April 21, 1964 S. E. COBLITZ 3,129,865

CHAIN RECEIVING AND ENGAGING MEANS FOR A PARTING TOOL

Filed July 24, 1962 2 Sheets-Sheet 1

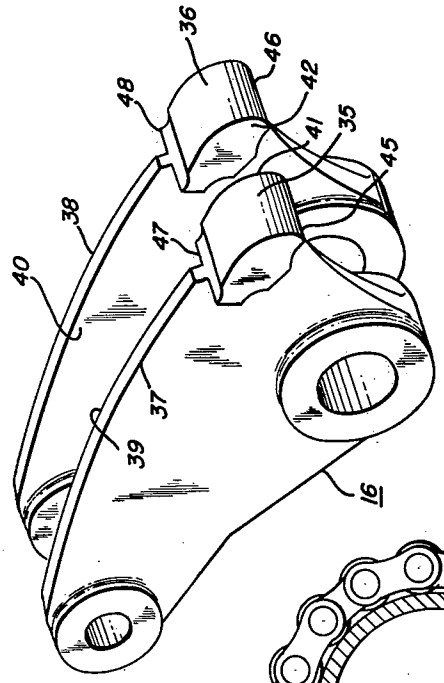


Fig. 2

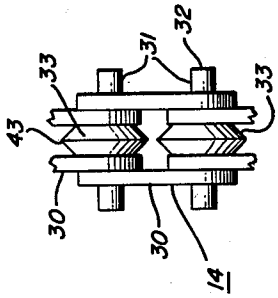


Fig. 3

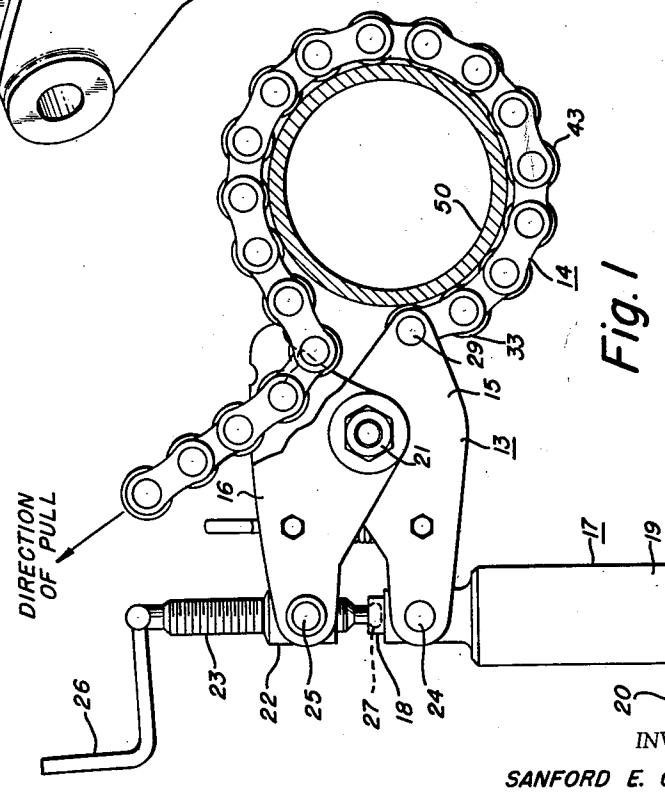


Fig. 1

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CHAIN RECEIVING AND ENGAGING MEANS FOR A PARTING TOOL

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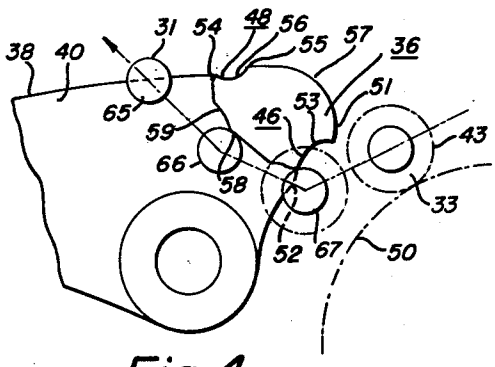


Fig. 4

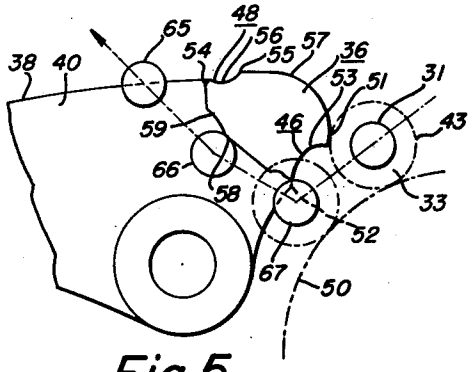


Fig. 5

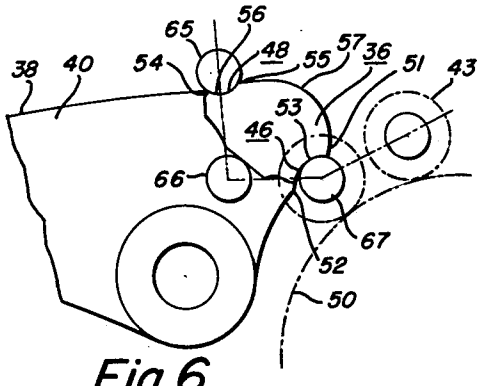


Fig. 6

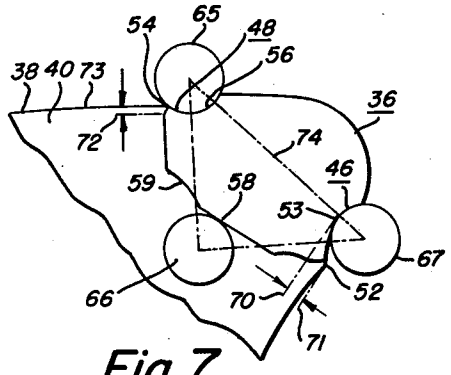


Fig. 7

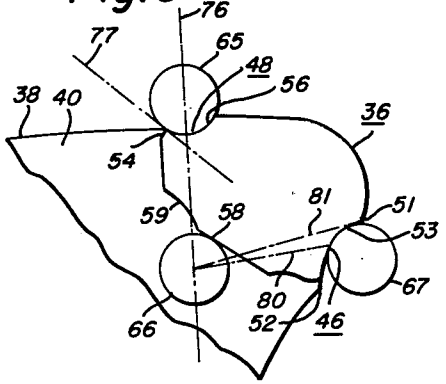


Fig. 8

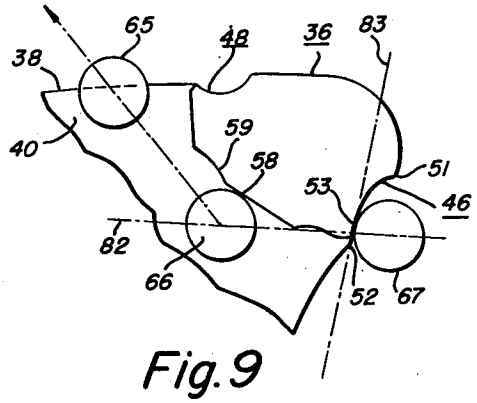


Fig. 9

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3,129,865
CHAIN RECEIVING AND ENGAGING MEANS FOR A PARTING TOOL

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4 Claims. (Cl. 225—103)

This invention relates to a cutter for parting a fracturable member and more particularly to a chain receiving and engaging means for holding and tension-squeezing a cutting chain wrapped around a fracturable member for parting same.

This invention is concerned mainly with hydraulic cutters which are heavy and bulky for operators to handle. The conventional cutters have a first end of a cutting chain permanently fastened to the cutter and the second end of the cutting chain is selectably refastened to the cutter each time a fracture is to be made. By the old method the operator had to adjust the jaws of the hydraulic cutter relative to a pipe, at the same time grab the chain and attempt to fasten it to a jaw of the cutter. This was no easy job and usually best results could be obtained by two men working as a team to operate the cutter. In addition, the socket into which the pins of the cutter chain were to be hooked usually were on the underside of the jaw so that it was not readily visible for the operator to determine whether the pin was in the socket or not. About the only way an operator could tell whether the chain was secure was by actually feeling whether the chain was in the socket, since usually there was not enough room for the operator to look under the jaw of the hydraulic cutter to see if the chain was in the socket.

Another troublesome feature with the old method was that even when the pin was secure in the socket there would be so much slack in the chain around the pipe that the tool was unable to squeeze the chain about the pipe to fracture same within the limitation of the movement of the jaws of the cutting tool.

An object of my invention is to provide a quick and easy way to connect a cutting chain to a pressure clamping member of a cutter tool.

Another object of my invention is the provision of a chain receiving and engaging means whereby preparatory to the securing of the second end of the cutting chain in the sockets of the chain engaging means, the chain may be wrapped around a fracturable member and pulled through the chain receiving and engaging means without the pins of the chain engaging or catching in the sockets thereof, whereby the pulling of the chain through the chain receiving and engaging means draws the pipe closer to the jaws of the cutter to remove the slack in the chain, after which the pins of the chain may then be hooked into the sockets of the chain engaging means for the tension squeeze operation.

Another object of my invention is the provision of a chain receiving and engaging means whereby a cutting chain may be wrapped and pulled tight around a fracturable member to such a degree that the amount of slack in the cutting chain is less than the distance the pressure clamp jaws have to move in order to cut the fracturable member.

Another object of my invention is to provide a chain receiving and engaging means comprising at least a first socket and a second socket whereby when the cutting chain is tightened around the fracturable member by pulling the cutting chain past the first and second sockets, the second socket being related to the first socket in such a fashion that when a pin of the cutting chain is engaged in the second socket, the pin of the selectable terminal cutter will automatically be engaged in the first socket.

Another object of my invention is the provision of a chain receiving and engaging means comprising a normally nonvisible socket and a normally visible socket which are designed in such a relationship with each other that a cutting chain may be wrapped around a fracturable member and drawn tight by pulling the second end of the cutting chain through a chain receiving and engaging means whereby when the cutting chain and the fracturable member are in a pressure cutting relationship with each other, a pin of the cutting chain may be placed in the normally visible socket, and the relationship between the pin in the normally visible socket and the normally nonvisible socket is such that a second adjacent pin located from the pin resting in the normally visible socket will automatically be engaged in the nonvisible socket and held therein.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 shows a cutter for parting a fracturable member, the cutter incorporating the invention of the chain receiving and engaging means;

FIGURE 2 is a pictorial view showing the relative position of the upper clamping members that embody the invention of the chain receiving and engaging means;

FIGURE 3 shows the top view of a portion of a cutting chain;

FIGURES 4 and 5 show a side view of the inside of a clamping member which illustrates the relationship of the pins of a cutting chain to a fracturable member when the cutting chain is being drawn tight around a fracturable member preparatory to securing the chain to the clamping member;

FIGURES 6, 7 and 8 show the side view of the inside of a clamping member which illustrates the position of the pins of the cutting chain when they are engaged in the sockets; and

FIGURE 9 is an enlarged side view of the inside of a clamping member and shows that the first socket defines a noncatchable slope.

With reference to the drawing, the invention of the chain receiving and engaging means is illustrated as being incorporated in a cutter **13** for parting a fracturable member **50**. The cutter **13** comprises a flexible cutting chain **14**, first and second pressure clamp jaws **15** and **16**, and a hydraulic unit **17**. The hydraulic unit **17** consists of a cylinder **19** in which is mounted a piston connected to a piston rod **18**. The upper end of the piston rod **18** is pivotally connected to the lower end of a threaded rod **23** by means of a ball-and-socket joint **27**. Pressure may be applied to actuate the piston rod **18** by means which is connected to a hose **20**. The first and second pressure clamp jaws **15** and **16** are pivotally connected to each other by a nut and bolt **21**. The rearward end of the clamp jaw **15** is bifurcated and is pivotally connected to the cylinder **19** by means of laterally extending pin lugs **24**. The forward end of the pressure clamp jaw **15** is fastened to the first end of the cutting chain **14** by means of a terminal cutting chain pin **29** on which is mounted a fixed terminal cutter **33**. The rearward end of the clamp jaw **16** is pivotally connected to a female threaded sleeve **22** by means of laterally extending pin lugs **25**. The forward end of the clamp jaw **16** contains the invention of the chain receiving and engaging means. The female threaded sleeve **22** is mounted on the threaded rod **23**. The threaded rod **23** may be rotated by means of a hand crank **26** in order to adjustably position the first and second pressure clamp jaws **15** and **16** in a desirable relationship with each other.

When parting a fracturable member **50**, the second end of the cutting chain **14** is wrapped around a frac-

turable member 50 and then secured to the chain receiving and engaging means mounted on the pressure clamp jaw 16. After the second end of the cutting chain 14 is secured to the pressure clamp jaw 16, it can be tightly adjusted around the fracturable member 50 to remove all slack in the chain by rotating the threaded rod 23 by means of a crank 26 which will actuate the female threaded sleeve causing the chain to tighten around the fracturable member 50. Hydraulic pressure is applied to the hydraulic unit 17, actuating the piston rod 18 which separates the pin lugs 24 and 25 and closes the forward ends of the pressure clamp jaws 15 and 16 which are secured to the cutting chain 14 thereby increasingly tightening the cutting chain 14 around the fracturable member 50 until the fracturable member 50 has been parted.

Generally the idea of fastening one end of a cutting chain to a first jaw and wrapping the other end around a fracturable member thereby securing the cutting chain to a second jaw and parting the fracturable member by closing the first and second jaws together is old, but my invention of the chain receiving and engaging means which incorporates a quick and easy way of pulling the cutting chain tight around the fracturable member to remove slack and securing the flexible cutting chain to the second jaw is new.

Referring to FIGURE 3, the cutting chain 14 consists of a plurality of chain links 30 pivotally connected to each other by pins 31 and parting members 33 mounted thereon. The pins 33 have end portions 32 extending beyond the outside surfaces of the chain links 30 which enables the pins 31 to be secured to the chain receiving and engaging means. The parting members 33 have a depth extending from the center of a pin 31 and the outside edge of a parting member 33 greater than the depth of a chain link 30 extending from the center of a pin 31 to the edge of the chain link 30. Thus, the parting members 33 have a cutting edge 43 extending beyond the edge of the chain links 30 which enables the cutting chain 14 to engage and part a fracturable member 50.

As best seen in FIGURE 2, the pressure clamp jaw 16 comprises two jaw members 37 and 38, each having a boss 35 and 36 respectively. The two jaw members 37 and 38 are spaced apart at such a distance that the space between the internal faces 39 and 40 of the jaw members 37 and 38 is greater than the length of the pins 31, but the space between the internal faces 41 and 42 of the bosses 35 and 36 is less than the length of the pin 31 but greater than the thickness of the chain links 30. Under this arrangement, the cutting chain 14 which is positioned with its pins 31 extending laterally can pass between the internal faces 39 and 40 of the jaw members 37 and 38 but cannot pass between the internal faces 41 and 42 of the bosses 35 and 36.

Each boss 35 and 36 comprises a first socket 45 and 46 respectively, and second socket 47 and 48. The first sockets 45 and 46 on each boss 35 and 36 are in transverse alignment with each other and both together constitute a first socket of the chain receiving and engaging means. The second sockets 47 and 48 on each boss 35 and 36 are in transverse alignment with each other and both together constitute a second socket of the chain receiving and engaging means.

The invention can best be illustrated by showing a portion of the internal face 40 of the jaw member 38 and the internal face 42 of the boss 36, as illustrated in FIGURES 4 through 9. For clarity the position of the cutting chain 14 is illustrated by pins 31 because they are the main part of the cutting chain 14 which cooperates with the invention of the chain receiving and engaging means. In FIGURES 4, 5 and 6 the dot-dash line 43 around the pins 31 represents the outside diameter of the cutting members 33.

The first socket 46 comprises a first edge 51, a second edge 52 and a dwell surface 53 positioned between the two edges. When the cutting chain 14 is pulled past the first socket 46, the pins 31 pass under the first edge 51, the dwell surface 53 and second edge 52. In light of this, the first edge 51 constitutes a pin entrance edge and the second edge 52 constitutes a pin exit edge.

The second socket 48 comprises a first edge 54, a second edge 55 and a dwell surface 56 positioned between the two edges. When a pin 31 enters the second socket 48, it passes over the first edge 54 which defines a pin entrance edge. The boss 36 has an external surface 57 which connects the second edge 55 of the second socket 48 and the pin entrance edge 51 of the first socket 46. The boss 36 has a laterally extending shoulder or pin guide wall surface 59 which interconnects the pin exit edge 52 of the first socket 46 and the pin entrance edge 54 of the second socket 48. The pin guide wall surface 59 has an intermediate portion 58 which is a segment of the pin guide wall surface 59 and is relatively equally distant between the pin exit edge 52 and the pin entrance edge 54. As seen in FIGURE 7, the pin guide wall surface 59 and the intermediate portion 58 thereof is so positioned that it is located on the opposite side of a line drawn between the centers of the pins in the sockets 46 and 48 in a direction away from the external surface 57. The first socket 46, the intermediate portion 58, and the second socket 48 comprising the chain receiving and engaging means are related to each other in such a fashion that the second end of the cutting chain 14 can be pulled through the chain receiving and engaging means without catching in the first and second sockets 46 and 48, whereby the cutting chain 14 may be tightened around a fracturable member 50, to remove slack in the chain and to draw the pipe closer to the jaws of the cutter.

FIGURE 5 best illustrates the position of the pins 31 and the cutting edges 43 of the parting members 33 when the cutting chain 14 has been pulled tight around a fracturable member 50. The pin nearest the second socket 48 constitutes a first pin 65. The pin nearest to the intermediate portion 58 constitutes a first adjacent pin 66, and the pin nearest to the first socket 46 constitutes a second adjacent pin 67.

In FIGURE 5 the operator is pulling on the second end of the chain and the pulling operation is such as to draw the fracturable member 50 closer to the jaws in order to remove the slack in the chain.

The FIGURE 4 shows the relationship between the fracturable member 50 and the jaws at the beginning of the pulling operation and the FIGURE 5 shows how the fracturable member 50 has been moved closer to the jaws at the conclusion of the pulling operation. The FIGURE 6 shows the pin 65 placed in the socket 48 in which case there has been a slackening of the chain which may be taken up by turning the crank 26 before the hydraulic pressure is applied. The slackening of the chain results from the fact that the pin 65 during the pulling operation had been pulled beyond the second socket 48, as shown in FIGURE 5. The slack need not be greater than the length between the centers of two adjacent pins nor less than a distance equal to the depth of the second socket measured with respect to the dwell surface 56 and the pin entrance edge 54.

When the cutting chain 14 has been tightened around a fracturable member 50 by pulling it through the chain receiving and engaging means, the first pin 65 illustrated in FIGURE 6 is positioned in the second socket 48 with the internal circumferential surface of the pin 65 resting in the dwell surface 56 of the second socket 48. The first adjacent pin 66 rests on the intermediate portion 58 and the point of contact on which the first adjacent pin 66 rides is determined by the first pin 65. More particularly, the arrangement of the first and second sockets 46 and 48 and the intermediate portion 58 of the pin guide wall surface or shoulder 59, is such that when the first pin 65 is engaged in the second socket 48, the second adjacent pin 67 becomes engaged in the first socket 46 because the distance between the first adjacent pin 66

resting against the pin guide wall or shoulder 59 and the second adjacent pin 67 is such that the latter can ride over the pin exit edge 52 of the first socket 46 and rest in the dwell surface 53 thereof, thereby securing the second end of the cutting chain 14 to the chain receiving and engaging means. The second socket 48, being on top of the jaw 16, is readily visible to the operator, and he knows that when he places the first pin 65 into the second socket 48, the second adjacent pin 67 will automatically be engaged in the first socket 46.

FIGURE 7 is an enlarged view of the invention of the chain receiving and engaging means. The dwell surface 53 of the first socket 46 has a depth less than the radius of a pin 67 and is defined by a line 70 extending from the dwell surface 53 and a line 71 parallel to the line 70 extending from the pin exit edge 52. The distance between the two lines 70 and 71 is the depth of the first socket 46. The dwell surface 56 of the second socket 48 has a depth less than the radius of the pin 65 and is defined by a line 72 extending from the dwell surface 56 and a line 73 parallel to the line 72 extending from the pin entrance edge 54. The distance between the two lines 72 and 73 is the depth of the second socket 48. FIGURE 7 further illustrates the triangular relationship of the pins 65, 66 and 67 to each other when the first pin 65 is resting in the second socket 48. The distance between the center of the pin 67 in the first socket 46 and the center of the pin 65 in the second socket 48, shown by line 74, is greater than the distance between two adjacent pins and less than three adjacent pins.

As illustrated in FIG. 8, the second socket 48 has a catchable slope so that a pin once placed in the second socket 48 cannot slip out. This is illustrated by the fact that line 76 which passes through the center of a pin 65 resting in the second socket 48 and the center of a pin contacting the intermediate portion 58 describes an acute angle with respect to a line 77 passing through the pin entrance edge 54 of the second socket 48 and tangent to the dwell surface 56 at the pin entrance edge 54.

The distance between the center of the first adjacent pin 66 contacting the intermediate portion 58 and the inner circumferential surface of the pin 67 shown by the line 80 is less than the distance between the center of the first adjacent pin 66 and the pin entrance edge 51 shown by line 81. This relationship prevents the pin 67 from becoming disengaged from the first socket. In other words, if it were not for the fact that the first adjacent pin 66 is resting against the intermediate portion 58, the second adjacent pin 67 could slip out of the first socket 46 when hydraulic pressure is applied.

It is to be observed that the first socket 46 is rather shallow and permits a pin to pass with reference thereto in either direction without being caught whereby the chain may be pulled to remove the slack. The FIGURE 9 shows the relationship where the chain is being pulled to remove the slack and under this situation the pin 67 may slide or ride over the pin exit edge 52 without catching. In other words, a line 83 drawn tangent to the dwell surface 53 at the chain exit edge 52 makes an obtuse included angle with respect to a line 82 passing through the centers of the first and second adjacent pin 66 and 67. The first socket 46 does not constitute a catchable socket when the chain is being pulled to remove slack therefrom.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A cutter for parting a fracturable member which comprises in combination, a cutting chain having first and second ends adapted to be placed around said fracturable member and to exert a parting pressure thereto without rotation or oscillation of said chain thereabout, said comprising chain links, laterally extending pins interconnecting said chain links and parting members for engaging and parting said fracturable member mounted on said pins between said chain links, said pins extending laterally from the sides of the links, and a pressure clamp means including a first pressure clamp jaw secured to said first end of said chain and a second pressure clamp jaw having chain receiving and engaging means thereon to receive and engage said pins at a location dictated by the size of said fracturable member, said second pressure clamp jaw comprising two spaced jaw members spaced apart at a distance greater than the length of the pins, said spaced jaw members having respectively internal laterally-extending boss means having opposed faces laterally spaced apart from each other for a distance less than the length of the pins and greater than the width of the chain links, said spaced jaw members and said boss means defining chain receiving and engaging means whereby said chain may be wrapped around said fracturable member with the second end pulled through said chain receiving and engaging means, said boss means respectively having first and second sockets, said first sockets being in transverse alignment with each other to receive said pins, said second sockets being in transverse alignment with each other to receive said pins, said first sockets having respectively a first edge and a second edge with a dwell surface therebetween, said first edge of said first sockets constituting a pin entrance edge and said second edge constituting a pin exit edge, said dwell surface of said first sockets having a depth measured with respect to the pin exit edge which is less than the radius of the pins, said second sockets having respectively a first edge and a second edge and a dwell surface therebetween, said first edge of said second sockets constituting a pin entrance edge, said dwell surface of said second sockets having a depth measured with respect to the pin entrance edge which is less than the radius of the pins, said boss means having respectively a pin guide wall surface extending from the pin exit edge of said first sockets and towards the pin entrance edge of said second sockets, whereby said cutting chain upon being wrapped around said fracturable member may be pulled through said chain receiving and engaging means and then drawn tight about said fracturable member with said pins riding over said pin entrance edge of said first sockets, said dwell surfaces therein, and said pin exit edge thereof, and then along said pin guide wall towards said second sockets without catching the pins, said first sockets and said second sockets being positioned with respect to each other than the distance between the center of a pin in the first socket and the center of a pin in the second socket is greater than the distance between two adjacent pins and less than three adjacent pins, engagement of a pin in said second sockets and the intermediate positioning of a first adjacent pin between said first and second sockets placing a second adjacent pin in a position to engage the dwell surface of said first sockets, the distance between the center of said first adjacent pin and the inside surface of the circumferential surface of the pin in the first sockets being less than the distance between the center of the first adjacent pin and the pin entrance edge of said first sockets whereby said pin in said first sockets is held therein, said dwell surface of said first sockets meeting with said pin exit edge thereof and defining a non-catchable slope which makes an included obtuse angle with respect to a line passing through the center of said pin in said first sockets and the center of the first adjacent pin.

2. A cutter for parting a fracturable member which comprises in combination, a cutting chain having first and second ends adapted to be placed around said fracturable member and to exert a parting pressure thereto without rotation or oscillation of said chain thereabout,

said chain comprising chain links, laterally extending pins interconnecting said chain links and parting members for engaging and parting said fracturable member mounted on said pins between said chain links, said pins extending laterally from the sides of the links, and pressure clamp means including a first pressure clamp jaw secured to said first end of said chain and a second pressure clamp jaw having chain receiving and engaging means thereon to receive and engage said pins at a location dictated by the size of said fracturable member, said second pressure clamp jaw comprising two spaced jaw members spaced apart at a distance greater than the length of the pins, said spaced jaw members having respectively internal laterally extending boss means having opposed faces laterally spaced apart from each other for a distance less than the length of the pins and greater than the width of the chain links, said spaced jaw members and said boss means defining chain receiving and engaging means whereby said chain may be wrapped around said fracturable member with the second end pulled through said chain receiving and engaging means, said boss means respectively having first and second sockets, said first sockets being in transverse alignment with each other to receive said pins, said second sockets being in transverse alignment with each other to receive said pins, said first sockets having respectively a first edge and a second edge with a dwell surface therebetween, said first edge of said first sockets constituting a pin entrance edge and said second edge constituting a pin exit edge, said dwell surface of said first sockets having a depth measured with respect to the pin exit edge which is less than the radius of the pins, said second sockets having respectively a first edge and a second edge and a dwell surface therebetween, said first edge of said second sockets constituting a pin entrance edge, said dwell surface of said second sockets having a depth measured with respect to the pin entrance edge which is less than the radius of the pins, said boss means having respectively an external surface interconnecting said pin entrance edge of said first sockets and said second edge of said second sockets, said boss means having respectively a pin guide wall surface interconnecting the pin exit edge of said first sockets and the pin entrance edge of said second sockets, said guide wall surface having an intermediate portion thereon which is substantially equal distance from said dwell surfaces of said first and second sockets, said intermediate portion being laterally positioned out of alignment with a line passing between said first and second sockets and in a direction on the side of said line away from said external surface, whereby said cutting chain upon being wrapped around said fracturable member may be pulled through said chain receiving and engaging means and then drawn tight about said fracturable member with said pins riding over said pin entrance edge of said first sockets, said dwell surfaces therein, and said pin exit edge thereof, and then along said intermediate portion without catching the pins, said first sockets, said second sockets and said intermediate portion defining a triangle, said first sockets and said second sockets being positioned with respect to each other that the distance between the center of a pin in the first socket and the center of a pin in the second socket is greater than the distance between two adjacent pins and less than three adjacent pins, the engagement of a pin in said second sockets and the contacting of a first adjacent pin against the intermediate portion placing a second adjacent pin in a position to engage the dwell surface of said first sockets, the distance between the center of said first adjacent pin and the inside of the circumferential surface of said second adjacent pin being less than the distance between said center of the first adjacent pin and the pin entrance edge of said first sockets, whereby said second adjacent pin is held in said first sockets.

3. A cutter for parting a fracturable member which comprises in combination, a cutting chain having first and second ends adapted to be placed around said fracturable member and to exert a parting pressure thereto without rotation or oscillation of said chain thereabout, said chain comprising chain links, laterally extending pins interconnecting said chain links and parting members for engaging and parting said fracturable member mounted on said pins between said chain links, said pins extending laterally from the sides of the links, and a pressure clamp means including a first pressure clamp jaw secured to said first end of said chain and a second pressure clamp jaw having chain receiving and engaging means thereon to receive and engage said pins at a location dictated by the size of said fracturable member, said second pressure clamp jaw comprising two spaced jaw members spaced apart at a distance greater than the length of the pins, said spaced jaw members having respectively internal laterally extending boss means having opposed faces laterally spaced apart from each other for a distance less than the length of the pins and greater than the width of the chain links, said spaced jaw members and said boss means defining chain receiving and engaging means whereby said chain may be wrapped around said fracturable member with the second end pulled through said chain receiving and engaging means, said boss means respectively having first and second sockets, said first sockets being in transverse alignment with each other to receive said pins, said second sockets being in transverse alignment with each other to receive said pins, said first sockets having respectively a first edge and a second edge with a dwell surface therebetween, said first edge of said first sockets constituting a pin entrance edge and said second edge constituting a pin exit edge, said second sockets having respectively a first edge and a second edge and a dwell surface therebetween, said first edge of said second sockets constituting a pin entrance edge, said boss means having respectively an external surface interconnecting said pin entrance edge of said first sockets and said second edge of said second sockets, said boss means having respectively a pin guide wall surface interconnecting the pin exit edge of said first sockets and the pin entrance edge of said second sockets, said guide wall surface having an intermediate portion thereon which is substantially equal distance from said dwell surfaces of said first and second sockets, said intermediate portion being laterally positioned out of alignment with a line passing between said first and second sockets and in a direction on the side of said line away from said external surface, whereby said chain upon being wrapped around said fracturable member may be pulled through said chain receiving and engaging means and then drawn tight about said fracturable member with said pins riding over said pin entrance edge of said first sockets, said dwell surfaces therein, and said pin exit edge thereof, and then along said intermediate portion without catching the pins, said first sockets, said second sockets and said intermediate portion defining a triangle, said first sockets and said second sockets being positioned with respect to each other that the distance between the center of a pin in the first socket and the center of a pin in the second socket is greater than the distance between two adjacent pins and less than three adjacent pins, the engagement of a pin in said second sockets and the contacting of a first adjacent pin against the intermediate portion placing a second adjacent pin in a position to engage the dwell surface of said first sockets, the distance between the center of said first adjacent pin and the inside of the circumferential surface of said second adjacent pin being less than the distance between said center of the first adjacent pin and the pin entrance edge of said first sockets, whereby said second adjacent pin is held in said first sockets, said dwell surface of said second sockets meeting with said pin entrance edge and defining a reverse catchable slope which makes an included acute angle with respect to a line passing through the center of said pin in said second sockets and the center of said first adjacent pin contacting said intermediate portions.

4. A cutter as defined in claim 3, and in which said

dwell surface of said first sockets meets with said pin exit edge and defines a forward noncatchable slope which makes an included obtuse angle with respect to a line passing through the center of said pin in said first sockets and the center of said adjacent pin contacting said intermediate portions.

References Cited in the file of this patent

UNITED STATES PATENTS

2,833,034	Wheeler	May 6, 1958
2,949,669	Wheeler	Aug. 23, 1960
2,950,035	Wheeler	Aug. 23, 1960