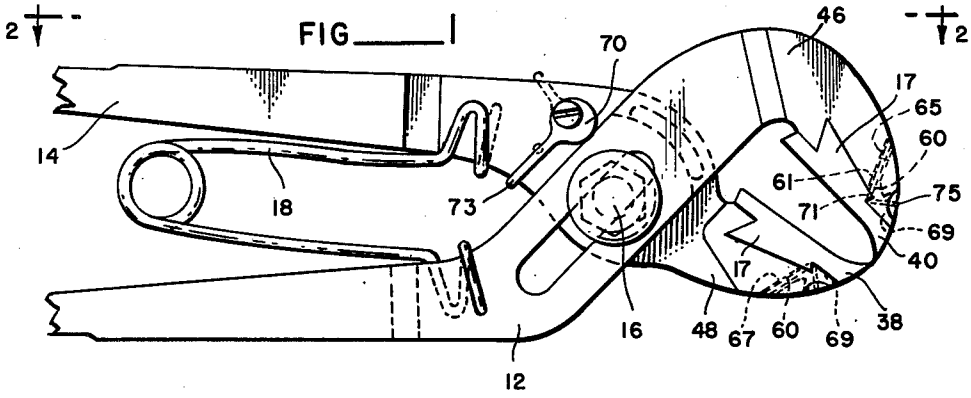
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CONVERTIBLE JAW PLIERS

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FIG. 1



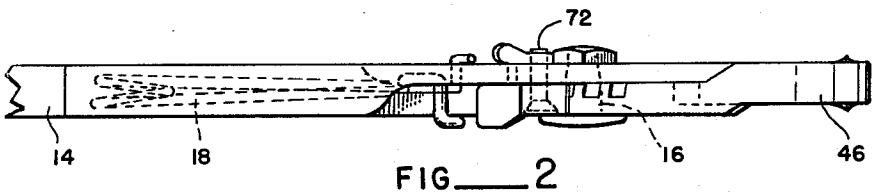


FIG. 2

FIG. 3

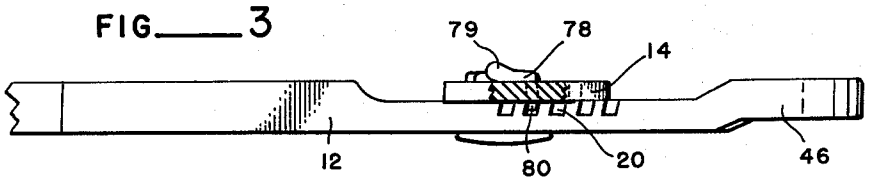


FIG. 12

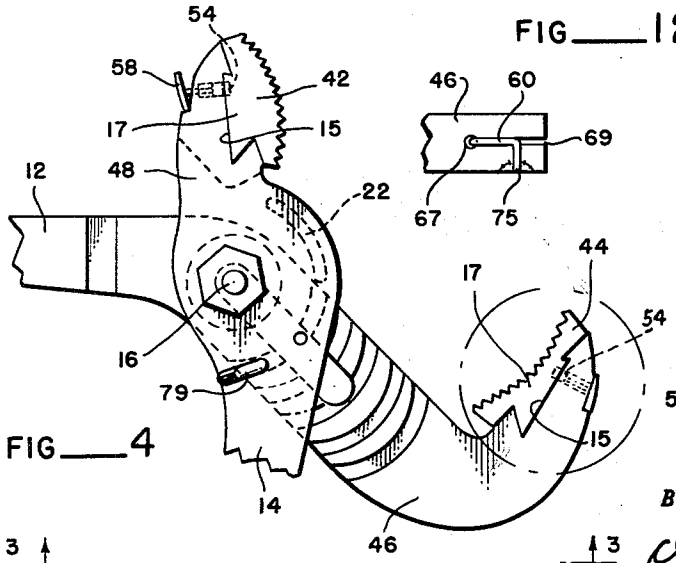


FIG. 4

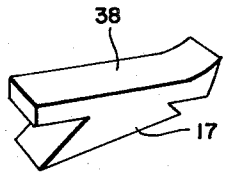
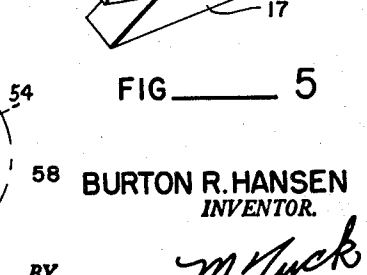


FIG. 5



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FIG. 6

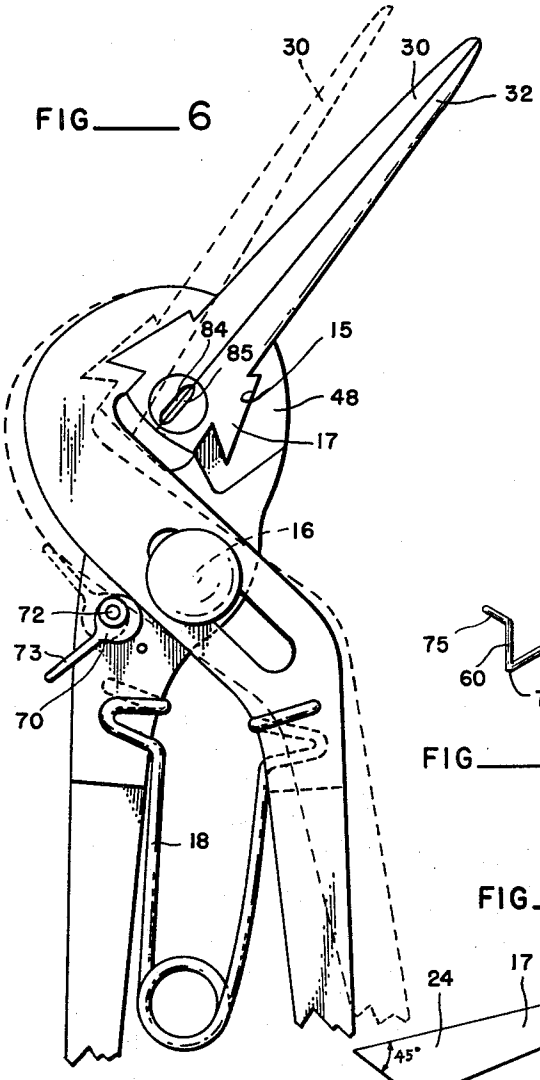


FIG. 9

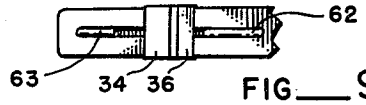


FIG. 7

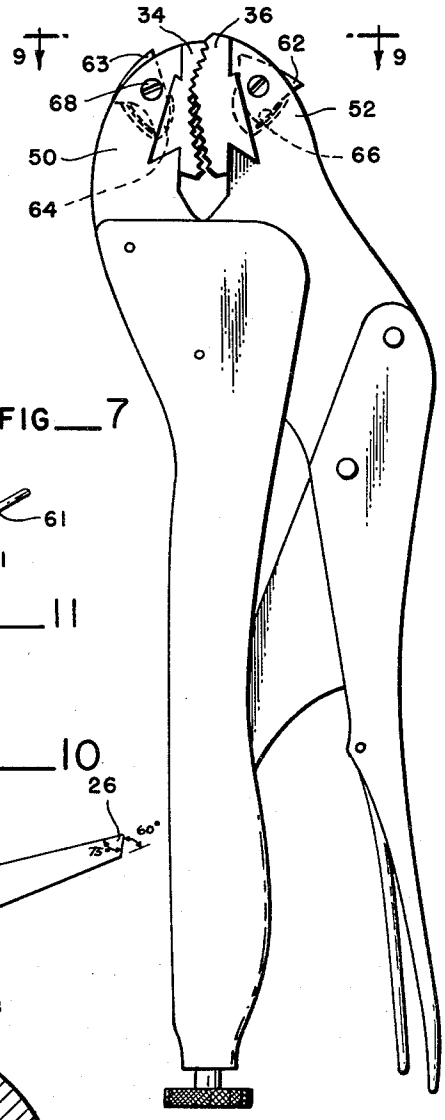


FIG. 11

FIG. 10

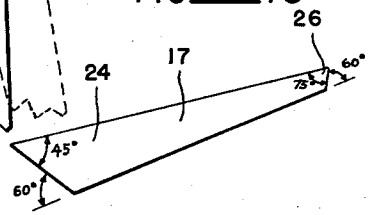
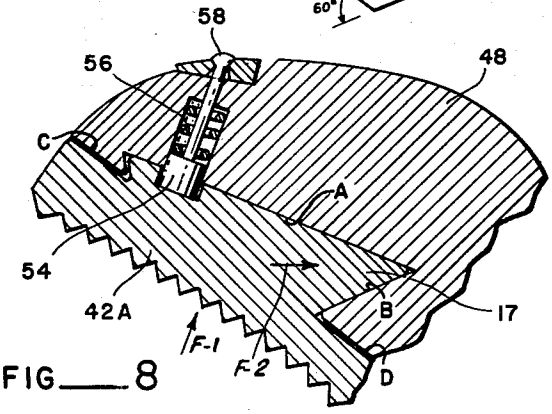


FIG. 8



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CONVERTIBLE JAW PLIERS

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5 Claims. (Cl. 81—423)

This present inventioin relates to the general art of pliers, by which is meant a tool having two lever members which are pivoted together near one end of both members and provided with jaws on the short pivoted ends and the opposite ends providing handles of increased length to give the mehanical purchase required to cause the jaws to grip with a pressure several times that applied to the handle portions of the lever members. More particularly, this present invention relates to a design providing a practical method for the common seating of a large variety of plier type jaws in one or more basic tools of the plier or movable jaw wrench types.

Manufacturers have supplied the mechanical world with a wide range of hand tools and have further provided a great number of specialized tools that can normally be used only for certain specific operations but which particularly fit those operations and are very efficient when so used. It follows that it would be most inconvenient for a person to have readily available the wide variety of tools that are currently obtainable for any one of the different lines of craft work. There are many basic types of pliers and wrenches and many sizes of each type. To solve this problem I have constructed my convertible plier jaws having coacting pairs adapted to any normal type of pliers or wrenches which have jaws formed on the short end of the two pivoted together levers and which provides an elongated handle or handle portions on the opposite side of the pivot point, a design which is characteristic of this general type of tool.

In making this plan available it is necessary that the actual fixed jaw portion of the pliers, of whatever type they may be, have sufficient material and be properly shaped so that transverse dovetailed slots can be provided in each of the plier jaws and that these dovetailed slots should be unsymmetrical with the deepest part of the slot in the direction of the pivot point of the pliers so that the pliers can have adequate strength without undue bulkiness; the male portion of the dovetail particularly must be made of sufficient metal to assure adequate strength for the task required. Throughout the present drawings, three general types of pliers have been illustrated. However, it is to be understood that my jaw arrangement is adaptable to various types of pliers or pivoted jaw wrenches beyond those illustrated and further, that a wide variety of jaws can be used in a standard tool which is provided with the transverse dovetailed slots as called for by my present plan.

The principal object of my present invention, therefore consists in providing a design which incorporates an irregular or unsymmetrical type of dovetailed slot running transversely through the permanent portion of coacting plier jaws and which is unique in that it provides offset angular position to the jaw face of the pliers and serves several purposes not heretofore known to the best of my belief.

A further object of this invention is to provide plier jaws which conform more nearly to the structural shape of the permanent portion of plier jaws, thereby retaining the maximum of structural strength for a given amount of material.

A further object of this invention is to provide for greater material strength where most needed to counteract the radial thrust created, particularly by the operation of the extended type of jaws.

A further object of this invention is to permit utilization of the wedge principle to the greatest advantage in rigidly stabilizing the seating of jaw inserts during functional operation of pliers which are so equipped.

A further object is to provide means which serve adequately in the retention of jaw inserts of a wide variety of forms of pliers and wrenches.

Further objects, advantages and capabilities will be apparent from the disclosure in the drawings or may be comprehended or are inherent in the device.

In the drawings:

FIGURE 1 is a face view with the handles partially broken away and illustrating a general utility type of modern pliers.

FIGURE 2 is a side view of the pliers of FIGURE 1.

FIGURE 3 is a view similar to FIGURE 2 but with the upper jaw and handle member revolved and shown in section, as taken from the line 3—3 of FIGURE 4, so as to illustrate particularly the construction of my lever locking pin.

FIGURE 4 is a fragmentary view illustrating a different type of toothed jaw in which the jaw inserts, while coactive, are not symmetrical.

FIGURE 5 is a perspective view illustrating one of the jaw insert members as shown in FIGURE 1.

FIGURE 6 is a view somewhat similar to that of FIGURE 1 but illustrating a long nosed type of plier jaw inserts and further illustrating a cam setting means which limits the amount the jaws can be opened, which is a great help in certain types of work when using the long jaws especially.

FIGURE 7 illustrates the toggle type plier and illustrates how my insert jaws can be adapted to this unusual form of pliers, or as it is often termed, a plier wrench.

FIGURE 8 is an enlarged fragmentary cross-sectional view showing one form of spring backed locking means used to insure that the jaw inserts will not move transversey of the jaws once they are seated for use.

FIGURE 9 is a top plan view of FIGURE 7 as taken along the line 9—9 of FIGURE 7 and with certain parts of the toggle plier broken away.

FIGURE 10 is a diagrammatic view illustrating a preferred angularity arrangement for the transverse slots on the dovetailed blocks of the jaw members.

FIGURE 11 is a perspective view of a wire detent locking means.

FIGURE 12 is a fragmentary detail view of the end of a pliers or wrench jaw showing the wire detent means.

Referring to the drawings, throughout which like reference numerals indicate like parts, the two plier handle and jaw members 12 and 14 which are pivoted together in an operative manner by pivot means 16, illustrate a type of plier particularly well adapted to this present invention. The form of this plier is quite well illustrated with some variations and it is believed that it will be understood from a study of FIGURES 1 through 4. The two elements, 12 and 14 are normally spring biased into the open position by means of spring 18, the functioning of which is illustrated in FIGURES 1 and 6. In this illustration, which includes FIGURE 6, the general utility types shown are equipped with the arcuate land and groove arrangement. These are probably best illustrated in FIGURES 3 and 4. It is desirable to point out however that this utility type wrench, of which there are many types, was taken for illustrative purposes as being one of the more difficult types for the adaptation of my convertible jaws. Further, the toggle wrench type of pliers shown in FIGURE 7 is another difficult type. It

is believed apparent that the ability to successfully use my convertible jaws in these two extreme types of wrenches or pliers should show that they are adaptable to a wide range of plier types and the like type of tools.

Referring to the showing of FIGURES 1, 4, 6, 8 and 9, the particular form of dovetailed transverse slot **15** arrangement used in the inner face of each of the two plier tool jaws is illustrated. The preferred angular values are given in FIGURE 10 for the dovetailed key member **17** so that the form of the unsymmetrical type of transverse slots may be clearly understood. With this arrangement it is noteworthy that the deepest portion or the heaviest end of the dovetail is shown at **24** nearest to pivot **16** and the lightest or shallowest end is shown at **26** farthest away from pivot **16**. This form of dovetailed slot **15** and coacting key **17** is used in all the various examples given, and while the proportions might be varied within limited amounts, experiment has proven the values given to be most generally satisfactory.

These proportions give the greatest resistance to distorting either of the convertible jaws, as **30** and **32**. Other forms of jaws are shown in FIGURE 7 at **34** and **36**, in FIGURE 4 at **42** and **44** and in FIGURE 1 at **38** and **40**. These jaws are illustrative of only a limited number of forms that these convertible jaws might take, it being the intent to have convertible jaws that will normally take care of every function for which plier or movable wrench jaws are produced. There would be one common element, and that is the size and proportion of the dovetailed transverse slots **15** and the dovetailed key block **17** formed as part of each of the jaw members. In this way, for example, two holders, such as illustrated by the pliers of FIGURES 6 and 7, might conceivably have two or three dozen different types of jaws, all of which could be used interchangeably in either holder, but of course the jaws would have to be used in coacting pairs.

Pliers are made for all classes of work and consequently are made in a wide variety of sizes even though the design characteristics are the same. I have found it desirable to employ a variety of different locking means to hold the convertible jaws as the tool jaws **46** or **48** or the other coacting pair of tool jaws, **50** and **52**. In FIGURES 4 and 8 I have illustrated a piston type locking member **54** which is spring backed by spring **56** and has a heading for the locking member **54** illustrated at **58** which can be raised and thus retract piston **54** from its engagement in the jaw member *42a*. In order to insure the small but necessary movement of the convertible jaw along the longitudinal axis of the tool jaw, the piston receiving opening in one of the jaws should be extended along an axis extending generally normal to the plane of closure of the jaws so that full use can be made of the wedging action occurring when the convertible jaws are under load in use. Because the wedging action of the insert jaws **38** and **40** prevents them from moving laterally when under pressure, it is not necessary that the mechanism for holding the insert jaws in place be capable of taking loads or that it be of heavy design. FIGURES 1, 11 and 12 show that light wire spring detent members **60** and **71** can be adapted to hold the insert jaws in place. Note that a small cylindrically shaped lead slug **65** is swedged into hole **67** to hold member **60** in place. Spring member **60** is essentially V-shaped to form point or detent **71**. Anchor **65** is pressed against portion **61** while the overhanging end **75** of the other portion is bent outwardly to be engaged by the operator's fingers for releasing the insert jaw. Wire portion **61** is anchored at **65** and passes through an oversized drilled hole **67** extending to slot **69**. The wire is exposed in the front transverse slot at **71** to form a locking detent to prevent the transverse movement of the jaws in the dovetailed slot. Wire **60** is bent to provide the overhanging end **75** so that the detent can be easily engaged by finger action to free the convertible jaws **34** and **36**.

For use under maximum loading conditions I employ the key locking members illustrated at **62** and **63** shown in FIGURES 7 and 9. To employ these, arcuate cuts are made as at **64** which are similar to the Woodruff cuts for Woodruff keys, except in this intance I provide that each of members **62** and **63** have fashioned as part thereof and illustrated at **66**, a portion to fit these arcuate cuts **64**. They are easily operated by the use of the outwardly extending portions indicated at **62** and **63** so that they can be operated by merely pressing the nose of the pliers onto a firm surface and pressing the nose of the pliers onto a firm surface and then pressing the outwardly extending pieces **62** or **63** within the outline of the jaws **50** and **52**, which pivot the members about their securing screws **68** and release the keys from cuts **64** so that the convertible jaw members can be moved sideways and thus be removed or fitted into the jaws.

In a tool of this order, particularly in the longer nosed types as shown in FIGURE 6, it is desirable to limit the opening of the jaws as a time saver on the average job. To achieve this I provide the eccentric **70** pivoted on pin **72** and have the operating handle **73**. It is believed apparent that as the eccentric is turned about its pivot **72** the eccentric will abut the movable jaw and handle elements **73** and limit its movement to that illustrated in the dashed lines in FIGURE 6, considering this as merely one of the various settings that might be achieved. The eccentric mount **72** is in effect a screw which is probably best illustrated in FIGURE 2. Consequently, it is possible to tighten screw **72** and thus lock the eccentric in position if desired, or if better suited to the work at hand thus making it work with considerable resistance.

In FIGURE 3 I have illustrated a shift lock pin **78**. This unit is threaded for downward adjustment and is provided with a lever portion as **79** for turning the detent portion **80** which may be selectively positioned in any of the grooves **20** when the jaws themselves are shifted. After being thus positioned, there will be no change from one groove to the other by the mating lands **22** as might occur when the tool is laid down or otherwise disposed of during periods of non-use. In FIGURE 6 is illustrated a side cutting pair of coacting cutting edges **84** and **85**, formed as part of the convertible jaws **30** and **32**. It will be believed apparent that my convertible jaws can be installed with the cutting edges on either side of the pliers.

Referring to FIGURE 8 I have illustrated the details of the seating and locking means for the inserts. Illustrated are the points of relief and areas of bearing that have been found desirable to insure that the jaw inserts will wedge themselves into the angular seat formed by sides A and B when force is applied in the directions indicated by the two force vectors F_1 and F_2.

When properly seated the inserts **17** will actually be contacting only the two sides A and B and with a minimum clearance (.002"–.003") at faces C and D. These faces will provide additional support only under extreme conditions as when the applied force is great enough to crowd the inserts against the two faces C and D.

It is believed that it will be apparent from the above description and the disclosure in the drawings that the invention comprehends a novel cnostruction of convertible jaw pliers.

Having thus described my invention, I claim:

1. A convertible jaw hand tool of the pliers or movable jaw wrench type, comprising:

(*a*) a tool having a coacting pair of tool jaws connected in an operative manner by pivot means;

(*b*) a coacting pair of insert jaw members;

(*c*) a transversely disposed dovetailed slot in the inner face of each of said tool jaws arranged to secure said pair of insert members in a coactive manner;

(*d*) said slots having an unsymmetrical form in which

the deepest end of the dovetail is nearest to said pivot means and the shallowest end farthest away from said pivot means;

(*e*) each of said insert members having a dovetailed key block for coaction with said dovetailed slots and

(*f*) means for locking said insert members against transverse movement within said tool jaws.

2. A convertible jaw hand tool of the pliers or movable jaw wrench type, comprising:

(*a*) a tool having a coacting pair of tool jaws connected in an operative manner by pivot means;

(*b*) a coacting pair of insert jaw members;

(*c*) a transversely disposed dovetailed slot in the inner face of each of said tool jaws arranged to secure a pair of insert members in a coactive manner;

(*d*) said slots having an unsymmetrical form in which the deepest end of the dovetail is nearest to said pivot means and the shallowest end farthest away from said pivot means;

(*e*) each of said insert members having a dovetailed key block for coaction with said dovetailed slots;

(*f*) means for locking said insert members against transverse movement with said tool jaws;

(*g*) comprising a spring biased piston type locking member to seat substantially one half in said tool jaw and one half in said insert members and said seating opening in said insert members having clearance space added along the longitudinal axis of one of said jaws.

3. A convertible jaw hand tool of the pliers or movable jaw wrench type, comprising:

(*a*) a tool having a coacting pair of tool jaws connected in an operative manner by pivot means;

(*b*) a coacting pair of jaw insert members;

(*c*) a transversely disposed dovetailed slot in each of said tool jaws arranged to secure said pair of jaw insert members in a coactive manner;

(*d*) said slots having an unsymmetrical form in which the deepest end of the dovetail is nearest to said pivot means and the shallowest end farthest away from said pivot means;

(*e*) each of said jaw insert members having a dovetailed key block for coaction with said dovetailed slot;

(*h*) each of said key blocks having a heaviest end disposed nearest said pivot means and a lightest end disposed farthest away from said pivot means and

(*f*) means for locking said jaw insert members against transverse movement within said tool jaws.

4. A convertible jaw hand tool of the pliers or movable jaw wrench type, comprising:

(*a*) a tool having a coacting pair of tool jaws connected in an operative manner by pivot means;

(*b*) a coacting pair of insert members;

(*c*) a transversely disposed dovetailed groove in the inner face of said tool jaws arranged to secure said pair of insert members in a coactive manner;

(*d*) said grooves having an unsymmetrical form in which the deepest end of the dovetail is nearest to said pivot means and the shallowest end farthest away from said pivot means;

(*e*) each of said insert members having a dovetailed key block for coaction with said dovetailed grooves;

(*f*) means for locking said insert members against transverse movement with said tool jaws and

(*g*) said locking means comprising a slot located at the outer end of each of said tool jaws midway between the sides of said jaws, a hole means passing from a point on the back of each of said tool jaws which point is spaced from the rearmost part of said slot, said hole extending generally toward the shallowest end of said dovetail groove, and a generally V-shaped spring wire means anchored in said hole means and extending through said hole to said shallowest end and up into said slot, the end of said wire means which is in said slot having an overhanging side detent means extending sideways to be moved by finger action to allow said insert member to move laterally.

5. A convertible jaw hand tool of the pliers or movable jaw wrench type, comprising:

(*a*) a tool having a coacting pair of tool jaws connected in an operative manner by pivot means;

(*b*) a coacting pair of insert members;

(*c*) a transversely disposed dovetailed slot in each of said tool jaws arranged to secure a pair of insert members in a coactive manner;

(*d*) said slots having an unsymmetrical form in which the deepest end of the dovetail is nearest to said pivot means and the shallowest end farthest away from said pivot means;

(*e*) each of said insert members having a dovetailed key block for coaction with said dovetailed slot;

(*h*) each of said key blocks having a heaviest end disposed nearest said pivot means and a lightest end disposed farthest away from said pivot means;

(*f*) means for locking said insert members against transverse movement within said tool jaws and

(*k*) said locking means for each convertible jaw comprising a locking detent means formed of spring wire, having a substantially right angle bend disposed midway in said detent means and which has at one end means for securing the spring wire in one of the tool jaws and at the opposite end an overhanging end to facilitate releasing said detent, both of said jaws having a longitudinal slot therein so said spring may be flexed to withdraw said locking detent into the body of said tool jaws, said pair of insert members coacting with said tool jaws, each having a longitudinal slot for engaging said right angle bends to lock said convertible jaws in said tool jaws.

References Cited by the Examiner

UNITED STATES PATENTS

433,794	8/90	Kasch.	
844,134	2/07	Jenkins	81—423 X
1,216,527	2/17	Weldon et al.	81—423
1,504,870	8/24	Coughlin.	
1,578,438	3/26	Hintz	81—341 X
2,404,224	7/46	Fink.	
2,814,222	11/57	Sanders	81—423 X

FOREIGN PATENTS

501,294	2/51	Belgium.
861,380	12/52	Germany.

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