending upwardly from the truck bed 11. Piston and cylinder actuators 24 and 25 are secured between a plate 26 on arm 12 and the truck bed and may be operated to raise, lower and rotate the boom.

Arm 13 is pivoted at the outer end of boom 12 and has its upper end 28 connected with a piston and cylinder actuator 29 secured to a plate 30 on arm 12. Actuator 29 pivots arm 13 on the end of the boom, in a generally vertical plane.

Leveling jacks (not shown) may be provided for truck bed 11 if additional stability is required.

The construction and control of the grapple and shear blade are best seen in FIGS. 3 through 6.

Arm 13 is a tubular member within which is mounted a cylinder 32 having movable therein a piston 33 to which a piston rod 34 is secured. Rod 34 extends outwardly through the end of cylinder 32 and has an end portion 35 to which the grapple and shear 10 are secured. Piston rod end 35 is connected by a pin 36 with a sleeve 37 slidable on tubular arm extension 38. The lower jaw member 14 of the grapple is secured to the end of sleeve 37, as by welding. Movable jaw member 15 is pivotally mounted on a pin 39 extending through the inner end of jaw member 14. A plate 40 extends upwardly from upper jaw 15 and is connected with piston and cylinder actuator 16 the other end of which is secured to sleeve 37. Operation of piston and cylinder actuator 16 causes grapple jaw 15 to pivot about pin 39 away from and toward fixed jaw 14.

Both grapple jaw members 14 and 15 have transversely spaced apart jaw surfaces 14a, 14b and 15a, 15b, FIG. 6, which are aligned with each other. Shear blade 17 is pivotally mounted on pin 39 between the jaw surfaces. An arm 42 extending from blade 17 is secured to piston and cylinder actuator 18, the other end of which is connected with sleeve 37.

The portion of piston rod 34 extending outwardly from cylinder 32 has a spiral cam groove 43 formed therein. The cam groove is wholly outside the cylinder when the piston is retracted, FIG. 3. A cam follower mounted on boom arm extension 38 extends into the groove causing piston rod 34 to rotate as it is reciprocated by piston 33. As best seen in FIG. 5, piston rod 34 extends through a guide bushing 44 adjacent the outer end of arm extension 38. The cam follower is a ball 45 held in groove 43 by a spring 46, which extends through aligned holes 47, 48 in the arm extension 38 and guide bushing 44, respectively. A plug 49 threaded into hole 47 compresses spring 46 and holds the follower ball 45 in the cam groove.

Sleeve 37 moves longitudinally or axially of arm 13 and rotationally thereon with movement of piston rod 34. It provides an anchor for grapple and shear actuators 16 and 18, fixed in position with respect to grapple jaw member 14.

The grapple and shear 10 may be oriented in any place and positioned vertically and horizontally by manipulation of piston and cylinder actuators 24, 25, 29 and 32, 33. The grapple and shear may be operated in any position of the boom 12 and arm 13. Objects may be picked up, moved about and cut as desired by the operator. Additional flexibility can be provided by incorporating a telescopic extension mechanism in boom 12 or arm 13, or both of them.

The piston and cylinder actuator 32, 33, etc., with a cam providing rotary motion of the piston rod as it moves axially may be used to power other devices requiring this combination of motions. For example, it could be used to power a drill or auger.

The details of the hydraulic system for operating the various piston and cylinder actuators are not shown. It will be appreciated that hydraulic connections are preferably made at both ends of each of the cylinders to provide precise control of the various movements by the operator.

I claim:

1. A grapple and shear comprising:

- a support;
- an arm movably mounted on said support;
- a grapple mounted at the end of said arm for movement rotatably about an axis generally coincident with the axis of the arm and for movement axially along an extension of the axis of said arm;
- a shear movable with said grapple;
- means for controlling movement of the grapple and the shear associated therewith; and
- means for actuating said shear to cut that which is held by said grapple.

2. The grapple and shear of claim 1 in which said grapple mounting means simultaneously moves the grapple and shear axially of the arm and rotationally about the arm's axis.

3. A grapple and shear comprising:

- a support;
- an arm movably mounted on said support;

a grapple at the end of said arm, including a fixed member and a movable member pivoted thereto, both members of the grapple having transversely spaced apart grapple surfaces, the surfaces of the fixed and movable members being aligned; and a shear comprising a blade pivoted for movement between the spaced apart surfaces of said fixed and movable grapple members.

4. A grapple comprising:

- a support;
- an arm movably mounted on said support;
- a piston and cylinder mounted on said arm, having an operating axis generally coaxial with the arm;
- a grapple mounted on the rod of said piston and cylinder for movement with respect to said arm;
- a sleeve slidable on said arm and connected with said grapple for movement therewith; and
- a grapple actuator connected between the grapple and the sleeve.

5. The grapple of claim 4 with a shear blade mounted on said grapple, operable to cut that which is held by the grapple, and a shear blade actuator connected between the blade and said sleeve.

6. The grapple of claim 4 in which said piston rod has a spiral cam surface thereon, and including a follower fixedly mounted with respect to said cylinder and engaging said cam, causing rotation of the piston rod and grapple with axial movement thereof.

7. The grapple of claim 4 in which said piston and cylinder is actuatable to rotate the grapple about an axis generally coincident with the axis of said arm.

8. The grapple of claim 4 in which said piston and cylinder is actuatable to translate said grapple generally axially along an extension of the axis of said arm.

9. The grapple of claim 4 in which said piston and cylinder is actuatable simultaneously to rotate said grapple about an axis generally coincident with the axis of said arm and to translate said grapple generally axially along an extension of the axis of said arm.

10. The grapple of claim 9 with a shear blade mounted on said grapple, operable to cut that which is held by the grapple, and a shear actuator connected between the blade and said sleeve.

* * * * *

50

55

60

65