

Unitary tool mechanism

This invention relates to a tool having a pair of arms secured at a head for pivotal movement between open and closed conditions, and a resilient member between the arms arranged to bias them towards an open condition.

Such tools are commonly used as hand tools or pliers for applying force or a cutting action to a work piece, and are also used as mechanisms in assemblies.

It is an object of the invention to provide a tool of simple unitary structure which may be made economically, for example by moulding or extrusion.

DE—A—2419818 describes a tool having a pair of arms secured at a head for pivotal movement between open and closed conditions and a resilient means between the arms arranged to bias them towards an open condition in which the head, the arms and the resilient means comprise a unitary structure formed in one piece from resilient material, the arms extending from the head in divergent manner and the resilient means comprising a pair of beams extending from respective portions of the arms spaced from the head, inwardly between the arms towards the head to a second head, the beams being adapted, on movement of the arms together, to engage along their lengths from the second head portion.

According to the invention, a tool as described above is characterised in that, the first and second heads comprise jaw surfaces arranged to be driven together for engagement with a work piece by movement together of the arms and the beams (16, 18) are arranged to engage progressively along their lengths from the second head (4) as the arms (12, 14) are moved together.

The tool is suitably formed from a resilient plastics material having a high yield strength.

The invention will now be described with reference to the accompanying partly diagrammatic drawings, in which:—

Figure 1 is an elevation of a tool for applying force between a pair of jaw members and in an open condition;

Figure 2 is a view similar to that of Figure 1 but with the tool in a partially closed condition;

Figure 3 is a side elevation of the tool of Figure 1;

Figure 4 is a section taken on the line 4—4 of Figure 1;

Figure 5 is a sectional elevation of a modified tool mounted on a support rail;

Figure 6 is a fragmentary section taken on the line 6—6 of Figure 5;

Figure 7 is a fragmentary elevation of the head portion of a further modified tool;

Figure 8 is a fragmentary section taken on the line 8—8 of Figure 7;

Figure 9 is a fragmentary sectional elevation

of a yet further modified tool in an open condition; and

Figure 10 is a fragmentary elevation similar to that of Figure 9 but with the tool in a partially closed condition.

The tool of Figures 1 to 4 comprises a first head 2 defining a lower jaw surface 6 and a second head 4 defining an upper jaw surface 7 spaced below surface 6. The surface 6 is defined at the roof of a cavity in the first head 2 between side walls 8, 10 adapted slidably to receive head 4 between them.

A pair of arms 12, 14 extend from the head 2 downwardly on opposite sides of the cavity in divergent manner. Initial portions of the arms 12, 14 are of progressively decreasing thickness towards lower thickened end portions 12A, 14A defining handles which can be gripped in a hand in conventional manner.

The second head 4 is supported from the lower ends of the arms 12, 14 by a pair of arcuate resilient beams 16, 18, convex towards each other and converging upwardly with upper end portions 16B, 18B closely adjacent and integral with the head 4.

The heads 2, 4, the arms 12, 14, and the beams 16, 18 are integrally formed as a unitary structure, suitably by moulding or by extrusion from a resilient plastics material having a high yield strength. It will be understood that a number of tools may be formed from a single moulding or extrusion having a cross section corresponding to the elevation of Figure 1, and individual tools severed transversely of the length of moulding or extrusion.

In operation, closure of the handle portions 12A, 14A together effects pivotal movement about the head 2 by bending of the thinner portions of the arms 12, 14. The arcuate beams 16, 18 progressively engage at their upper portions 16B, 18B and are supported against each other as seen in Figure 2, effectively to increase their length in the direction of arrow 20 and drive the head 4 into the cavity of head 2 towards jaw surface 6.

The sides 8, 10 of the cavity and the engaged portions of beams 16, 18 resist lateral displacement of the head 4 and maintain its orientation. A workpiece, not shown, may be engaged between the jaw faces 6, 7 and subject to compression. The beams 16, 18 are correspondingly subject to compression and the arms 12, 14 to tension. Resilience of the beams and the arms serves to open the tool when the handles are released.

In the modified tool of Figures 5 and 6, like reference numerals refer to similar parts as described with reference to Figures 1 to 4. The head 4 at its underside between the beams 16, 18 is formed with a cylindrical socket 22 extending through the head 4 transversely of its line of action. The socket has a restricted

opening between the beams 16, 18 and receives a complementary cylindrical head 26A of an upright rail 26 which extends downwardly between the beams 16, 18 and is stiffened by a transverse flange 28 at a rear side of the tool.

In operation of the tool the beams 16, 18 are flattened against the rail 26 as the handles 12, 14 are closed, and the rails serves to support the beams.

In the embodiment of Figures 7 and 8, in which like reference numerals again refer to similar parts as described with reference to Figures 1 to 4, the head 4 is formed at its rear side with an upwardly directed extension 4A which extends slidably through a recess 2A in a rear side of the head 2.

The extension 4A at its upper end is formed with a further head portion 4B presenting a lower jaw face 4C spaced from and opposed to a jaw face 2B presented by the upper side of head 2.

In the embodiment of Figures 7 and 8, a workpiece may be gripped between jaw surfaces 6 and 7 on closure of the tool or between surfaces 4C and 2B on opening of the tool handles.

In the embodiment of Figures 9 and 10 in which like reference numerals again refer to similar parts as described in connection with Figures 1 to 4, the head 2 is formed with an upright bore in which the lower, open end of a cylinder 30 is secured. An upright rod 36 is secured to the head 4 and extends coaxially through the lower end of the cylinder 30. A washer type piston 38 is secured at the upper end of the rod 36, and the upper closed end 32 of the cylinder is formed with an outlet 34.

Actuation of the tool causes reciprocation of the piston 38 in the cylinder and alternate compression and suction in the cylinder and its outlet 34, the resilience of the beams 16, 18 effecting opening of the tool and downward movement of the piston 38.

Claims

1. A tool having a pair of arms (12, 14) secured at a head for pivotal movement between open and closed conditions and a resilient means (16, 18) between the arms (12, 14) arranged to bias them towards an open condition, the head (2), the arms (12, 14) and the resilient means (16, 18) comprising a unitary structure formed in one piece from resilient material, the arms (12, 14) extending from the head (2) in divergent manner and the resilient means (16, 18) comprising a pair of beams (16, 18) extending from respective portions of the arms (12, 14) spaced from the head (2), inwardly between the arms (12, 14) towards the head (2) to a second head (4), the beams (16, 18) being adapted, on movement of the arms (12, 14) together, to engage along their lengths from the second head (4),

characterised in that, the first and second heads (2, 4) comprise jaw surfaces (6, 7 respectively) arranged to be driven together for engagement with a work piece by movement together of the arms (12, 14) and the beams (16, 18) are arranged to engage progressively along their lengths from the second head (4) as the arms (12, 14) are moved together.

2. A tool as claimed in Claim 1, characterised in that the beams (16, 18) are arcuately convex away from their respective arms (12, 14).

3. A tool as claimed in Claim 1 or in Claim 2, characterised in that the arms (12, 14) are flexible relative to the head (2) on closure of the arms (12, 14) together to obtain the pivotal action by bending of the arms (12, 14).

4. A tool as claimed in any preceding claim, characterised in that the jaw surface (6) of the first head (2) is located in a recess (8, 10) formed in the first head (2) between the arms (12, 14) and adapted slidably to receive the second head (4) on closure of the arms (12, 14).

5. A tool as claimed in any preceding claim, characterised in that the second head (4) is formed between the beams (16, 18) with a recess (22) having a restricted lower entry between the beams (16, 18), a support rail (26) having an enlarged head portion (26A) engaging the recess (22) with the rail (26) extending between the beams (16, 18) such that on closure of the arms (12, 14) together, the beams (16, 18) progressively flatten against opposite sides of the rail (26).

6. A tool as claimed in Claim 4, characterised in that the second head (4) is formed with an extension (4A) slidably overlapping the first head (2) and formed with a third head portion (4B) spaced from the first head (2) on a side remote from the second head (4).

7. A tool as claimed in Claim 4, characterised in that the second head (4) is formed with an extension (36) projecting through an aperture 30 in the first head (2).

Patentansprüche

1. Werkzeug mit einem Paar von Armen (12, 14), die an einem Kopf befestigt sind, der eine Schwenkbewegung zwischen einem geöffneten Zustand und einem geschlossenen Zustand ermöglicht, und mit einer federnd nachgiebigen Einrichtung (16, 18) zwischen den Armen (12, 14) zum Vorspannen derselben in Richtung auf einen geöffneten Zustand, wobei der Kopf (2), die Arme (12, 14) und die federnd nachgiebige Einrichtung (16, 18) eine einheitliche Struktur aufweisen, die in einem Stück aus federnd nachgiebigem Material gebildet ist, wobei die Arme (12, 14) sich in divergierender Weise von dem Kopf (2) wegerstrecken und die federnd nachgiebige Einrichtung (16, 18) ein Paar von Trägern (16, 18) besitzt, die sich von jeweiligen von dem Kopf (2) beabstandeten Bereichen der Arme (12, 14) nach innen zwischen die Arme (12, 14)

opening between the beams 16, 18 and receives a complementary cylindrical head 26A of an upright rail 26 which extends downwardly between the beams 16, 18 and is stiffened by a transverse flange 28 at a rear side of the tool.

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5. A tool as claimed in any preceding claim, characterised in that the second head (4) is formed between the beams (16, 18) with a recess (22) having a restricted lower entry between the beams (16, 18), a support rail (26) having an enlarged head portion (26A) engaging the recess (22) with the rail (26) extending between the beams (16, 18) such that on closure of the arms (12, 14) together, the beams (16, 18) progressively flatten against opposite sides of the rail (26).

6. A tool as claimed in Claim 4, characterised in that the second head (4) is formed with an extension (4A) slidably overlapping the first head (2) and formed with a third head portion (4B) spaced from the first head (2) on a side remote from the second head (4).

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in Richtung auf den Kopf (2) zu einem zweiten Kopf (4) erstrecken, und wobei die Träger (16, 18) derart ausgebildet sind, daß sie bei einer Zusammenbewegung der Arme (12, 14) von dem zweiten Kopf (4) ausgehend entlang ihrer Längen aneinander angreifen, dadurch gekennzeichnet, daß der erste und der zweite Kopf (2, 4) Klemmbackenflächen (6 bzw. 7) aufweisen, die zum Angreifen an einem Werkstück dadurch zusammendrängbar sind, daß die Arme (12, 14) zusammenbewegt werden, und daß die Träger (16, 18) beim Zusammenbewegen der Arme (12, 14) entlang ihrer Längen ausgehend von dem zweiten Kopf (4) zunehmend aneinander angreifen können.

2. Werkzeug nach Anspruch 1, dadurch gekennzeichnet, daß die Träger (16, 18) bogenförmig konvex von ihren jeweiligen (12, 14) weg ausgebildet sind.

3. Werkzeug nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß die Arme (12, 14) zur Erzielung der Schwenkwirkung beim Zusammenschließen der Arme (12, 14) durch Biegen der Arme (12, 14) in bezug auf den Kopf (2) flexibel sind.

4. Werkzeug nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, daß sich die Klemmbackenfläche (6) des ersten Kopfes (2) in einer Ausnehmung (8, 10) befindet, die in dem ersten Kopf (2) zwischen den Armen (12, 14) ausgebildet ist und in der der zweite Kopf (4) beim Schließen der Arme (12, 14) gleitend aufnehmbar ist.

5. Werkzeug nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, daß der zweite Kopf (4) zwischen den Trägern (16, 18) mit einer Ausnehmung (22) ausgebildet ist, die einen verengten unteren Eingang zwischen den Trägern (16, 18) aufweist, und daß eine Stützscheibe (26) mit einem vergrößerten Kopfbereich (26A) in die Ausnehmung (22) eingreift, wobei sich die Schiene (26) zwischen den Trägern (16, 18) erstreckt derart, daß beim Zusammenschließen der Arme (12, 14) die Träger (16, 18) sich zunehmend gegen gegenüberliegende Seiten der Schiene (26) legen und flachdrücken.

6. Werkzeug nach Anspruch 4, dadurch gekennzeichnet, daß der zweite Kopf (4) mit einer Verlängerung (4A) ausgebildet ist, die den ersten Kopf (2) verschiebbar überlappt und mit einem dritten Kopfbereich 4B ausgebildet ist, der in einem Abstand von dem ersten Kopf (2) auf der von dem zweiten Kopf (4) entfernten Seite angeordnet ist.

7. Werkzeug nach Anspruch 4, dadurch gekennzeichnet, daß der zweite Kopf (4) mit einem Fortsatz (36) ausgebildet ist, der durch eine Öffnung (30) in dem ersten Kopf (2) hindurchragt.

Revendications

1. Outil comportant une paire de bras (12,

14) fixés à une tête de façon à pivoter entre des positions d'ouverture et de fermeture et des moyens élastiques (16, 18) agencés entre les bras (12, 14) pour les rappeler vers une position d'ouverture, la tête (2), les bras (12, 14) et les moyens élastiques (16, 18) constituant une structure unitaire formée d'une seule pièce de matière élastique, les bras (12, 14) s'étendant de la tête (2) d'une manière divergente et les moyens élastiques (16, 18) comprenant une paire de lames (16, 18) partant de parties respectives des bras (12, 14) espacées de la tête (2), vers l'intérieur entre les bras (12, 14), en direction de la tête (2) jusqu'à une seconde tête (4), les lames (16, 18) étant destinées, lors d'un mouvement de rapprochement des bras (12, 14) à entrer en contact sur leur longueur à partir de la seconde tête (4), caractérisé en ce que les première et seconde têtes (2, 4) présentent des surfaces de mâchoires (6, 7, respectivement) agencées pour être rapprochées l'une de l'autre afin d'entrer en contact avec une pièce par un mouvement de rapprochement des bras (12, 14) et les lames (16, 18) sont agencées pour entrer progressivement en contact sur leur longueur à partir de la seconde tête (4) pendant que les bras (12, 14) sont rapprochés l'un de l'autre.

2. Outil selon la revendication 1, caractérisé en ce que les lames (16, 18) sont courbes et présentent une convexité s'éloignant de leurs bras respectifs (12, 14).

3. Outil selon la revendication 1 ou la revendication 2, caractérisé en ce que les bras (12, 14) sont flexibles par rapport à la tête (2) lors de la fermeture l'un vers l'autre des bras (12, 14) afin qu'une action de pivotement soit obtenue par flexion des bras (12, 14).

4. Outil selon l'une quelconque des revendications précédentes, caractérisé en ce que la surface de mâchoire (6) de la première tête (2) est située dans un évidement (8, 10) formé dans la première tête (2) entre les bras (12, 14) et destiné à recevoir par glissement la seconde tête (4) lors de la fermeture des bras (12, 14).

5. Outil selon l'une quelconque des revendications précédentes, caractérisé en ce que la seconde tête (4) présente entre les lames (16, 18) un évidement (22) ayant une entrée inférieure réduite située entre les lames (16, 18), un rail (26) de support ayant une partie de tête élargie (26A) emboîtée dans l'évidement (22), le rail (26) s'étendant entre les lames (16, 18) de manière que, lors de la fermeture l'un vers l'autre des bras (12, 14), les lames (16, 18) s'aplatissent progressivement contre les côtés opposés du rail (26).

6. Outil selon la revendication 4, caractérisé en ce que la seconde tête (4) présente un prolongement (4A) qui chevauche en couissant la première tête (2) et qui est formé avec une troisième partie de tête (4B) espacée de la première tête (2) sur un côté éloigné de la seconde tête (4).



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7. Outil selon la revendication 4, caractérisé en ce que la seconde tête (4) est formée avec un

prolongement (36) faisant saillie à travers une ouverture (30) de la première tête (2).

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