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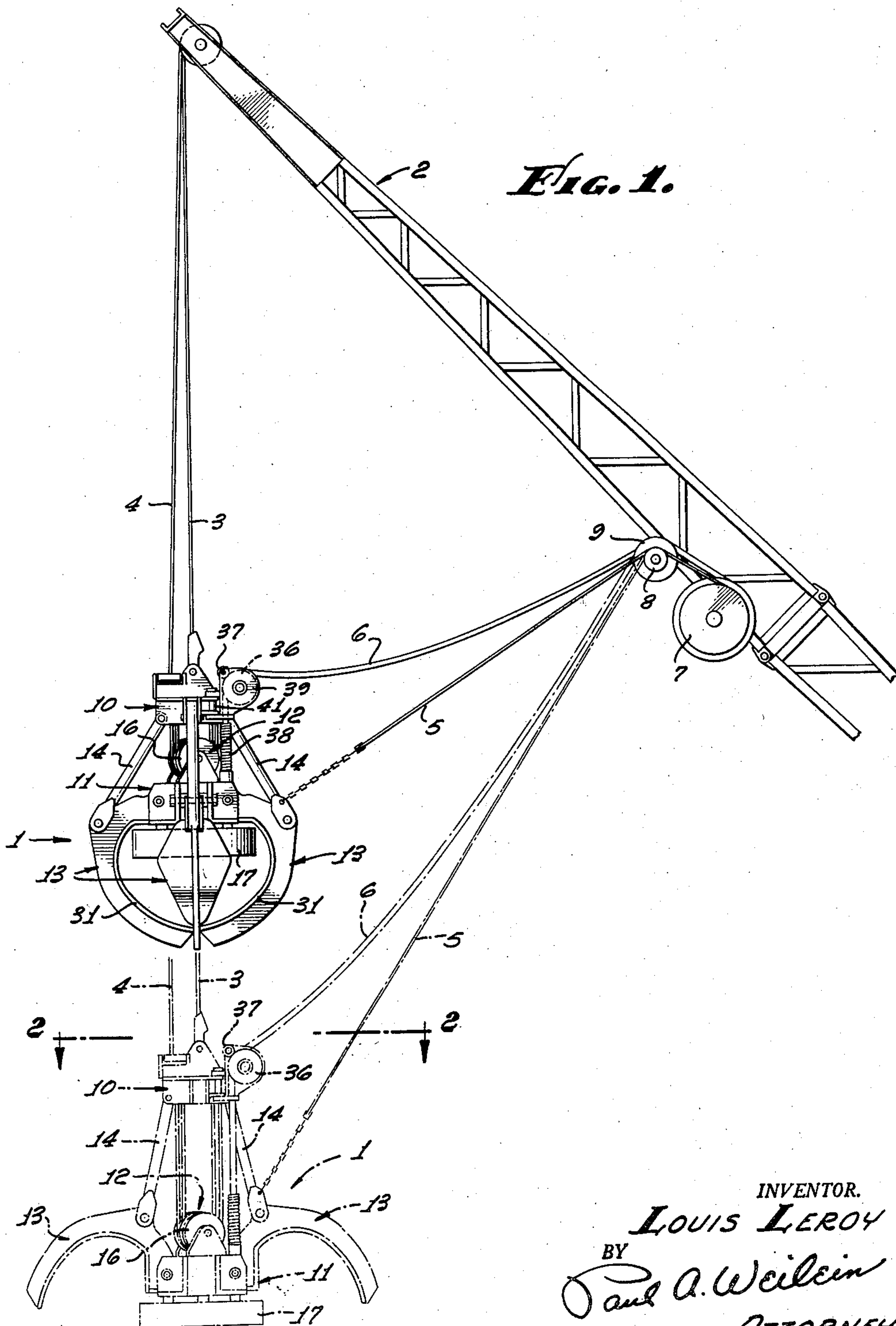
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2,850,189

GRAPPLE

Filed May 14, 1956

3 Sheets-Sheet 1



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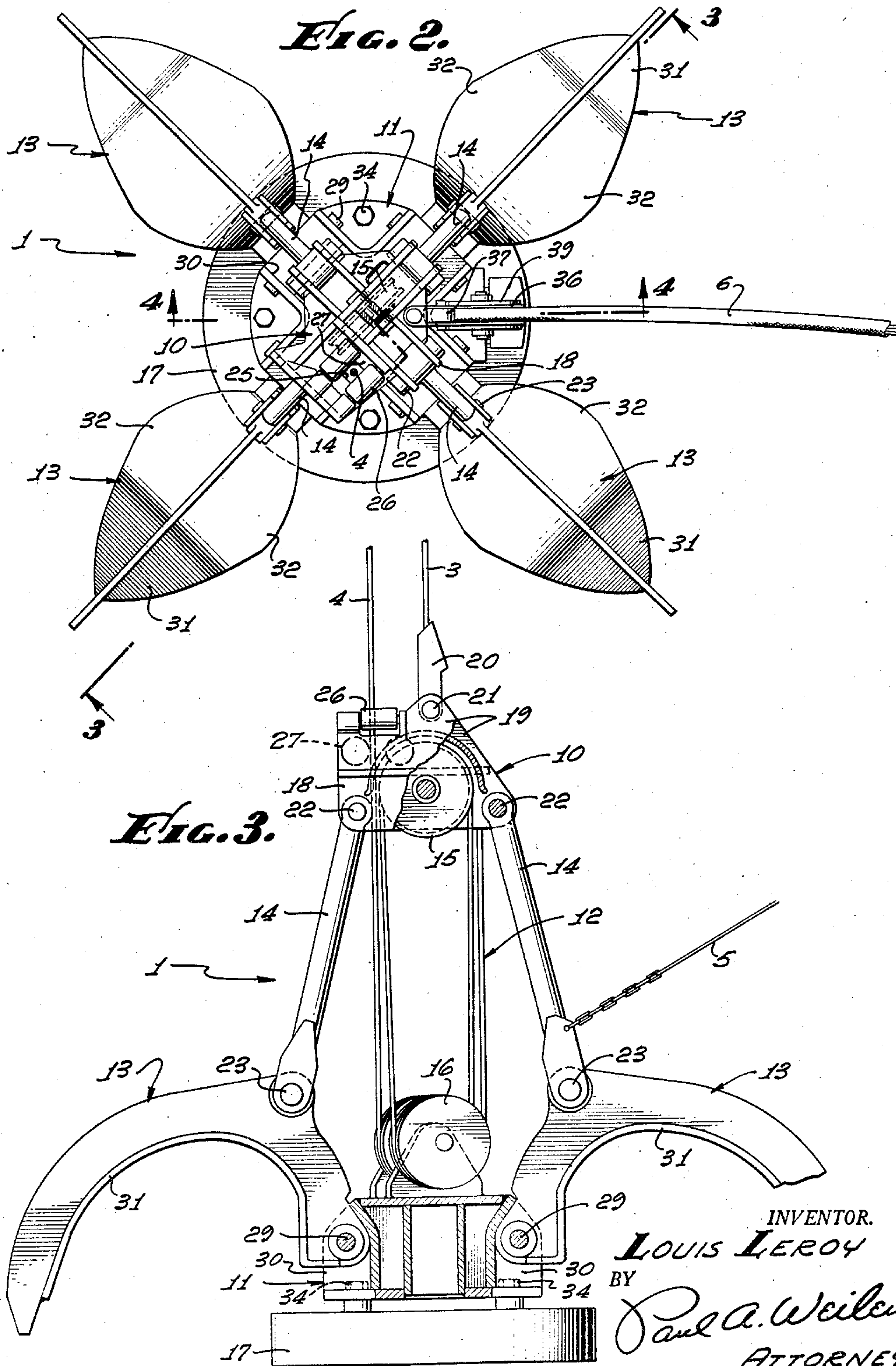
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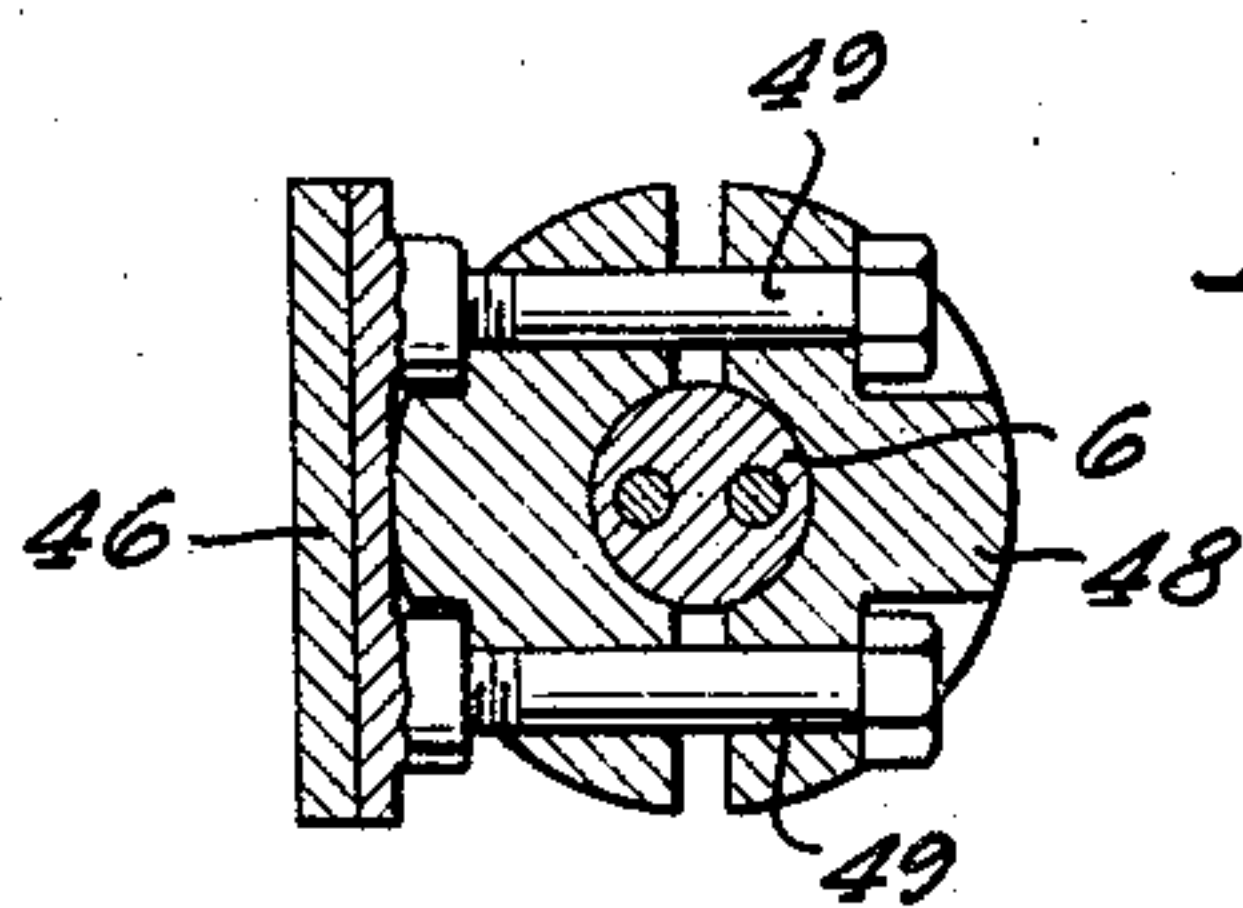
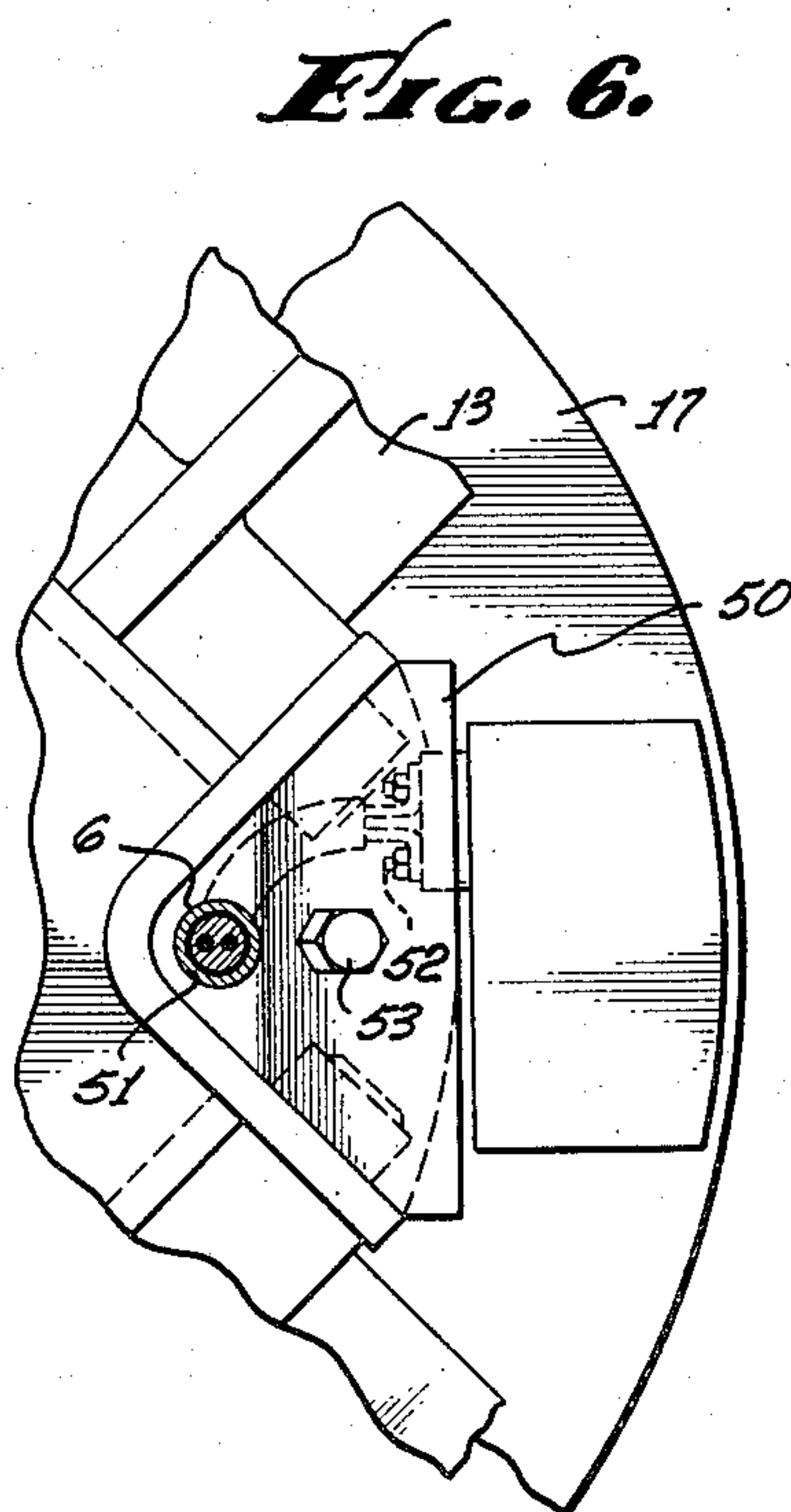
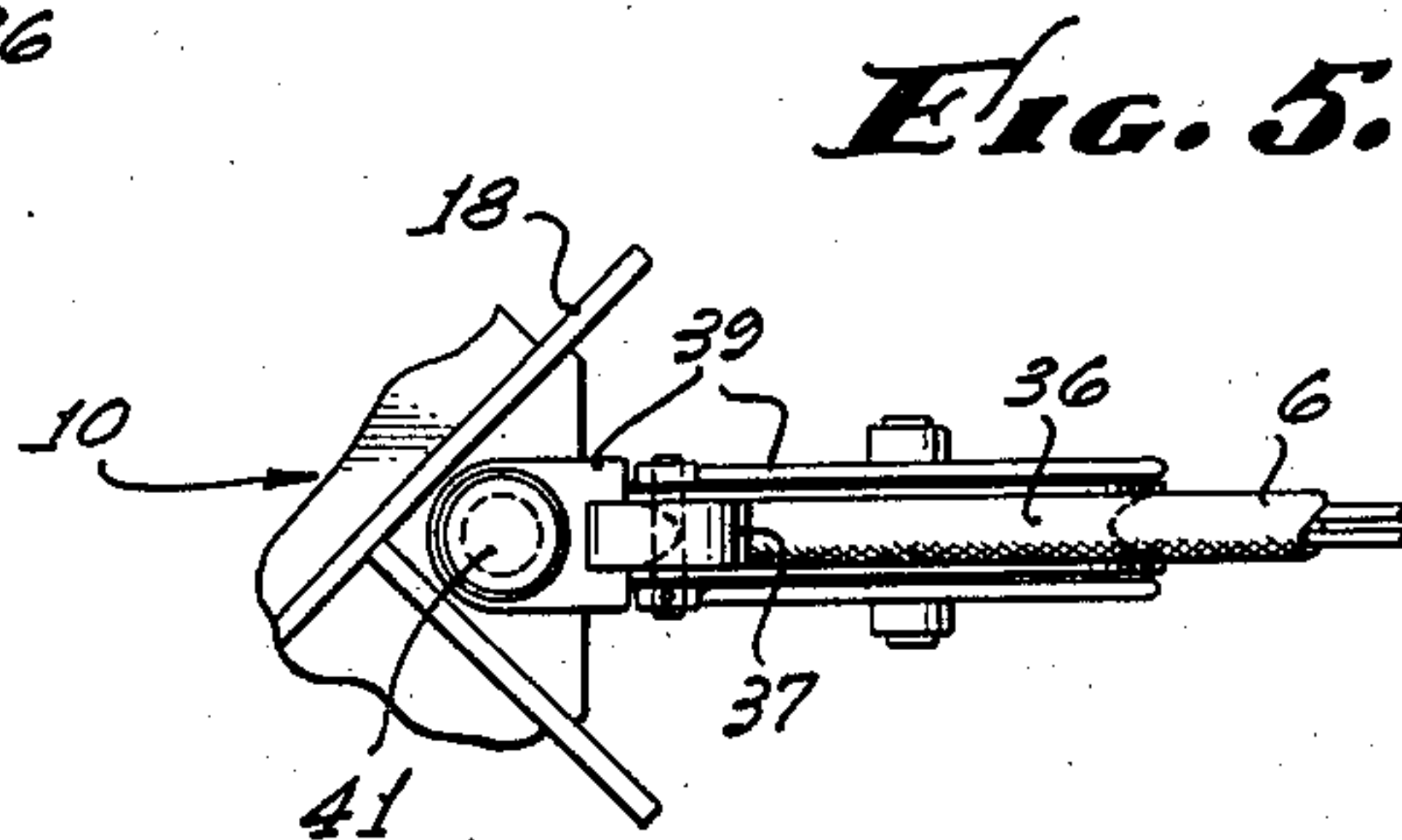
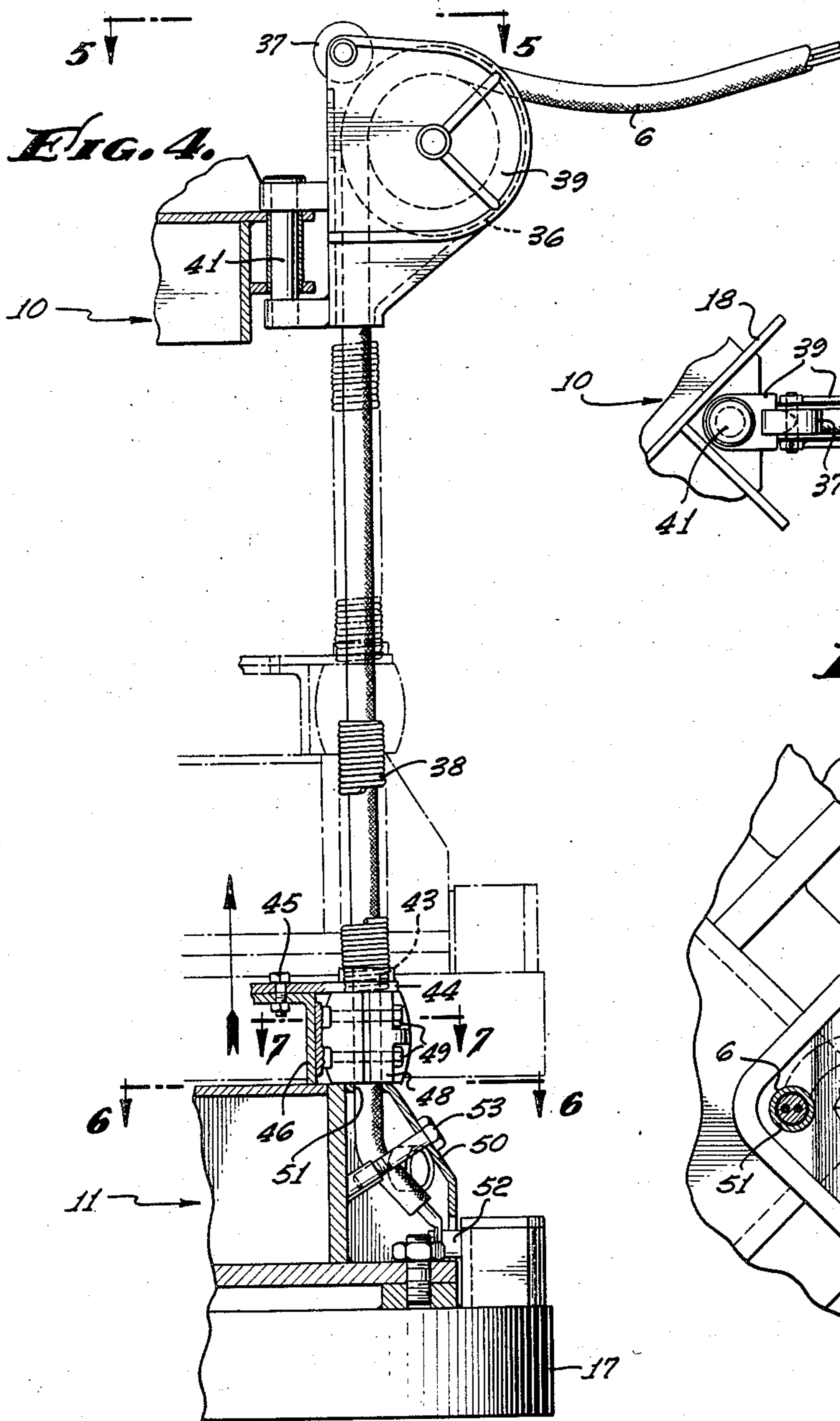
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2,850,189

## GRAPPLE

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Application May 14, 1956, Serial No. 584,586

16 Claims. (Cl. 214-114)

This invention relates to grapples and more particularly to a crane-operated grapple for handling scrap metal, scrapped automobile bodies and various other pieces of scrap material.

It is an object of this invention to provide a grapple of the character described which is an improvement over grapples heretofore made, in point of ruggedness, long life, ease of operation and control, reliability of performance and the capacity for handling large amounts of scrap metal of various sizes and shapes.

It is another object of this invention to provide a grapple such as described which includes an electromagnet arranged to aid in the handling of metal scrap by the grapple arms and in the operation of such arms.

It is another object of this invention to provide a grapple such as described having novel means for connecting an electrical conductor cable with the magnet so that damage of the cable and failure thereof as a conductor are prevented.

It is another object of this invention to provide a grapple such as described which embodies a novel construction and arrangement of an upper body adapted to be suspended by the holding line of a crane, a lower body swingably mounting grapple arms; a block and tackle unit operable as a link between the two bodies by means of the hoist line actuated from the crane, for effecting relative vertical movement between the two bodies; links connecting the upper body with the grapple arms for swinging the arms into and from load-supporting position responsive to relative vertical movement between the two bodies; and an electromagnet carried by the lower body for aiding in the handling of metal scrap as well as the operation of the grapple arms.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown one form in the drawing accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

Fig. 1 is a side elevation of a grapple embodying the present invention as it would appear when installed for operation in connection with a crane, showing the grapple in load-supporting and elevated position in full lines and in lowered and open position in dot-dash lines.

Fig. 2 is a top plan view of the grapple as seen from line 2-2 of Fig. 1;

Fig. 3 is a sectional view taken substantially on the line 3-3 of Fig. 2;

Fig. 4 is a sectional view taken substantially on the line 4-4 of Fig. 2, showing parts of the grapple in raised position in dot-dash lines;

Fig. 5 is a top plan view taken from the 5-5 of Fig. 4;

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Fig. 6 is an enlarged sectional view taken on the line 6-6 of Fig. 4; and

Fig. 7 is an enlarged sectional view taken on the line 7-7 of Fig. 4.

In Fig. 1 of the drawings, there is shown a grapple 1 embodying the present invention, as it would appear when ready for use in connection with a crane. Only the boom 2 of the crane is shown. The holding line 3 and the hoist line 4 of the crane are connected with the grapple and for operating the latter in a manner to be hereinafter fully described. Also connected with the grapple are a tag line 5 and an electrical conductor cable 6, which are operatively mounted on a spring-loaded tagline drum 7 supported on the boom 2. The tagline 5 and cable 6 extend over guide pulleys 8 and 9 respectively, also mounted on the boom 2 adjacent the drum 7.

Generally, the grapple 1 includes an upper body 10 adapted to be suspended by the holding line 3 of the crane; a lower body 11, a block and tackle unit 12 linking the two bodies, grapple arms 13 swingably mounted on the lower body 11, and links 14 between the upper body 10 and the grapple arms.

The block and tackle unit 12 includes the hoist line 4 of the crane, also pulley blocks 15 and 16 mounted on the upper body 10 and lower body 11 respectively. Actuation of this block and tackle unit 12 by appropriate movement of the holding line 3 and hoist line 4, will effect the movement of the grapple arms 13 into and from load-supporting position in a manner to be hereinafter more fully described.

As here shown, an electromagnet 17 is carried by the lower body 11 to aid in the picking up and handling of scrap metal, particularly small scrap. This magnet may be removed if desired when large pieces of scrap are to be handled. However, the magnet does not interfere with the handling of large pieces of scrap. In fact, the use of the magnet appreciably increases the efficiency of the grapple.

The upper body 10 is formed of a series of steel parts 18 welded to one another to provide a skeleton structure. This structure includes a pair of opposed flange portions 19 located centrally of the upper side of the body whereby a clamp 20 may be pivoted therebetween, as at 21, to provide for connecting the holding line 3 of the crane with the body 10.

The links 14 here shown in the form of steel bars, have their upper ends pivoted as 22 on the upper body 10 and their lower ends pivoted as at 23 on the grapple arms 13.

The crane hoist line 4 extends downwardly through an opening 25 in the body 10 to the pulley block 16 on the lower body 11, thence upward and around the pulley block 15, being connected to one of the blocks in the conventional manner of block and tackle units. Guide rollers 26 and 27 are mounted on the upper body 10 adjacent the opening 25 whereby the hoist line 4 will be guided through the opening 23.

The lower body 11 is in the form of a skeleton steel structure similar to that of the upper body 10 and mounts the pulley lock 16 on the upper side thereof.

The grapple arms 13 are pivoted as at 29 in recesses 30 in the lower body 11 so that they may swing into and from a position for gripping and supporting a load of scrap. When swung downwardly, the arms 13 extend below the magnet 17 so that the free ends thereof abut one another. In this way the scrap is gripped between the arms 13 and the under face of the magnet. When the arms 13 are raised to their uppermost portion as shown at the lower end of Fig. 1 and in Fig. 3, the lower ends of the arms are above the plane of the lower surface of the magnet to facilitate contact of the magnet with the scrap.



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As here shown, each of the grapple arms 13 is in the form of an arcuate steel bar having laterally extended flanges 31 along the inner edges thereof. The flanges 31 on each arm 13 are enlarged laterally as at 32 (see Fig. 2) in a direction away from the free end of the arm so as to provide comparatively wide supporting surface for a load of scrap material held by and between the arms.

The magnet 17 as well seen with reference to Fig. 3 is of greater diameter than the lower body 11 and is detachably secured thereto by means of the fastenings 34. The magnet with the lower body 11 serves as an effective counterweight in the operation of the grapple.

The pivotal connections 23 of the lower ends of the links 14 with the grapple arms 13 are located between the ends of such arms at points nearer to the pivoted ends of the arms than to the free ends of such arms.

Means are provided for connecting the electrical conductor cable 6 with the grapple in such a manner as to prevent damage of the cable and failure thereof as an electrical conductor. This means includes a pair of pulleys 36 and 37 on the upper body 10 and a flexible shield 38 on the lower body 11. The pulley 36 is mounted in a frame 39 which is swivelly mounted on a vertical axis as at 41 (see Figs. 1, 4, and 5) on the upper body 10. The cable 6 extends from the boom-carried tagline drum 7 and pulleys 8 and 9, over the pulley 36 and then downwardly in a straight line to the magnet 17. The pulley 37 is mounted on the frame 39 above the pulley 36 and engages the cable 6 to hold it in place on the pulley 36.

The shield 38 is in the form of a coiled spring which surrounds the lower end portion of the cable 6 and is secured in any suitable manner in a socket 43 on an arm 44 fastened as at 45 on an angle bar 46 welded on the body 11.

It is desired to secure the lower end portion of the conductor cable 6 to the lower body 11 in such a manner that any lateral movement of the cable between the upper body 10 and the lower body 11, as may be occasioned by the cable encountering objects in the use of the grapple, or by any other cause, will not damage the cable. Accordingly, a slip clamp 48 grips the cable 6 beneath the arm 46 and is held in place by means of bolts 49, as shown in Figs. 4 and 7. The upper end of the clamp 48 abuts the lower side of the arm 46, whereas the lower end of the clamp engages the upper end of a shield plate 50. The cable 6 extends downwardly from the clamp 48 through an opening 51 in the shield plate 50 and at its lower end is electrically connected with binding posts 52 for the magnet 17. The shield plate 50 is secured in place by bolts 53 so as to protect that portion of the cable disposed between the clamp 48 and the binding posts 52.

It will now be apparent that as the upper and lower bodies 10 and 11 of the grapple are relatively moved in the operation of the grapple, the conductor cable 6 will be guided and held in a comparatively straight line by the coiled spring shield 38 and the pulleys 36 and 37 thereby preventing kinking of the cable and resultant failure thereof. The spring shield 38 also yields responsive to being struck by or against an object in the use of the grapple and therefore with the clamp 48 and the shield plate 50 will prevent damage of the cable.

As here shown, there are four grapple arms 13 and four links 14 connecting the grapple arms with the upper body 10. These links and arms are pivoted in such a manner as to prevent relative turning or swinging movement of the bodies 10 and 11 in the use of the grapple.

In the operation of the grapple to lower it into position to pick up scrap metal from the ground or other surface, for example, from the elevated position shown in full lines in Fig. 1, the holding line 3 is lowered an appropriate extent and then held, after which the hoist line 4 is lowered, thereby permitting the lower body 11 and magnet 17 to gravitate a unit relative to the upper body and onto the scrap to be picked up. As the body 11

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and magnet 17 are lowered, the links 14 cause the grapple arms 13 to be raised, as shown in dot-dash lines in Fig. 1, when the magnet 17 rests on the scrap material. With the parts of the grapple in the position shown in dot-dash lines in Fig. 1, the magnet may be energized to attract and hold the scrap material; upon now lifting the hoist line 4, the body 11 is moved upwardly toward the body 10, whereby the links 14 will cause the grapple arms 13 to swing down and encompass the scrap material beneath the magnet 17, thereby picking up the scrap. During this actuation of the grapple arms 13, the holding line 4, is raised appropriately and upon continued raising of the line the grapple may be lifted off the ground and moved by the crane for the handling of the load of scrap as desired.

When it is desired to release the load of scrap, the magnet 17 is deenergized and the hoist line 4 is lowered while the upper body 11 is held by the holding line 3. The body 11 and magnet 17 will then gravitate downwardly to swing the grapple arms 13 upwardly and outwardly, thereby releasing the scrap load.

I claim:

1. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; an electromagnet supported by said lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; a flexible electrical conductor cable electrically connected with said electromagnet and adapted to be connected with a source of electrical energy; a pulley mounted on said body in a position such that the conductor cable may be extended in a straight line from said electromagnet up to and over said pulley; and a tubular shield on said lower body through which said cable extends.

2. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; an electromagnet supported by said lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; a pulley positioned on said upper body so that a conductor cable for said electromagnet may be extended thereover and downwardly in a substantially straight line for connection with said electromagnet; and an upstanding tubular shield for said cable carried by said lower body; said shield surrounding said cable.

3. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms; means swingably mounting said arms on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movements between said bodies; links connecting said upper body with said arms operable to swing said arms upwardly from load-sustaining position upon movement of said bodies away from one another and to swing said arms downwardly into load-sustaining position upon movement of said bodies toward one another; an electromagnet; and means mounting said electromagnet on said lower body.

4. A grapple comprising: an upper body; means on said body for connecting said body with the holding line of a crane; a lower body; pulleys on said bodies; a line connecting said pulleys operable by the hoist line of the



crane for effecting relative movement between said bodies; arcuate grapple arms; means pivotally mounting one end of each of said arms on said lower body; said arms being swingable between a closed position in which the free ends thereof substantially contact one another and an open position in which said free ends are raised upwardly and outwardly; rigid links pivoted at their ends to said grapple arms and said upper body respectively; an electromagnet; and means detachably mounting said electromagnet on the under side of said lower body; said free end of said grapple arms being disposed above the plane of the lower side of said magnet when in said open position.

5. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; said lower body being constructed and arranged to detachably support thereon an electromagnet free from connection with said arms; elements on said upper body and said lower body respectively, mounted in line with one another whereby an electrical conductor cable may be supported and held thereon for connection with such an electromagnet; and means mounting the cable-supporting element on said upper body so as to swivel about a substantially vertical axis.

6. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms; means swingably mounting said arms on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet; means detachably mounting said electromagnet on said lower body; a guide pulley for an electrical conductor cable; means mounting said pulley so as to swivel about an upright axis on said upper body; and means on said lower body substantially in line with said guide pulley providing for electrically connecting said cable with said magnet.

7. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; a guide pulley for an electrical conductor cable; means mounting said pulley so as to swivel about an upright axis on said upper body; means on said lower body substantially in line with said guide pulley providing for electrically connecting said cable with said magnet; and a pulley on said mounting means for holding said cable on said guide pulley.

8. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical

movement between said bodies; an electromagnet on said lower body; a guide pulley for an electrical conductor cable; means mounting said pulley to swivel about an upright axis on said upper body; means on said lower body substantially in line with said guide pulley providing for electrically connecting said cable with said magnet; and a flexible tubular shield carried by said lower body for embracing and protecting the lower portion of said cable.

9. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; a guide pulley for an electrical conductor cable; means mounting said pulley so as to swivel about an upright axis on said upper body; and means on said lower body substantially in line with said guide pulley for connecting said cable with said magnet; said last named means including a coiled spring shield through which said cable may be extended; means fixing one end of said shield to said lower body; a clamp gripping said cable below said last named means; means fixing said clamp to said lower body; and a shield plate on said lower body covering the portion of the cable between said clamp and said magnet.

10. A grapple comprising: an upper body adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means mounted on one of said bodies adapted to be slidably engaged by an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; and clamping means disposed between said guide means and said magnet in line with said guide means for gripping and holding the cable adjacent the electrical connection of the cable with said magnet, whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies.

11. A grapple comprising: an upper body adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means mounted on one of said bodies adapted to be slidably engaged by an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; clamping means disposed between said guide means and said magnet in line with said guide means for gripping and holding the cable adjacent the electrical connection of the cable with said magnet, whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies; and a shield between said guide means and said clamping means for covering and protecting said cable.



12. A grapple comprising: an upper body adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means mounted on one of said bodies adapted to be slidably engaged by an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; clamping means disposed between said guide means and said magnet in line with said guide means for gripping and holding the cable adjacent the electrical connection of the cable with said magnet, whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies; and means disposed above and below said clamping means for covering and protecting said cable.

13. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means mounted on one of said bodies adapted to be slidably engaged by an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; clamping means disposed between said guide means and said magnet in line with said guide means for gripping and holding the cable adjacent the electrical connection of the cable with said magnet, whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies; and means disposed between said clamping means and the electrical connection of said cable with said magnet for shielding and protecting said cable.

14. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means swivelly mounted on one of said bodies adapted to be slidably engaged with an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; and clamping means on said lower body in line with said guide means for gripping and

holding said cable above said magnet whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies.

15. A grapple comprising: an upper body adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means swivelly mounted on one of said bodies adapted to be slidably engaged with an electrical conductor cable so that said cable may be extended downwardly therefrom for electrical connection with said magnet; clamping means on said lower body in line with said guide means for gripping and holding said cable above said magnet whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies; and a shield mounted on one of said bodies between said clamping means and said guide means for covering and protecting said cable.

16. A grapple comprising: an upper body, adapted to be suspended by the holding line of a crane; a lower body; grapple arms swingably mounted on said lower body; a block and tackle unit linking said bodies; said unit including a hoist line adapted to be operated by the crane for actuating said unit to effect relative vertical movement between said bodies; links connecting said upper body with said arms operable to swing said arms into and from load sustaining position responsive to relative vertical movement between said bodies; an electromagnet on said lower body; guide means swivelly mounted on one of said bodies adapted to be slidably engaged by an electrical conductor cable so that said cable may be extended downwardly therefrom in a straight line for electrical connection with said magnet; clamping means disposed between said guide means and said magnet in line with said guide means for gripping and holding the cable adjacent the electrical connection of the cable with said magnet, whereby said cable will move in a straight line between said clamping means and said guide means upon relative vertical movement between said bodies; and a shield mounted on one of said bodies between said clamping means and said guide means for covering and protecting said cable, said shield surrounding said cable and permitting axial movement of the cable relative thereto.

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