Aug. 30, 1966 J. R. CAMBRON 3,269,230

HAND TOGGLE PLIERS

Filed May 10, 1965 2 Sheets-Sheet 1

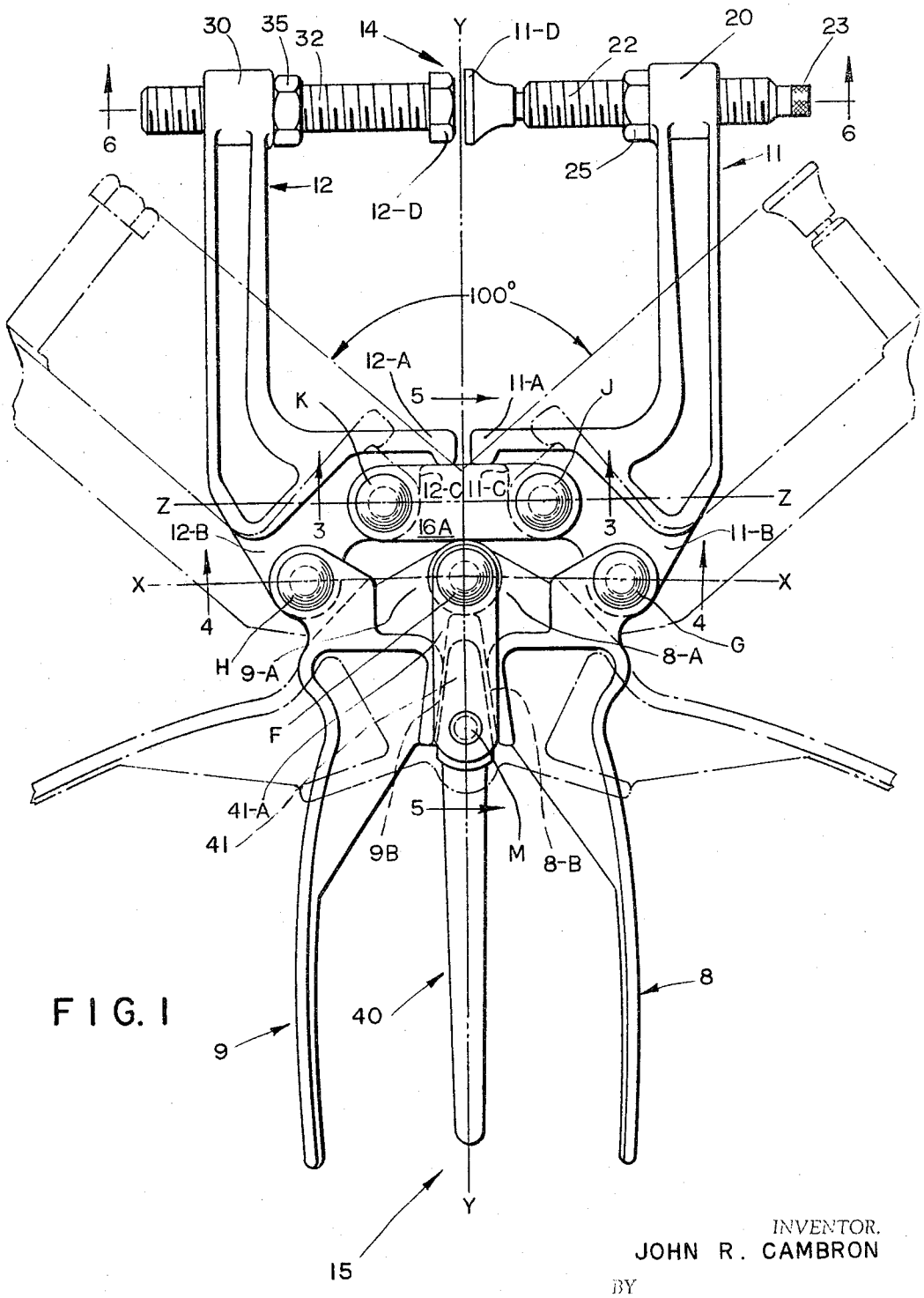

FIG. 1

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Aug. 30, 1966 J. R. CAMBRON 3,269,230

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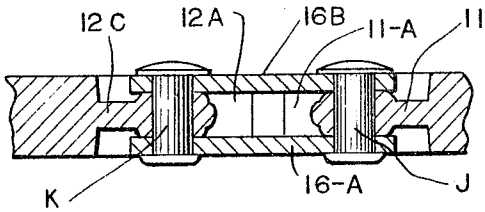

FIG. 3

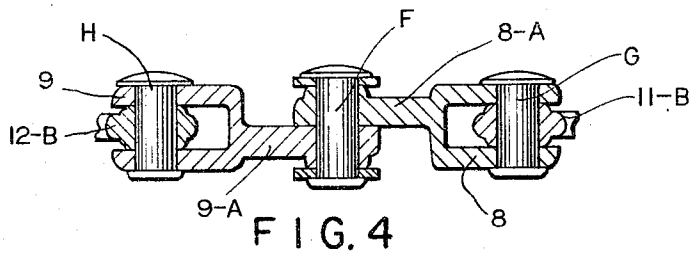

FIG. 4

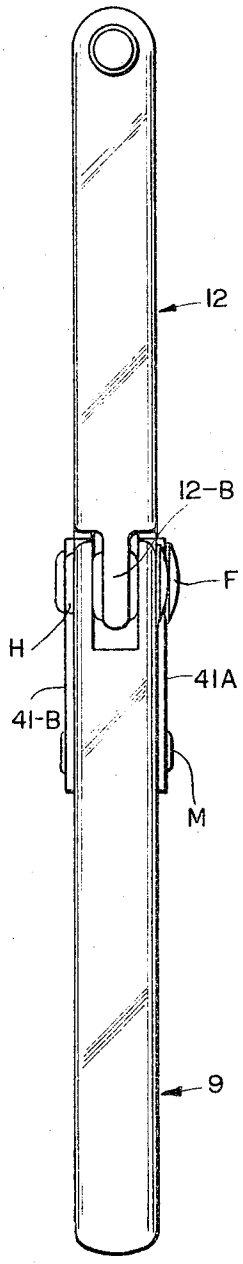

FIG. 2

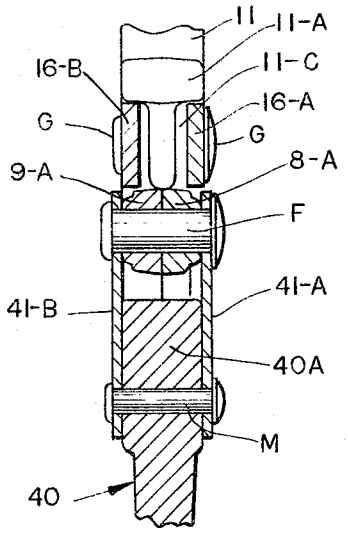

FIG. 5

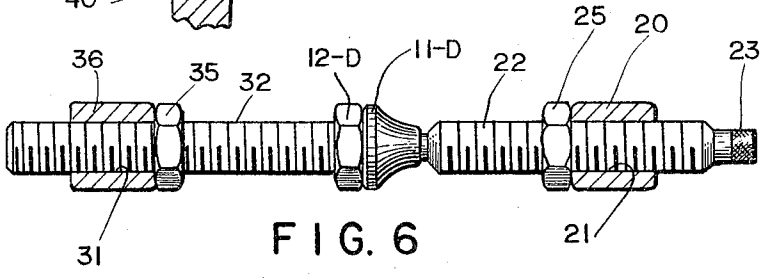

FIG. 6

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HAND TOGGLE PLIERS

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6 Claims. (Cl. 81—350)

This invention relates to portable hand toggle pliers or clamps of the type in which a pair of clamp arms are pivotally secured to a pair of handles which are manually actuated to open and close the clamping portions secured to the outer ends of the clamp arms.

In use, the clamping portions are closed to grip an object with a firm but relatively small gripping pressure.

Heretofore, hand toggle pliers have been so constructed that when in open position the axes of the clamp arms may be separated no more than 90°. This limitation makes it extremely difficult and sometimes impossible to advance the clamping portions to or to remove them from gripping position in certain desirable uses thereof because insufficient clearance is provided between the open clamping portions.

In one prior art commercial embodiment, disclosed in U.S. Patent 3,097,553, an arrangement of pivotal connections between the clamp arms and handles has been provided which permits a maximum separation of 90° between the axes of the clamp arms. However, in this arrangement a very great closing force must be exerted upon the handles in order to move the clamp arms from fully opened position to closed or gripping position. In fact, it is necessary to use two hands to move such clamp arms from fully opened position to closed position and in many instances, this makes it extremely difficult to use the clamp.

One object of the present invention is to provide a hand toggle pliers which when in open position provides a separation between the axes of the clamp arms of 90° or more and which may be moved from fully opened position to closed position by exerting relatively small forces upon the handles, for example, this closing operation may be accomplished by one hand of the user leaving the other hand free for other uses.

Another object of this invention is to provide a hand toggle pliers which may be constructed to provide separations between the axes of the clamp arms of from 90° to 120° when in open position, depending upon the locations of the pivots with respect to each other.

A still further object is to provide a novel hand toggle pliers which is economical to manufacture, easy to use and which may be used in situations where it is impossible to use prior art pliers because of their restrictions as to the amount by which the axes of the clamp arms can be separated in fully open position.

Other objects and advantages will be apparent from a consideration of the following description and the annexed drawings wherein one embodiment of a toggle pliers embodying this invention is shown.

In the drawings:

FIG. 1 is a side elevational view of a hand toggle pliers embodying this invention, with the handles and clamping portions shown in closed position in full lines and in fully opened position in dot dash lines;

FIG. 2 is an edge elevational view of the pliers shown in FIG. 1;

FIG. 3 is a section taken on the lines 3—3 of FIG. 1;

FIG. 4 is a section taken on the lines 4—4 of FIG. 1;

FIG. 5 is a section taken on the lines 5—5 of FIG. 1; and

FIG. 6 is a section taken on the lines 6—6 of FIG. 1.

In the embodiment of the invention shown in the drawings, the hand toggle pliers are shown in full scale and a

separation of 100° is provided between the axes of the clamp arms in fully opened position. They may be moved from a fully opened position to closed position by one hand of the user.

The pliers shown in the drawings comprise a pair of substantially L-shaped handles 8 and 9, a first swinging clamp arm 11 and a second swinging clamp arm 12.

The forward or clamping end of the pliers is designated generally by the numeral 14 and the rear or handle end is designated generally by the numeral 15.

The handles and clamp arms are arranged generally at opposite sides of the center axis Y—Y of the clamp.

The handles are provided with short legs 8–A and 9–A which extend towards each other with their ends overlapping and extending across the center axis Y—Y. The overlapping ends of the short legs 8–A and 9–A are pivotally interconnected at the center axis by the rivet F (see FIGS. 1 and 4).

The long legs of the handles which are grasped by the user extend rearwardly alongside the center axis when the clamp arms are in closed position as shown in full lines in FIG. 1.

The clamp arms 11 and 12 are provided with lateral portions 11–C and 12–C which have integral extensions 11–A and 12–A, the ends of which face each other from opposite sides of the center axis Y—Y when the pliers are in closed position.

The rear end portions 11–B and 12–B of the clamp arms 11 and 12 are pivotally interconnected to the handles 8 and 9 by the rivets G and H respectively. The rivets G and H are equidistantly spaced from the center axis Y—Y and they are normally aligned on the axis X—X which is perpendicular to the center axis Y—Y.

The central pivotal connection F is located slightly forward of the axis X—X when the pliers are in closed position, thereby causing the clamping portions 11–D and 12–D to grip an object between them with a gripping pressure after the user's hands have been removed from the handles.

A pair of links 16–A and 16–B cross the center axis Y—Y and have one set of their ends pivotally connected by the rivet J to the lateral portion 11–C of the clamp arm 11 at a point spaced at one side of the center axis Y—Y approximately midway between the central handle pivotal connection F and the lower end clamp arm handle interconnection G. Their other ends are pivotally connected by the rivet K to the lateral portion 12–C of the clamp arm 12 at a point spaced at the other side of the center axis Y—Y approximately midway between the central handle pivotal connection F and the lower end clamp arm handle interconnection H. When the clamp arms are in closed position, the axis Z—Z which connects the pivots J–H is perpendicular to the center axis Y—Y.

In the embodiments shown in the drawings, when the pliers are in closed position, the distance between the pivots H and G is 2¾", the pivots G and H each being spaced 1⅜" from the center axis Y—Y. Each of the pivots J and K is 11/16" from the center axis Y—Y and the axis Z—Z is spaced 11/16" from the axis X—X. Thus with the pivots J–K spaced at opposite sides of the center axis Y—Y approximately midway between the central handle pivotal interconnection F and the clamp arm interconnections G and H respectively (as shown in FIG. 1) and the axis Z—Z spaced forwardly of the axis X—X a distance (11/16") which is about 50% of the distance between the pivot F and the pivot G (1⅜"), the axes of the clamp arms may be separated 100° (their positions shown in dot dash in FIG. 1) and they may be moved from that fully opened position to closed position by exerting relatively small forces upon the handles.

The rearward faces of the handle extensions 11–A and

12–A contact the forward faces of the links 16–A and 16–B as shown in FIGS. 1 and 5 thereby to limit the closing movements of the arms.

The links 16–A and 16–B may be united into a single link, for example by providing bifurcated end portions.

The forward end of the clamp arm 11 terminates in a boss 20 which is provided with an interiorly threaded passage 21. The exteriorly threaded bolt 22 has a knurled end portion 23 and its opposite end is provided with a generally hemispherical end (not shown) which is received in a socket in the clamping element or clamping portion 11–D. The lock nut 25 serves to lock the bolt 22 in any desired position of adjustment.

The forward end of the clamp arm 12 terminates in a boss 30 which is provided with an interiorly threaded passage 31. The exteriorly threaded bolt 32 has an integral clamping element or portion 12–D and carries a lock nut 35 which serves to lock the bolt 32 in any desired position of adjustment.

Thus, the clamping portions 11–D and 12–D may be adjusted to receive objects of varying sizes to be gripped or clamped between them as is well known in the prior art.

The trigger 40 is located between the handles 8 and 9 and it can be actuated by the same hand which grasps the handles for effecting an initial release of the pliers from its closed position in which the center of the pivot F is slightly forward of the axis X—X as shown in FIG. 1.

The trigger 40 is pivotally interconnected with the rear ends of the spaced plates 41–A and 41–B by the rivet M. The forward ends of the plates 41–A and 41–B are pivotally interconnected with the short legs 8–A and 9–A of the handles by the rivet F.

The forward end 40–A of the trigger is in the nature of a converging cam element and it is positioned between the cam surfaces 8–B and 9–B of the handles 8. It operatively engages at least one of these surfaces when the handle of the trigger is moved towards one of the handles 8 or 9 for initially prying apart the handles, thereby to release the clamp arms from object clamping position. This trigger construction is disclosed in U.S. Patent 2,783,797 in connection with one of the prior art hand plier or clamps.

An opening of about 90° between the axes of the clamp arms 11 and 12 is provided if the axis Z—Z of the pivots J–K is located forwardly from the axis X—X approximately 82% of the distance between the pivots F and G with the pivots J and K located approximately midway between the central handle pivot F and the lower end clamp arm pivots G and H respectively, in closed position of the pliers.

An opening of about 120° between the axes of the clamp arms 11 and 12 is provided if the axis Z—Z of the pivots J–K is located forwardly from the axis X—X approximately 34% of the distance between the pivots F and G with the pivots J–K located approximately midway between the central handle pivot F and the lower end clamp arm pivots G and H respectively, in closed position of the pliers.

I have found by experimentation that to produce satisfactory pliers for the intended uses with the five pivot arrangement illustrated, the distance between the axes X—X and Z—Z should be no greater than approximately 82% of the distance between the pivots F and G and no less than approximately 34% of the distance between the pivots F and G, thus providing an opening between the axes of the clamp arms of from 90° to 120° in fully opened positions depending upon the spacing selected between the axes X—X and Z—Z.

From the foregoing description, it will be apparent to persons skilled in the art that this invention provides novel hand toggle pliers which are economical to manufacture, easy to use and which may be used in situations where it is impossible to use prior art pliers because of their restrictions as to the amount by which the axes of the clamp arms can be separated in fully opened position.

It should be understood that the specific embodiments of this invention which are disclosed herein are of a descriptive, rather than a limiting nature and that various changes, combinations, substitutions, additions and modifications may be effected in accordance with these teachings without departing in spirit or scope from the invention in its broader aspects.

I claim:

1. In a hand toggle pliers comprising a pair of substantially identical L-shaped handles, a first swinging clamp arm, a second swinging clamp arm, the pliers having a center axis, a forward clamping end and a rear handle end; the two handles being arranged on opposite sides of said center axis with their short legs extending transversely to and overlapping and being pivotally interconnected substantially at said center axis and their long legs normally extending rearwardly alongside the center axis, with the two clamp arms each being arranged on opposite sides of said center axis and each having a clamping portion arranged to clamp against the clamping portion of the other arm, a lower end portion pivotally connected to its respective adjacent handle at the junction between the long and short legs of the respective handles, and a lateral portion normally extending laterally from the clamp arm between said clamping and said lower end portions towards the end of the other lateral portion, the two lower end portion handle pivots being equidistantly spaced from the center axis and being normally aligned on an axis which is perpendicular to the center axis and which is approximately coaxial with the central pivotal interconnection between the two handles, the improvement comprising

a link crossing the center axis and having one end pivotally connected to the lateral portion of the first clamp arm at a point spaced at one side of the center axis approximately midway between the central handle pivotal interconnection and the lower end clamp arm handle interconnection and the other end pivotally connected to the lateral portion of the second clamp arm at a point spaced at the opposite side of the center axis approximately midway between the central handle pivotal interconnection and the lower end clamp arm handle interconnection, each of said lateral portion interconnections being spaced forwardly of the axis on which the two handle base pivots are aligned, a distance which is from about 34% to about 82% of the distance between the central handle pivotal interconnection and one of the lower end clamp arm handle pivotal interconnections when the pliers is in its normal clamping position, whereby the clamping portions of the arms may be swung towards and away from each other for clamping and releasing by manually swinging the long legs of the handles about their central common pivotal interconnection to provide separation of the axes of the clamp arms by from about 90° to about 120°.

2. A toggle pliers according to claim 1 wherein at least one of the clamp arm lateral portions has an extension which contacts a forward portion of the link during the latter portion of the movement of the clamp arms to their clamping positions.

3. A toggle pliers according to claim 1 wherein each clamp arm has a lateral portion which has an extension the rearward portion of which contacts a forward portion of the link during the latter part of the movement of the clamp arms to their clamping positions.

4. In a hand toggle pliers comprising a pair of substantially identical L-shaped handles, a first swinging clamp arm, a second swinging clamp arm, the pliers having a center axis, a forward clamping end and a rear end; the two handles being arranged on opposite sides of said center axis with their short legs extending transversely to and overlapping and being pivotally interconnected substantially at said center axis and their long legs nor-

mally extending rearwardly alongside the center axis with the two clamp arms each being arranged on opposite sides of said center axis and each having a clamping portion arranged to clamp against the clamping portion of the other arm, a lower end portion pivotally connected to its respective adjacent adjacent handle at the junction between the long and short legs of the respective handles, and a lateral portion normally extending laterally from the clamp arm between said clamping and said lower end portions towards the end of the other lateral portion, the two lower end portion handle pivots being equidistantly spaced from the center axis and being normally aligned on an axis which is perpendicular to the center axis and which is approximately coaxial with the central pivotal interconnection between the two handles, the improvement comprising

a link crossing the center axis and having one end pivotally connected to the lateral portion of the first clamp arm at a point spaced at one side of the center axis approximately midway between the central handle pivotal interconnection and the lower end clamp arm handle interconnection and the other end pivotally connected to the lateral portion of the second clamp arm at a point spaced at the opposite side of the center axis approximately midway between the central handle pivotal interconnection and the lower end clamp arm handle interconnection, each of said lateral portion interconnections being spaced forwardly of the axis on which the two handle base pivots are aligned, a distance which is about

50% of the distance between the central handle pivotal interconnection and one of the lower end clamp arm handle pivotal interconnections when the pliers is in its normal clamping position, whereby the clamping portions of the arms may be swung towards and away from each other for clamping and releasing by manually swinging the long legs of the handles about their central common pivotal interconnection to provide separation of the axes of the clamping arms by about 100°.

5. A toggle clamp according to claim 4 wherein at least one of the clamping arm lateral portions has an extension which contacts a forward portion of the link during the latter portion of the movement of the clamp arms to their clamping positions.

6. A toggle clamp according to claim 4 wherein each clamping arm has a lateral portion which has an extension, the rearward portion of which contacts a forward portion of the link during the latter part of the movement of the clamp arms to their clamping positions.

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