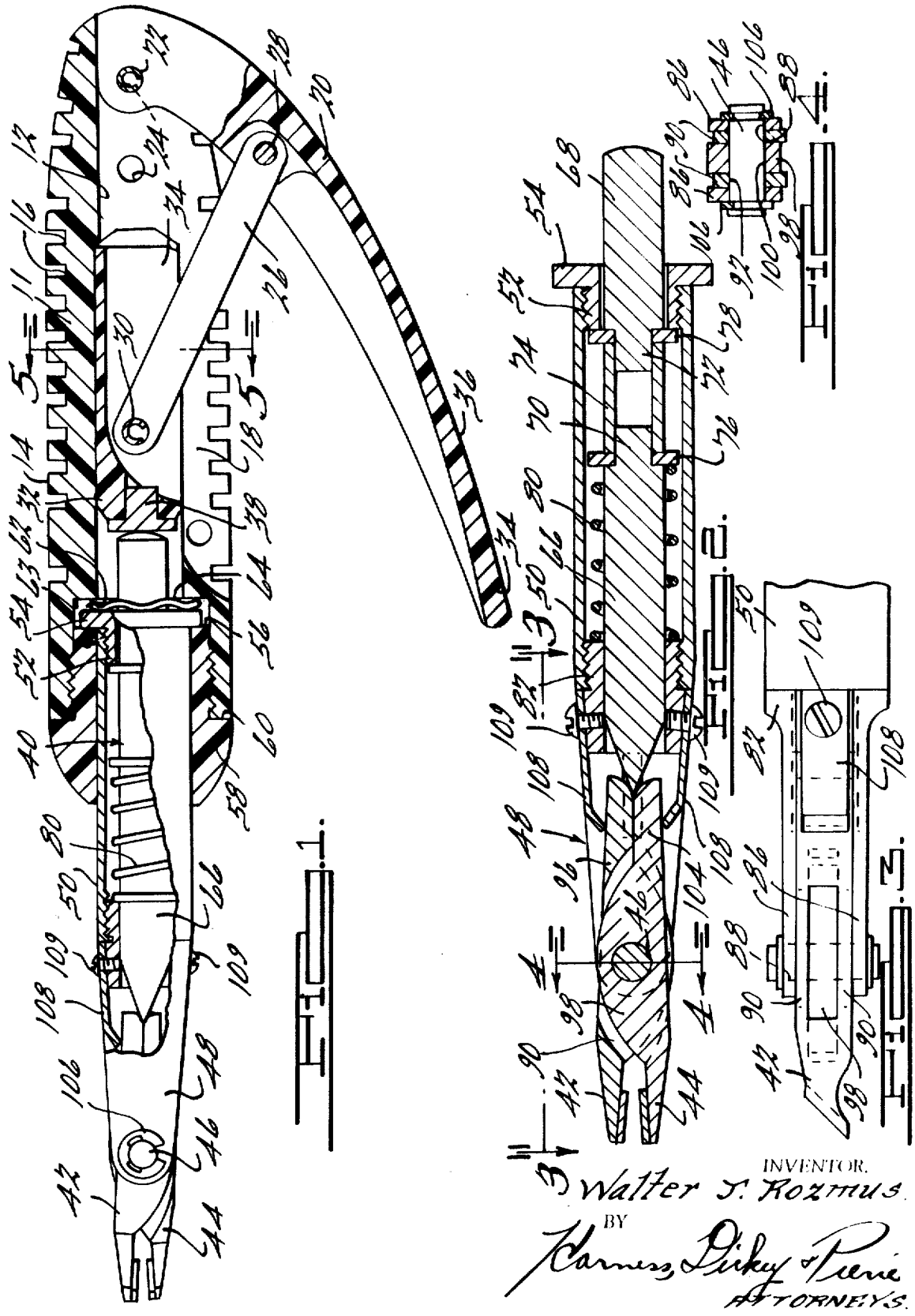
June 22, 1971 W. J. ROZMUS Re. 27,146

CAM ACTUATED PIVOTED JAW TOOL

Original Filed June 15, 1968 2 Sheets-Sheet 1



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CAM ACTUATED PIVOTED JAW TOOL

Original Filed June 15, 1968 2 Sheets-Sheet 2

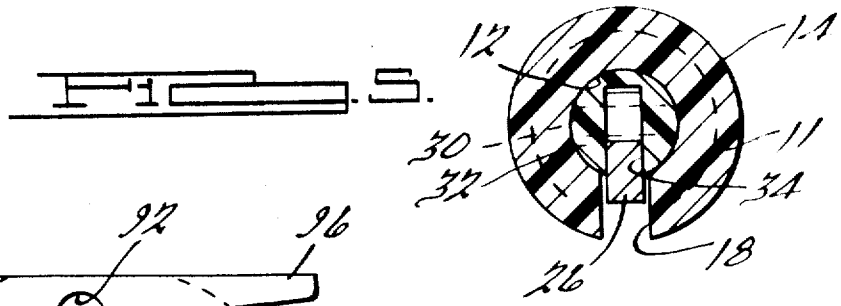


Fig. 5.

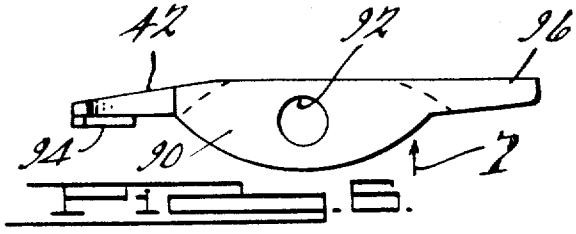


Fig. 6.

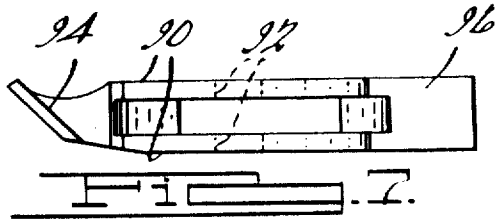


Fig. 7.

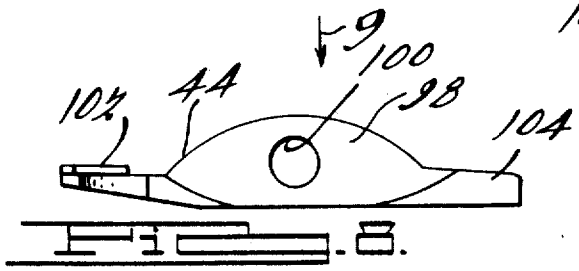


Fig. 8.

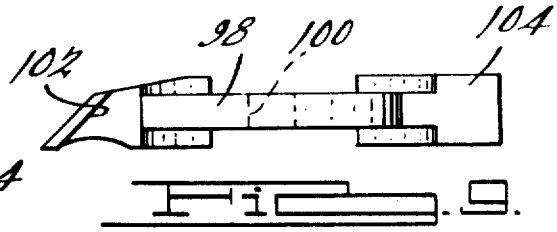


Fig. 9.

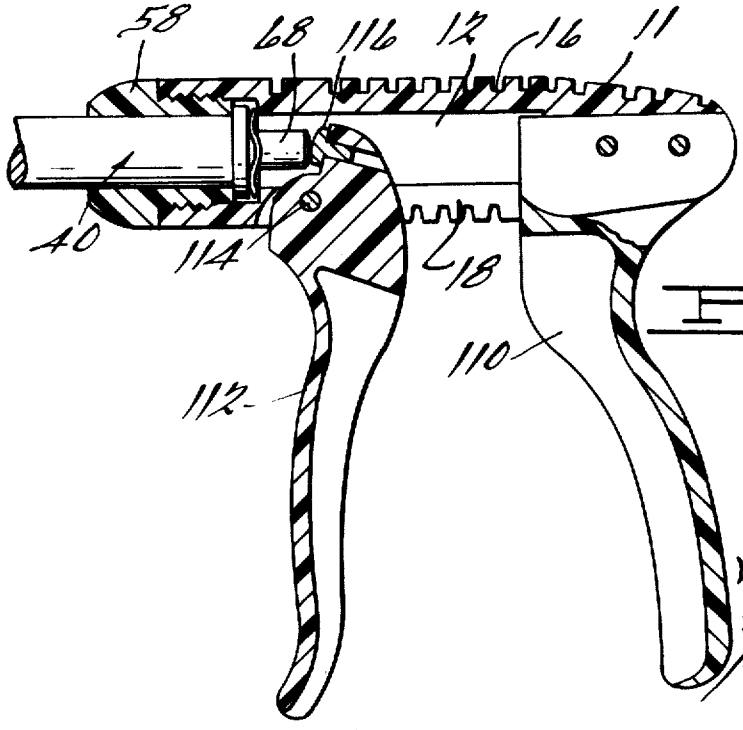


Fig. 10.

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27,146

CAM ACTUATED PIVOTED JAW TOOL

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Original No. 3,372,480, dated Mar. 12, 1968, Ser. No. 557,686, June 15, 1966. Application for reissue Dec. 22, 1969, Ser. No. 870,284

Int. Cl. B26b *17/02*

U.S. Cl. 30—193 15 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A pivoting jaw tool which is especially suited for use as a wire nipper. The jaws are formed separately from the remaining portion of the tool and are fitted together in such a manner as to insure their proper alignment. Accordingly, the jaws may be installed on the tool by a removable pivot pin without having to carefully fit them to the tool. The jaws are wedge-actuated and the actuating wedge, together with the jaws and the jaw holder, form a separable subassembly which can be readily interchanged on the tool. The wedge is actuated through operation of a handle pivoted to the tool body.

This invention relates to tools, and particularly hand tools having a pair of pivoted work-engaging jaws.

It is an object of the present invention to provide a pivoted jaw tool in which the jaws are interfitted in a manner establishing the relative position along the pivot axis irrespective of the location of the head or jaw-engaging shoulders of the bolt, nut, rivet, pivot pin or other fastener used to hold the jaws in assembly.

It is another object of the present invention to provide a pivoted jaw tool in which the jaws are formed separately from the handle or actuating portion of the tool to permit the machining and heat treating of the jaws separately from the rest of the tool and to permit the jaws to be made from a different material than the remaining portion of the tool.

It is still another object of the present invention to provide a tool of the above character in which the jaws are extremely rigidly positioned, are closely and accurately located with respect to one another, are ruggedly made, and are fully supported against deflection by extensive bearing areas contacting one another.

It is another object of the present invention to provide a tool of the above character in which the pivot axis of the jaws may be adjusted and in which the jaws are readily accessible to remote locations which are too small to be reached by hand.

It is another object of the present invention to provide a pivoted jaw tool possessing a high degree of versatility and interchangeability of its component parts, in which jaws of the same or different types may be readily substituted in the tool and in which the position of the jaws with respect to the hand held pair of the tool can be readily changed by the substitution of a minimum number of parts.

It is still a further object of the present invention to provide a tool of the above character which is particularly suited for use as a cutter for nipping wire in the electronics industry, and wherein the cutting edges may be ground in fixtures prior to the assembly of the jaws to the remaining portion of the tool so that upon the subsequent assembly of the jaws with the rest of the tool the alignment of the cutting edges remains exact.

It is another object of the present invention to provide a tool of the above character which eliminates the need for heat treating the parts after assembly or subjecting parts of the tool to hammering or other physical abuse in order to loosen the pivot joint and place the assembly in proper condition for utilization.

It is another object of the present invention to provide a pivoted jaw tool which possesses a high mechanical advantage, which is relatively inexpensive to manufacture, which is durable in construction and which is convenient to use for even unskilled workers, which is easily received and which is otherwise excellently suited for its intended purpose.

These and other objects of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a view partly in elevation and partly in longitudinal vertical section of a tool made in accordance with the present invention;

FIG. 2 is a view in full section of a part of the structure shown in FIG. 1;

FIG. 3 is a view of a part of the structure illustrated in FIG. 2, looking in the direction of the arrows **3**—**3** of FIG. 2;

FIG. 4 is a sectional view of the structure illustrated in FIG. 2 taken along the line **4**—**4** thereof;

FIG. 5 is a sectional view of the structure illustrated in FIG. 1 taken along the line **5**—**5** thereof;

FIGS. 6 and 7 are plan and side elevational views of one of the jaws illustrated in FIGS. 1 to 3;

FIGS. 8 and 9 are plan and side elevational views of the other one of the jaws illustrated in FIGS. 1 to 3, and

FIG. 10 is a fragmentary sectional view of a tool illustrating a modified form of the present invention.

The invention is illustrated herein in the form of a cutting tool particularly suited for cutting wire, or the like. It is to be understood, however, that the invention is equally applicable to other movable jaw hand tools which are intended for gripping, twisting, bending, punching or other work performing functions.

Referring now to the drawings, and particularly to FIG. 1, the tool is shown as having a housing or supporting body **11** of elongated generally tubular form. The housing **11** has a longitudinally extending central bore **12** which extends completely between the opposite ends and is of stepped diameter. The outer periphery **14** of the housing **11** is formed with a plurality of longitudinally spaced annular grooves **16** which merely make the tool easier to grip and reduce the tendency of the hand to perspire on the tool when it is used over an extended period of time. The housing **11** has a longitudinally extending slot **18** formed in the bottom thereof and providing an opening between the bore **12** and the outer periphery **14**. A handle **20** has one end thereof pivotally connected to the rear end of the housing **11** by a pivot pin **22**. The pivot pin **22** extends across the bore **12** and is fitted in one of a pair of holes **24** drilled across the housing **11**. The handle **20** serves to operate a link **26**, which is pivotally connected to the handle **20** at one end thereof by a pivot pin **28** positioned relatively closely to the pivot pin **22**. The handle **20** and link **26** define a toggle mechanism which is adapted to be hand-operated for effecting operation of the tool.

The end of the link **26** opposite from the pivot pin **28** is pivotally connected by a pivot pin **30** to a generally cylindrical plunger **32** which is smoothly slidable within the bore **12**. The plunger **32** has a slot **34** formed in one side thereof in alignment with the housing slot **18** to accommodate the link **26**. The pivot pin **30** will be seen to lie forwardly of the pivot pin **28** and the pivot pin **28** lies below and between the pivot pins **30** and **22**. Accordingly, when the handle **20** is moved toward the housing **11**

by the application of a force adjacent its free end, the plunger **32** will be moved along the bore **12** with a substantial mechanical advance. The tool of FIG. 1 is preferably held with the housing **11** in the palm of the hand, with the ends of the fingers wrapped around the outer surface **36** of the handle **20**, and with the forward end of the tool pointed generally toward the user.

The plunger **32** carries a hardened abutment member **38** at its forward end which is abuttable with the rear end of a wedge assembly **40**. The wedge assembly **40** is rectilinearly shiftable along the longitudinal axis of the tool (e.g., the axis of the bore **12**) to open and close a pair of jaws **42** and **44**. The jaws **42** and **44** are both pivoted on a single pivot pin **46** which is carried by a jaw holder **48** having generally the shape of a clevis. The jaw holder **48** is disposed at the forward end of a housing extension tube **50** projecting forwardly from the housing **11**. An externally threaded retainer member **52** is threaded into the rear end of the tube **50**. The retainer member **52** has an annular flange **54** which projects radially outwardly of the outer periphery of the tube **50** for abutment by an end wall **56** of an externally threaded retainer nut **58**. The nut is threaded into the forward end of the bore **12** and has an annular shoulder **60** engageable with the forward end of the housing **11**. The outer periphery of the nut **58** forms a smooth continuation of the outer periphery **14** of the housing **11**. The side of the flange **54** opposite from the nut **58** engages a spring wave washer **62** which, in turn, is held against an annular shoulder **63** formed in the bore **12**. The wedge assembly **40** passes through the wave washer **62**, the retainer member **52**, the nut **58**, and the tube **50**. When the nut **58** is tightened against the forward end of the housing **11** the wave washer **62** is held under compression and the tube **50** is normally kept from rotating or otherwise moving with respect to the housing **11**. However, the tube **50** may be gripped and forcibly rotated to adjust the pivot axis of the jaws **42** and **44**. The wave washer **62** yields to facilitate such adjustment.

The detailed parts of the wedge assembly **40** are best illustrated in FIG. 2 from which it will be seen that said assembly includes a wedge member **66**, and an extension rod **68**. The wedge member **66** has a reduced diameter rear terminal portion **70** and the extension rod **68** has a reduced diameter forward terminal portion **72**. Said reduced diameter portions **70** and **72** are pressed fitted within the opposite ends of a sleeve or tube **74**. A pair of washers **76** and **78** are positioned on the wedge member **66** and extension rod **68**, respectively, and are held thereon by their abutment with the opposite ends of the tube **74**. A coil spring **80** is positioned on the wedge member **66** and is held under compression between the washer **76** and the rear end of an externally threaded portion **82** of the jaw holder **48**. It will be noted that the jaw holder portion **82** is threaded into the forward end of the tube **50**. By this means a rearward force is applied to the wedge member **66** so that the spring **80** serves a wedge retracting function. The degree of retraction is limited by the abutment of the washer **78** with the forward end of the retainer member **52**. It will be seen that a jaw operating force is applied to the rear end of the extension rod **68** by the abutment member **38** carried by the plunger **32**. This force is, of course, exerted axially of the wedge assembly **40**.

The detailed shape of the jaws **42** and **44** and the jaw holder **48** are best seen in FIGS. 4 and 6 to 9. It will be seen that the jaw holder **48** has a pair of parallel generally flat laterally spaced walls **86** which are disposed parallel to the longitudinal axis of the tool and project forwardly from the threaded portion **82** thereof. The walls **86** have aligned holes **88** for the reception of the pivot pin **46** and are spaced apart a distance just great enough to receive the jaw **42** therebetween for smooth operating pivotal movement. It will be noted that there is a distinct difference between the jaws **42** and **44**, the jaw **42** being identifiable as a female jaw and the jaw **44** being identifiable as the male jaw.

The female jaw **42** has a pair of parallel laterally spaced walls **90** having aligned pivot pin receiving openings **92** formed generally centrally therein. The walls **90** possess substantially greater dimension in a direction parallel to the longitudinal axis of the tool than they do in a direction laterally of such axis. The portion of the jaw **42** disposed forwardly of the walls **90** will be seen to have a work engaging surface in the form of a single cutting edge **94** and the portion of the jaw **42** rearwardly of the walls **90** defines a wedge-engaging cam portion **96**.

The male jaw **44** will be seen to have a single central wall **98** provided with a central pivot pin receiving opening **100**. The portion of the jaw **44** which is disposed forwardly of the wall **98** has a work engaging surface in the form of a single cutting edge **102** and the portion of jaw **44** disposed rearwardly of the wall **98** defines a cam portion **104**. The cam portions **96** and **104** are engageable by the wedge member **66** for actuation of the jaws.

The wall **98** of the male jaw will be seen to possess a lateral thickness enabling it to fit snugly but slidably between the walls **90** of the female jaw **42**. When the wall **98** is fitted between the walls **90** and the pivot pin **46** is inserted in the openings **92** and **100**, the cutting edges **94** and **102** will align with one another, and the cam portions **96** and **104** will be in oppositely facing relation for insertion of the end of the wedge member **66** therebetween. It will be noted that the cam portion **96** and the cutting edge **94** lie on the same side of a given midplane including the longitudinal axis of the tool, while the cam portion **104** and the cutting edge **102** lie on the opposite side of such midplane. Thus, when the cam portions **96** and **104** are forced apart by wedge member **66**, the cutting edges **94** and **102** are moved together. It will be seen that the pivot pin **46** is properly held within the holes **92** and **100** of the jaws **42** and **44** and within the holes **88** and the jaw holder **48** by means of a pair of spring retaining rings **106** which are snap fitted in appropriately machined grooves in the outer periphery of the pivot pin **46**. Because of the extensive axially extending bearing area between the jaws **42** and **44** it will be seen that there is little chance for inclination or deflection of one of said jaws with respect to the other. This results from the substantially close fit of the wall **98** between the integrally formed walls **90**.

The normal relative position of the jaws **42** and **44** is with the cutting edges **94** and **102** spaced apart. This position results from the use of a pair of leaf springs **103** which bias the cam portions **96** and **104** of the jaws toward one another. The springs **108** are held to the jaw holder **48** by screws **109** threaded into the jaw holder portion **82**.

It should be emphasized that the jaws **42** and **44** are each machined from a single piece of material which is preferably harder and longer wearing material than what is used for the rest of the tool. The jaws **42** and **44** are also machined to much closer tolerances than the remaining portions of the tool. The precise separate finishing of the jaws **42** and **44** from hard material, such as high speed tool steel, is easily accomplished without having to use a similar, expensive hard material for the remainder of the tool. By way of example, the spacing between the walls **90** may be held to within $\frac{1}{1000}$ of an inch, and the pivot pin **46** held to a tolerance of $\frac{2}{10,000}$ of an inch by centerless grinding. By means of the foregoing, the proper fit and alignment of the cutting edges **94** and **102** may be held to within $\frac{2}{10,000}$ of an inch. In this connection it may be noted that one of the two surfaces which are ground to form the cutting edges **94** and **102** of each jaw may be ground prior to the assembly of such jaws on a pivot pin and the second of the surfaces ground

to form the cutting edge may be ground with the two jaws **42** and **44** joined on a common pivot pin. By this means the absolute accurate alignment of the cutting edges **94** and **102** is assured. From the foregoing it will be apparent that the jaws **42** and **44** may be used over an extended period of time without appreciable misalignment between the cutting edges **94** and **102** thereof. or a variety of other relatively soft and easily workable materials without adversely affecting the quality of the cut produced by the jaws **42** and **44** and without adversely affecting the long useful life of said jaws. It will also be seen that the cutting edges **94** and **102** are relatively closely spaced from the pivot pin **46** compared to the point at which the manual actuating force is applied. By this means the mechanical advantage of the resistance offered by the work to the movement of the cutting edges, which is transmitted to the pivot pin, is considerably reduced compared to that encountered in conventional cutting pliers having their cutting edges spaced a long distance from the pivot location.

In reviewing the functions of the various parts of the tool it will be seen that the retainer member **52** and the portion **82** of jaw holder **48** function as guides for the wedge assembly **40**. The tube **50** just forms a protective enclosure for the wedge assembly **40** and positions the jaw holder **48** at the desired distance from the housing **11**. The tube **50** can be changed to lengthen or shorten it if desired and it is then only necessary to change the tube **74** to match the new tube **50**. All the remaining parts of the wedge assembly **40** remain the same irrespective of the length of the tubes **50** and **74**.

If the cutting edges **94** and **102** should become dull or if the jaws **42** and **44** should otherwise require servicing, the jaws can easily be removed from the tool and replaced with another pair of jaws. This is, of course, accomplished by removing one of the snap rings **106** and withdrawing the pivot pin **46** from the holes **88**, **92** and **100**. The jaws **42** and **44** can then be slid out from between the walls **86** of the jaw holder **48**. On an assembly line the jaws **42** and **44** are the parts of the tool that are most likely to require servicing and the construction of the tool permits the quick substitution of a new pair of jaws for a pair in need of servicing with the tool being taken out of use practically no time at all.

Alternatively, the nut **58** can be unscrewed and slid off the tube **50** and jaw holder **48**. For this purpose the nut **58** is provided with suitable slots (not shown) to clear the heads of the screws **109**. The entire subassembly consisting of the tube **50**, jaws **42** and **44**, jaw holder **48**, and wedge assembly **40**, can then be replaced. Replacement assemblies having different types of jaws may be provided for a single tool. For example, a replacement subassembly having work gripping, rather than work cutting, jaws may be provided for alternative use with the same housing.

FIG. 10 shows a slightly modified version of the tool in which the hand **20**, link **26**, and plunger **32** are omitted. In lieu thereof, a stationary handle **110** is fixed to the housing adjacent the rear end thereof and an actuating handle or trigger **112** is pivoted to the housing **11** forwardly of the handle **110** by means of a pivot pin **114**. The handle **112** extends through the slot **18** and carries a hardened abutment member **116** within the bore for engagement with the rear end of the rod **68** of the wedge assembly **40**. The construction shown in FIG. 10 may be characterized as having a pistol grip type holder and actuating mechanism and is operated by manually squeezing the handle **112** toward the handle **110**.

While it will be apparent that the preferred embodiments herein illustrated are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A pivoted jaw tool including a jaw holder having a pair of parallel spaced walls, a pivot pin supported between said jaw holder walls, a pair of jaws pivotally supported upon said pivot pin and formed separately from said jaw holder, one of said jaws having a pair of parallel laterally projecting wall portions spaced apart in the direction of the axis of said pivot pin, the other of said jaws having a laterally projecting wall portion closely but pivotally fitted between the wall portions of said one jaw, said wall portion having aligned openings receiving said pivot pin, said jaws having aligned cutting portions disposed forwardly of said pivot pin and cam portions disposed rearwardly of said pivot pin, a shiftable wedge engageable with said cam portions to pivot both of said jaws on said pivot pin and means for shifting said wedge, said jaws and said pivot pin forming a subassembly which is readily removable from and installable in said jaw holder and wherein the alignment of said cutting portions is maintained by the fit of the projecting wall portion of said other jaw between the wall portions of said one jaw.

2. The structure set forth in claim **1** wherein said walls are disposed perpendicular to said pivot axis and the wall of said other jaw is flatly engageable with said pair of walls of said one jaw.

3. The structure set forth in claim **1** in which the work-engaging and cam portions of said one jaw are disposed on one side of a plane which includes said pivot pin and extends longitudinally of the tool and the work-engaging and cam portions of said other jaw are disposed on the other side of said plane whereby movement of said cam portions away from one another will cause said work-engaging portions to move toward one another.

4. The structure set forth in claim **1** in which said pivot pin has removable abutment means at least one end thereof readily disengageable from said pivot pin to permit said pivot pin to be withdrawn from said openings and said jaws to be removed from said jaw holder.

5. The structure set forth in claim **1** in which said wall portions of said one jaw define therebetween a recess which extends transversely entirely through said jaw, said recess being closed by the work-engaging portion of said one jaw at the forward end of said wall portions thereof and said recess being closed by the cam portion of said one jaw at the rearward end of said wall portions thereof.

6. The structure set forth in claim **1** including first spring means biasing said jaw cam portions toward one another and second spring means biasing said wedge away from said jaws.

7. A pivoted jaw tool including a housing, a housing extension tube having a radially extending shoulder positioned at one end of said housing, a nut surrounding said tube and threadably engageable with said housing at one end thereof, said nut being engageable with said extension tube shoulder to locate said shoulder with respect to a shoulder formed on said housing, wedge means slidable in said extension tube having a wedge surface at the end thereof opposite from said housing and an abutment surface at the opposite end thereof, means carried by said tube for limiting movement of said wedge means toward said housing, a pair of jaws pivotally supported by said housing extension tube at the end thereof opposite said housing and engageable by said wedge surfaces for actuation thereof, and wedge actuating means supported on said housing and engageable with said abutment surface to move said wedge means between said jaws, said tube, said jaws and said wedge means forming a subassembly which is removable from the remaining portion of the tool upon the removal of said nut, whereby subassemblies of varying length and jaw configurations may be interchangeably used on said tool.

8. The structure set forth in claim **7** in which said nut can be slid off of said tube over said jaws to permit interchanging of a subassembly including said tube and a pair of jaws pivotally supported on said tube.

9. The structure set forth in claim 7 including a spring washer disposed between said housing extension tube shoulder and said housing shoulder, said spring washer being yieldable to permit angular adjustment of said housing extension tube with respect to said housing.

10. The structure set forth in claim 7 in which said wedge means having said wedge surfaces comprises a wedge member, an abutment member having said abutment surface and a sleeve removably connecting said wedge member and abutment member whereby said sleeve and said housing extension tube can be changed to position said jaws varying distance from said housing.

11. The structure set forth in claim 10 including a washer positioned between said sleeve and said wedge member and a spring positioned between said washer and said jaws for biasing said wedge away from said jaws.

12. The structure set forth in claim 7 including first spring means basing said jaws to an open position and second spring means biasing said wedge away from said jaws.

13. A pivoted jaw hand tool including a housing having a bore formed therein and a slot extending laterally between said bore and the outer periphery of said housing, a pair of pivoted jaws carried by said housing, wedge means for operating said jaws, a plunger slidable in said bore and abuttable with said wedge means, a handle pivoted to said housing at one end thereof, a link extending through said slot and pivoted at its opposite ends to said handle and said plunger whereby pivotal movement of said handle toward said housing will advance said plunger in said bore to actuate said wedge.

14. A pivoted jaw tool including a jaw holder having a pair of parallel spaced walls,

a pivot pin supported between said jaw holder walls,

a pair of jaws pivotally supported upon said pivot pin and formed separately from said jaw holder,

one of said jaws having a pair of parallel laterally projecting wall portions spaced apart in the direction of the axis of said pivot pin,

the other of said jaws having a laterally projecting wall portion closely but pivotally fitted between the wall portions of said one jaw,

said wall portion having aligned openings receiving said pivot pin,

said jaws having aligned cutting portions disposed forwardly of said pivot pin and cam portions disposed rearwardly of said pivot pin,

means engageable with said cam portions operable to bias said cam portions apart and thereby pivot both of said jaws on said pivot pin,

said jaws and said pivot pin forming a subassembly which is readily removable from and installable in said jaw holder and wherein the alignment of said cutting portions is maintained by the fit of the projecting wall portion of said other jaw between the wall portions of said one jaw.

15. A pivoted jaw tool including a jaw holder having a pair of cooperable spaced walls,

a pivot member supported between said jaw holder walls,

a pair of jaws supported upon said pivot member for movement relative thereto,

one of said jaws having a pair of parallel laterally projecting wall portions spaced apart in the direction of the axis of said pivot member,

the other of said jaws having a laterally projecting wall portion closely but movably fitted between the wall portions of said one jaw,

said wall portion having aligned openings receiving said pivot member,

said jaws having aligned cutting portions disposed forwardly of said pivot member and cam portions disposed rearwardly of said pivot member,

means engageable with said cam portions operable to bias said cam portions apart and thereby pivot both of said jaws on said pivot member,

said jaws and said pivot member forming a subassembly which is readily removable from and installable in said jaw holder.

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GIL WEIDENFELD, Primary Examiner

U.S. Cl. X.R.

30—180, 261; 81—349

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. Reissue No. 27,146 Dated June 22, 1971

Inventor(s) Walter J. Rozmus

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 3, "advance" should read --advantage--. Column 4, line 53, "103" should read --108--. Column 5, line 57, "hand" should read --handle--.

Signed and sealed this 28th day of December 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents

USCOMM-DC 60376-P69
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