Oct. 23, 1962 W. F. JOERS 3,059,334

POWER OPERATED SHEAR

Filed April 3, 1961

Fig. 1.

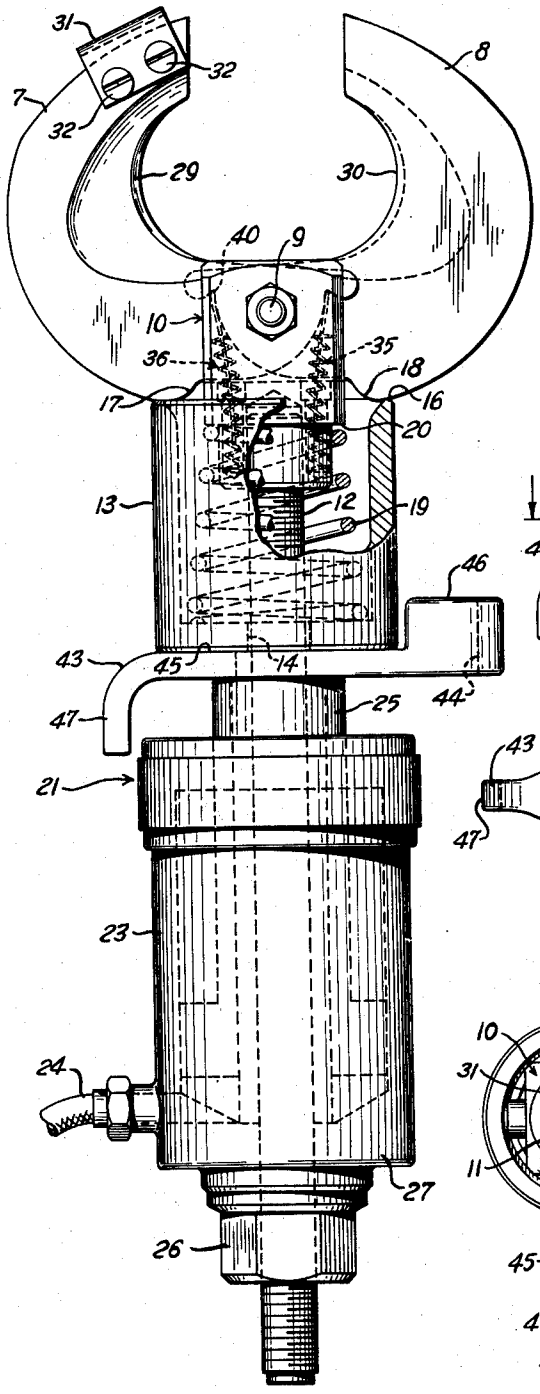


Fig. 2.

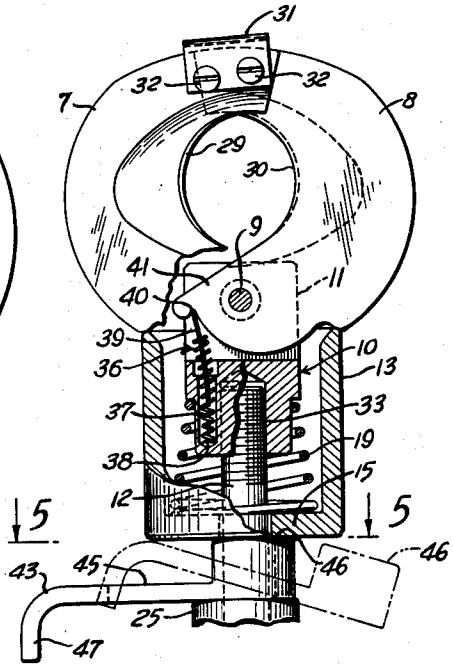


Fig. 5.

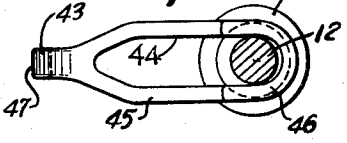


Fig. 3.

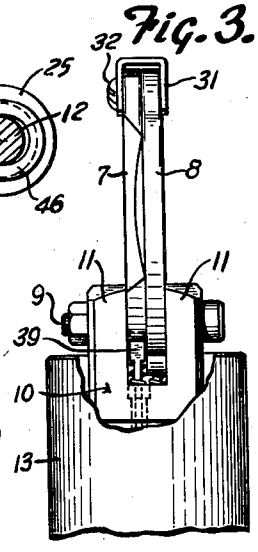
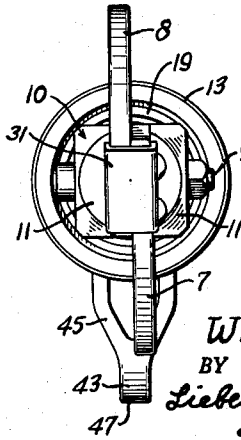


Fig. 4.



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POWER OPERATED SHEAR

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The present invention relates generally to improvements in the art of cutting metallic cables, and relates more particularly to the provision of an improved power operated shear.

A primary object of the invention is to provide an improved portable cable cutting device operable by fluid pressure and which is extremely simple and compact in construction as well as highly efficient and flexible in use.

Mechanically and fluid actuated cutting tools in the nature of shears for operating on diverse materials have heretofore been proposed as shown in United States Patents No. 239,817, No. 335,796, No. 492,931, No. 693,231, No. 1,467,262, No. 1,623,201, No. 2,526,955, No. 2,699,756, and No. 2,716,812 amongst others. While some of these prior cutters were intended for use on metal, most of them were necessarily restricted in use by reason of their construction to much softer and more readily severable materials. In addition to these limitations as to use, many of the cutting shears heretofore proposed have lacked the desired compactness and portability and the resultant flexibility of operation in the field and in confined working areas. In addition, these prior devices are lacking in the desired simplicity of construction which enable quick dismantling of the tool for replacement or repair of parts and easy reassembly thereof without special complicated instructions.

It is therefore another important object of this invention to provide an improved power operated cable cutter or shear which obviates all of the aforesaid objections and disadvantages of prior devices of this general type.

A further important object of the present invention is to provide an improved fluid actuated power shear which embodies novel manually operable means for quickly articulating the cutting blades to or from a partially closed working position, thus shortening the required length of stroke or travel of the ram for performance of the work.

Still another object of the invention is to provide an improved cable cutter or shear embodying novel means for maintaining the cutting blades under resilient tension throughout their complete operating range so as to cause the same to automatically return or tend to return to open position with the activating rear edges of the blades constantly urged into engagement with the blade actuating member.

These and other objects and advantages of the invention will become apparent from the following detailed description.

A clear conception of the several features constituting the present improvement and of the mode of constructing and of utilizing of a typical cable cutter embodying the invention may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

FIG. 1 is a side elevation of a typical cable cutter embodying the invention and showing the blades in completely open or expanded condition, the blade actuating member and a portion of the main return spring being broken away for the sake of clarity;

FIG. 2 is a somewhat reduced fragmentary side elevational view showing the blades actuated to partially closed working condition by the manually operable stepped slide, the actuating member being again broken

away and with the main spring as well as the blade carrier and secondary spring housing being shown in section;

FIG. 3 is another fragmentary side view of the blade end of the device taken from the right side of FIG. 2 and with a part of the blade actuating member again being broken away for clarity;

FIG. 4 is an end view of the power shear with the blades partially closed as in FIGS. 2 and 3; and

FIG. 5 is a transverse section taken along the line 5—5 of FIG. 2.

While the invention has been shown herein as being especially adapted for use in a cable cutter and as being operable by a hydraulic ram of a particular type, it is not intended to thereby unnecessarily restrict or limit the use or operability since the novel features may be used to advantage in any type of shear with the blades being adapted for power actuation by various types of fluid motors. It is also intended that the broadest possible interpretation shall be given to descriptive terms used herein.

Referring to the drawing, the cable cutter shown thereing as embodying the invention comprises, in general, a pair of cooperable cutting blades **7, 8** secured as by means of a pivot pin **9** between the spaced arms **11** of a blade carrying block **10** having a shaft **12** extending axially from the opposite side thereof, a blade actuating member **13** shown as being generally cup-shaped and having a central aperture **14** formed in its base **15** for freely slidably receiving the shaft **12** with the spaced actuating edges **16** of the member **13** bearing directly against rear cam surfaces **17, 18** of the blades **7, 8** respectively on the opposite sides of the pivot pins **9**, means such as a compression spring **19** surrounding the shaft **12** within the confines of the member **13** and seated at one end against the base **15** of the member **13** and at the other end against an annular shoulder **20** formed on the blade carrying block **10** to constantly resiliently urge the block **10** outwardly, and power actuating means shown generally herein as a fluid motor **21** acting against the base **15** of the cup-shaped member **13** in opposition to the spring **19** to thereby move the member **13** axially relative to the blade carrying block **10** as movement of the shaft **12** is restrained, thus causing the blades **7, 8** to swing upwardly about their pivot **9** in the performance of a cutting operation due to the coaction of the lip **16** of the member **13** with the cam surfaces **17, 18** of the blades **7, 8** respectively.

The fluid motor **21** shown herein for purposes of illustration is of the type disclosed more fully in United States Patent No. 2,955,578 and comprising a cylinder **23** having a pressure fluid supply conduit **24** communicating with one side of the work performing plunger or ram **25** to move the same outwardly, the ram **25** being returned to its initial starting or inactive position as by means of a spring, not shown, and having a bore extending axially therethrough for receiving the shaft or rod **12** which has a nut **26** threaded thereon and bearing against the end of the cylinder **23** remote from the extending work performing end of the ram **25**. Accordingly, as fluid under pressure is supplied to the cylinder **23** by way of the conduit **24**, the ram **25** is caused to move outwardly carrying with it the cup-shaped member **13**, and since the shaft **12** is restrained from axial movement by the nut **26** bearing against the cylinder end head **27**, the blade carrying block **10** remains stationary and the blades **7, 8** are articulated about their pivot **9** by the coaction of the lip **16** of the member **13** with the curved cam surfaces **17, 18** of the blades. It should however be understood that other types of fluid motors or power actuators may be used with equal effect, and the shaft **12** may be secured directly to the piston of a reversely acting ram device

with a suitable spacer being provided between the base of the cup-shaped member **13** and the adjacent end of the power cylinder.

As shown, the blades **7**, **8** of the present power shear are each generally semi-circular with the cooperating cutting edges **29**, **30** respectively being conveniently formed by a grinding wheel or disc, and with the curved rear cam edges **17**, **18** being relatively wide and flat to afford an effective bearing and blade actuating surface. Also, to maintain the blades **7**, **8** closely together during their working strokes to render the same more efficient, one leg of a generally U-shaped guide **31** is secured as by means of machine screws **32** to one of the blades with the other leg thereof being slidably cooperable with the other blade as the blades are articulated about the pivot **9**. While the shaft or draw rod **12** may be secured to the bifurcated blade carrying block **10** in any suitable manner, this shaft may be conveniently threaded within a socket **33** formed as an integral part of the block **10**.

While the spring **19** which is compressed between the blade carrying block **10** and the base of the cup-shaped blade actuating member **13** effectively acts in opposition to the ram **25** of the fluid motor to constantly urge the block to its outermost position to enable the lip **16** of the member **13** to effectively act on the edges **17**, **18** of the blades, means should also be provided for resiliently urging the blades **7**, **8** outwardly about the pivot **9** and into constant effective bearing contact with the lip **16**. For this purpose, a pair of simple but effective combined coil and leaf springs designated generally by the numerals **35**, **36** are provided by the present invention as shown most clearly in FIGS. 2 and 3, each of the composite springs cooperating with one of the blades to constantly urge the same outwardly about the common pivot **9**, and since these springs are identical, reference will only be made herein to the spring **36** which coacts with the blade **8**. This composite spring **36** consists simply of a coil spring **37** seated within a bore or cavity **38** formed in the blade carrying block **10** and opening between the spaced arms **11** thereof laterally of the pivot **9**, and a T-shaped leaf spring **39** carried by the coil spring **37** with the crosshead thereof seated within a notch or groove **40** formed in a portion **41** of the blade **8** which extends rearwardly beyond the pivot pin **9**. The coil spring **37** is thus retained in position within the bore **38** by the leg of the T-shaped leaf spring **39** which it embraces and is compressed between the bottom of the bore **38** and the crosshead of the leaf spring **39** to constantly seat the same within the notch **40** of the extending portion **41** of the blade, thus urging the blade into seating engagement with the lip **16** of the member **13** at all times, and it is to be understood that the spring **35** has similar coaction with the blade **7**.

To quickly articulate the blades from extreme open condition to a partly closed position as when operating on work of smaller diameters, a laterally movable lever cam or slide **43** is provided between the base **15** of the cup-shaped member **13** and the work engaging end of the ram **25**. This cam member **43** is slotted longitudinally as at **44** and has stepped surfaces **45**, **46** and a gripping portion **47**. Thus, when the slide **43** is in the position shown in FIG. 1 wherein the base of the cup-shaped member **13** is seated on the surface **45** of the slide **43**, the blades **7**, **8** are permitted to open to their fullest extent. To activate the blades initially to a partially closed position and thus reduce the amount of ram stroke necessary to perform the work, the cam member **43** may be used as a lever or fulcrum, as shown by means of dot-and-dash lines in FIG. 2, to lift and manually move the cup-shaped member **13** axially toward the cutting blades, thereby compressing the spring **19** and permitting the member **43** to be moved laterally with the aid of its gripping portion **47** from the dot-and-dash line position to the full line position as shown. In this position, the blades **7**, **8** are partially closed and a shorter piston stroke is required to perform the work.

From the foregoing detailed description, it is believed apparent that the present invention contemplates the provision of a portable power actuated shear or cable cutter which is extremely compact and versatile in its operation as well as highly flexible in its uses. The blades **7**, **8** are effectively actuated by the fluid motor **21** through coaction of the cup-shaped member **13** directly with the cam surfaces **17**, **18**, and these blades are constantly maintained in contact with the lip **16** of the cup-shaped member **13** by means of the novel composite coal-leaf springs **35**, **36**. In addition, the blades may be quickly and readily manually manipulated to partially closed work engaging position by means of the novel cam member **43** having stepped cam surfaces and which is also adapted to be used as a lever for conveniently manually lifting the cup-shaped member **13** to thus permit lateral movement of the member **43**.

Various modes of carrying out the invention are contemplate as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing inwardly and forwardly directed cam surface located rearwardly and laterally of the pivotal connection, blade actuator having spaced edges cooperable with said inwardly and forwardly directed cam surfaces of said blades rearwardly of their pivotal connection, power means for effecting relative movement of said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, means housed within said blade actuator for constantly resiliently opposing relative movement of said actuator and said blades by said power means, and other means independently cooperable with each of said blades for constantly resiliently urging the same apart to maintain the cam surfaces thereof in contact with the lip of said actuator.

2. A cutting tool comprising, a pair of blades pivotally interconnected on a carrying member for relative swinging movement, said blades each having a rearwardly facing inwardly and forwardly directed cam surface located rearwardly and laterally of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with said inwardly and forwardly directed cam surfaces of said blades and provided with an opening extending axially through the base thereof, an elongated element secured at one end to said blade carrying member and having the other end thereof extending outwardly through the base opening of said blade actuator, power means carried by said elongated element for effecting relative movement of said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, means housed within said blade actuator for constantly resiliently urging said actuator and said blade carrying member apart, and other means independently cooperable with each of said blades for constantly resiliently urging the same to open condition with the cam surfaces thereof in contact with the lip of said actuator.

3. A cutting tool comprising, a pair of blades pivotally connected to a carrying member for relative swinging movement, said blades each having a rearwardly facing cam surface located on one side of the pivotal connection and each of said blades also having a rear portion extending laterally of the opposite side of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades and provided with an opening extending axially through the base thereof, an elongated element secured at one end to said blade carrying member and having the other end thereof extending outwardly through the base opening of said blade actuator, power means carried by the outwardly extending end of said elongated element and cooperable with said blade actuator to move the same relative to said blade carrying member and thereby cause said blades to swing

about their pivotal connection, spring means housed within said blade actuator and compressed between the base thereof and said blade carrying member for constantly resiliently urging said actuator and said member apart, and other spring means compressed between said blade carrying member and the laterally extending rear portions of said blades for constantly resiliently urging the same to open condition.

4. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing cam surface located laterally of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades, power means for effecting relative axial movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, cam means interposed between said power means and said blade actuator and movable to selected positions to vary the amount of axial movement required to swing the blades in their working stroke, means housed within said blade actuator for constantly resiliently opposing relative movement of said actuator and said blades, and other means cooperable with said blades for constantly resiliently urging the same apart to maintain the cam surfaces thereof in contact with the lip of said actuator.

5. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing cam surface laterally of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades, power means for effecting relative axial movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, a cam lever interposed between said power means and said blade actuator and pivotally and laterally movable to selected positions to vary the relative positions of the blades and the amount of axial movement required by said power means to swing said blades in their working stroke, means housed within said blade actuator for constantly resiliently opposing relative movement of said actuator and said blades, and other means cooperable with said blades for constantly resiliently urging the same apart to maintain the cam surfaces thereof in contact with the lip of said actuator.

6. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing cam surface located laterally of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades, a fluid motor having a force applying ram cooperable with said blade actuator for effecting relative axial movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, a cam lever interposed between and spacing said ram from said blade actuator, said cam lever being movable to selected positions to vary the spacing between said ram and said blade actuator and consequently the amount of ram travel required to swing the blades in their working stroke, means housed within said blade actuator for constantly resiliently opposing relative movement of said actuator and said blades, and other means cooperable with said blades for constantly resiliently urging the same apart to maintain the cam surfaces thereof in contact with the lip of said actuator.

7. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing cam surface located laterally of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades and provided with an opening extending axially through the base thereof, an elongated element secured at one end to said blade carrying member and having the other end thereof extending

outwardly through the base opening of said blade actuator, a fluid motor carried by the extending end of said elongated element and having a force transmitting ram for effecting relative axial movement of said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, a cam embracing said elongated member between said ram and said blade actuator and movable to selected positions to vary the spacing between said ram and said actuator and thus vary the length of ram travel required to swing said blades, means housed within said blade actuator for constantly resiliently urging said actuator and said member apart, and other means cooperable with said blades for constantly resiliently urging the same to open condition with the cam surfaces thereof in contact with the lip of said actuator.

8. A cutting tool comprising, a pair of blades pivotally interconnected for relative swinging movement, said blades each having a rearwardly facing cam surface located on one side and rearwardly of the pivotal connection and each blade also having a portion extending laterally across to the opposite side of and in proximity to the pivot connection, a cup-shaped blade actuator having its peripheral lip cooperable with said cam surfaces of said blades, power means for effecting relative movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, means housed within said blade actuator for constantly resiliently opposing movement of said actuator by said power means, and a spring cooperable with the laterally extending portion of each of said blades for constantly resiliently urging the same to open condition.

9. A cutting tool comprising, a pair of blades pivotally connected to a carrying member for relative swinging movement, said blades each having a rearwardly facing cam surface located on one side of the pivotal connection and each blade also having a portion extending laterally across to the opposite side of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades, power means for effecting relative movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, means housed within said blade actuator for constantly resiliently opposing movement of said actuator by said power means, and a spring compressed between the laterally extending portion of each of said blades and said blade carrying member for constantly resilient urging said blades to open condition.

10. A cutting tool comprising, a pair of blades pivotally connected to a carrying member for relative swinging movement, said blades each having a rearwardly facing cam surface located on one side of the pivotal connection and each blade also having a rearwardly notched portion extending laterally across to the opposite side of the pivotal connection, a cup-shaped blade actuator having its peripheral lip cooperable with the cam surfaces of said blades, power means for effecting relative movement between said blade actuator and said blades to thereby cause said blades to swing about their pivotal connection, means housed within said blade actuator for constantly relisiently opposing movement of said actuator by said power means, and a pair of composite springs each having a coil portion bearing against said blade carrier and a leaf portion extending from one end of the coil portion and seated in the notch in the laterally extending portion of one of said blades for constantly resiliently urging said blades to open condition.

11. A cutting tool comprising, a pair of blades pivotally interconnected for relative swing movement, said blades each having a rearwardly facing cam surface located laterally of the pivotal connection, a blade actuating member having spaced edges co-operable with the cam surfaces of said blades, power means for moving

said blade actuating member relative to said blades to thereby cause said blades to swing about their pivotal connection, cam means interposed between said power means and said blade actuating member and movable to vary the amount of axial movement required to swing the blades in their working stroke, means housed within said blade acuating member for constantly resiliently opposing movement of said member by said power means, and other means cooperable with said blades for constantly resiliently urging the same to open condition.

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