Aug. 29, 1944. G. F. JOYNER 2,357,204

SHEET METAL SHRINKING MACHINE

Filed March 29, 1943

Fig. 1

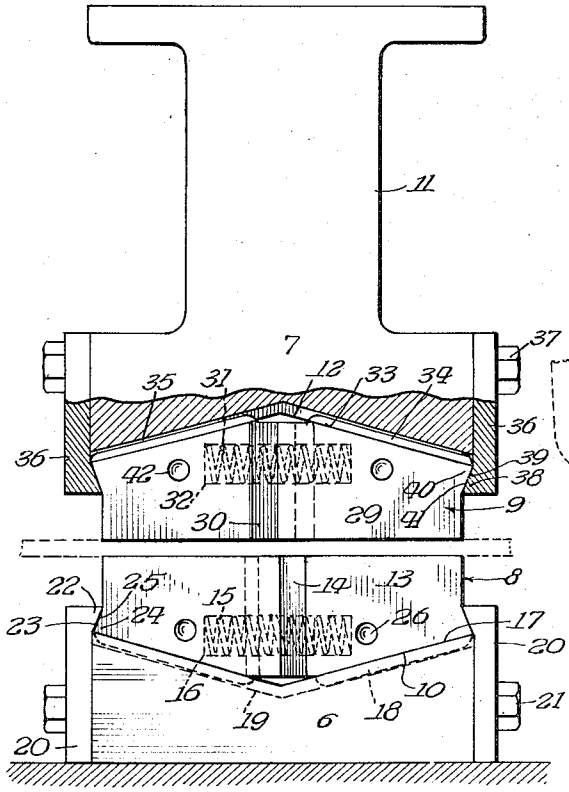


Fig. 2

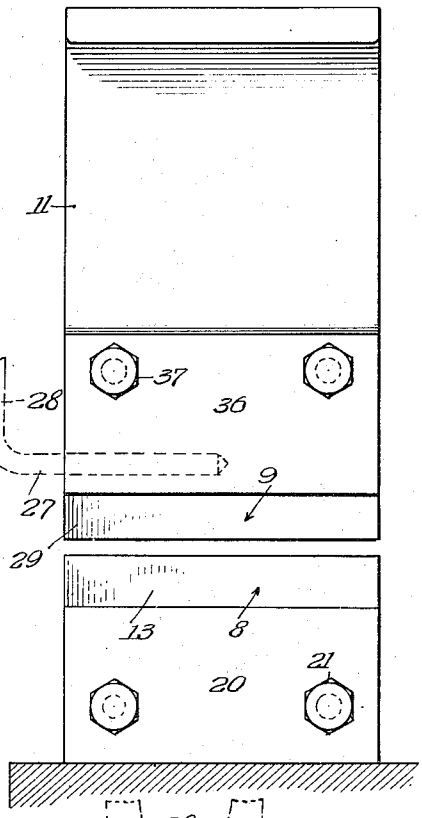


Fig. 3

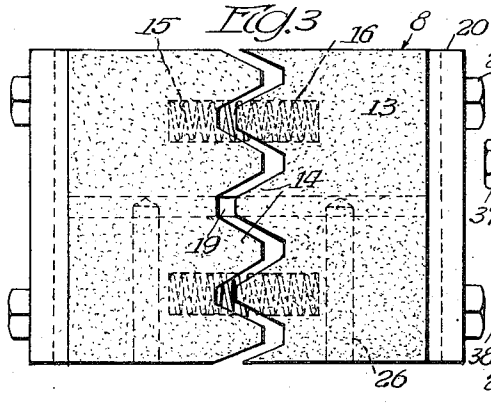


Fig. 4

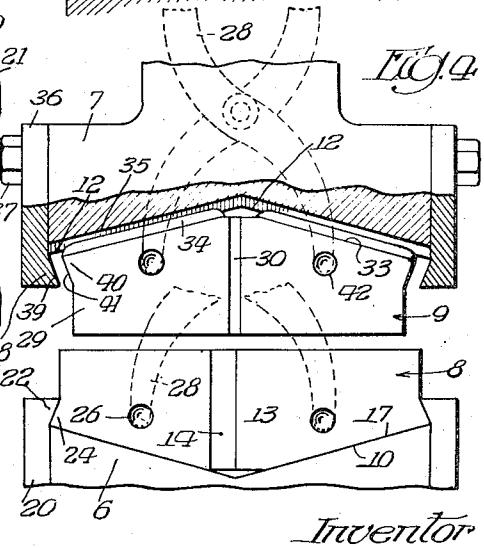
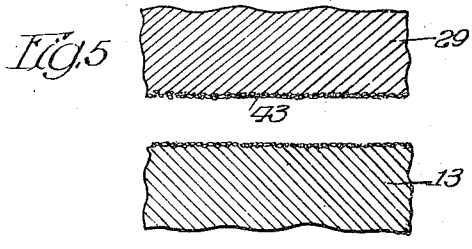


Fig. 5



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SHEET METAL SHRINKING MACHINE

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11 Claims. (Cl. 78—61)

The present invention relates generally to machines for shrinking pieces of sheet metal. More particularly the invention relates to that type of sheet metal shrinking machine which comprises (1) a fixed or stationary lower supporting member having at the top portion thereof a pair of adjoining downwardly convergent cam surfaces, (2) a vertically movable upper supporting member above, and in vertical alignment with, the lower member and having at the bottom portion thereof a pair of adjoining upwardly convergent cam surfaces, (3) a sectional lower jar removably connected to the top portion of the lower supporting member and consisting of a pair of complemental side by side sections which are urged apart by way of compression springs and have downwardly convergent bottom cam surfaces in engagement with the cam surfaces of the lower supporting member, respectively, and (4) a sectional upper jaw removably connected to the bottom portion of the vertically movable upper supporting member and consisting of a pair of complemental side by side sections which are urged apart by way of compression springs and have upwardly convergent top cam surfaces in engagement with the cam surfaces of the upper supporting member, respectively; and is adapted when a piece of sheet metal is positioned between the jaws and the upper supporting member is shifted or moved downwards towards the lower supporting member, to have the jaw sections grip the sheet metal piece frictionally and also to have such sections slide inwards as a result of the cam or wedge action of the cam surfaces and effect shrinking of the piece.

In a sheet metal shrinking machine of this type is has heretofore been customary to form the jaw sections of hardened steel and to roughen the gripping surfaces of the sections by subjecting them to a sand blast. In view of the fact that the gripping surfaces are subject to wear it is necessary frequently to remove the jaw sections and roughen the gripping surfaces by further sand blasting. Removal of the jaw sections from the supporting members is a tedious operation and consumes an appreciable amount of time. Frequent sand blasting of the gripping surfaces of the jaw sections results in rapid wear and necessitates all too frequent replacement of the sections.

One object of the invention is to provide a sheet metal shrinking machine of the type under consideration which is an improvement upon, and is more efficient and practical than, previously designed shrinking machines of like general character by reason of the fact that the jaw sections are so designed and constructed that it is an extremely simple matter to maintain the gripping surfaces thereof in the desired roughened condition and roughening of the gripping surfaces results in no appreciable wearing away of the sections.

Another object of the invention is to provide a sheet metal shrinking machine in which the complemental jaw sections are formed of a tough zinc alloy or like metallic material and have the gripping surfaces thereof roughened by having minute steel particles embedded therein.

A further object of the invention is to provide a sheet metal shrinking machine in which the jaws are so connected to their respective supporting members that they may be quickly and readily removed for roughening or replacement purposes without raising the upper supporting member to a greater extent than its normal upstroke.

A still further object of the invention is to provide a sheet metal shrinking machine which is of new and improved construction, effectively and efficiently fulfills its intended purpose and is so simple in design that it may be manufactured at a low and reasonable cost.

Other objects of the invention and the various advantages and characteristics of the present sheet metal shrinking machine will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a side view of a sheet metal shrinking machine embodying the invention, parts of the vertically movable supporting member being broken away and other parts being shown in section for purposes of illustration;

Figure 2 is an end view;

Figure 3 is a plan view of the lower jaw and its supporting member;

Figure 4 is a fragmentary side view showing in detail the manner in which the jaws are removably connected to their respective supporting members; and

Figure 5 is an enlarged section showing the manner in which the gripping surfaces of the

upper and lower jaws are roughened by having minute steel particles embedded therein.

The machine which is shown in the drawing constitutes the preferred form or embodiment of the invention. It is expressly designed to shrink sheet metal pieces or like work and as its main or principal parts comprises a lower supporting member 6, an upper supporting member 7, a lower jaw 8 and an upper jaw 9. As hereinafter described, the lower and upper jaws are associated with, and removably secured to, the lower and upper supporting members, respectively.

The lower supporting member 6 has a flat bottom and is adapted to rest upon a platen or like supporting instrumentality. It is adapted to be fixedly or stationarily maintained in place in any suitable manner and is rectangular in horizontal section. At its top portion the lower supporting member 6 has a pair of adjoining downwardly convergent cam surfaces 10. These surfaces are equal in size or area and extend inwards and downwards from the end faces of the lower supporting member 6.

The upper supporting member 7 is disposed above, and in vertical alignment with, the lower supporting member 6 and is mounted in any suitable manner so that it is shiftable vertically towards and away from the lower supporting member 6. It is rectangular in horizontal section and has at its upper portion an upstanding flange-equipped stem 11 whereby it may be attached to any particular raising and lowering mechanism having a fixed up and down stroke. At its bottom the upper supporting member 7 has a pair of adjoining upwardly convergent cam surfaces 12. These surfaces are the same in size or area and extend inwards and upwards from the end faces of the supporting member 7. The angle between the cam surfaces 12 corresponds to the angle between the cam surfaces 10.

The lower jaw 8 overlies and rests upon the lower supporting member 6 and is of sectional or composite design. It comprises a pair of side by side complemental sections 13. Each of these is provided on the inner portion thereof with a rectilinear series of equidistantly spaced teeth-like projections 14. The projections on one of the jaw sections 13 are laterally offset with respect to the projections on the other section and fit, and are adapted to slide, within the spaces between the projections of said other jaw section, as shown in Figure 3. The jaw sections 13 are urged apart by means of a pair of compression springs 15. These are positioned in parallel and laterally spaced relation and extend between the two jaw sections. The ends of the springs are disposed or confined within cylindrical sockets 16 in the inner portions of the jaw sections 13. The jaw sections 13 have downwardly convergent bottom cam surfaces 17 and these fit against, and are free to slide on, the cam surfaces 10, respectively. When the jaw sections 13 are subjected to downward pressure the cam surfaces 17 on the jaw sections 13 coact with the cam surfaces 10 at the upper portion of the lower supporting member 6 in such manner as to cause the jaw sections 13 to slide together, i. e., towards one another. When the jaw sections 13 are released from downward pressure the springs 15 force the jaw sections 13 apart. The jaw sections 13 are held against lateral displacement with respect to the lower supporting member 6 by way of depending, longitudinally extending ribs 18. These ribs are formed on the central portions of the cam surfaces 17 and fit loosely within the end portions of a shallow V-shaped longitudinally extending groove 19 in the upper face of the supporting member 6, i. e., the face of the supporting member that defines or constitutes the downwardly convergent cam surfaces 10. The jaw sections 13 are removably or releasably held in connected relation with the lower supporting member 6 by way of a pair of end plates 20. These plates fit against the end faces of the lower supporting member 6 and are secured in place by way of cap screws 21. The upper margins of the plates project above the upper end edges of the supporting member 6 and have inwardly extending projections 22 along their inner faces. These projections are V-shaped in cross section and have undercut or downwardly and outwardly chamfered flat inner faces 23. The latter overhang the end edges of the cam surfaces 10. The outer end portions of the jaw sections 13 are cut away so as to provide along the bottom margins thereof outwardly extending projections 24 and these projections are of V-shaped cross section and have flat, outer surfaces 25 which are chamfered or beveled inwardly and upwardly and coact with the faces 23 of the projections 22 to form interlocking connections for holding the jaw sections 13 in connected relation with the lower supporting member 6 when they are released and shifted outwards to their fullest extent by the compression springs 15. Removal of the jaw sections 13 is effected by shifting them together a sufficient distance to effect removal of the depending ribs 18 from the ends of the V-shaped groove 19. As soon as the ribs are freed from the groove ends the jaw sections 13 are released or freed from the lower supporting member 6 and may be completely removed by shifting them laterally out of overlying relation with the supporting member 6. In order to facilitate inward shift of the jaw sections 13 in connection with removal of the lower jaw 8 from the lower supporting member 6 each jaw section is provided at one side thereof with a socket 26. The two sockets, as shown in Figure 4, are adapted to receive and interlock with a pair of laterally extending pins 27 on the jaws of special pliers 28. When the pliers are used to effect removal of the jaw sections 13 from the lower supporting member 6 the jaws of the pliers are opened and the projecting ends of the pins 26 are inserted into the sockets 26. Thereafter the handle parts of the pliers are swung together so as to force the jaw sections 13 together. When the sections are shifted together a sufficient distance to effect withdrawal of the ribs 18 from the ends of the groove 19 the pliers are shifted to one side so as wholly to disconnect the jaw sections from the supporting member 6. Because of the specific design and arrangement of the interlocking connections that are formed by the chamfered faces 23 and 25 of the V-shaped projections 22 and 24 the jaw sections 13 are effectively held in connected relation with the lower supporting member 6 when they are urged outwards to their fullest extent by the springs 15 and in addition such sections may be quickly and readily released from the lower supporting member 6 without the necessity of being raised to any appreciable extent.

The upper jaw 9 is the same in design and construction as the lower jaw 8 except that it is disposed in an inverted position. It is of sectional or composite design and comprises a pair of side by side complemental sections 29. The latter have on the inner portions thereof interfitting teeth-like projections 30 and are urged apart by means of a pair of compression springs

31. The latter extend between the inner portions of the jaw sections 29 and have the ends thereof disposed or confined within cylindrical sockets 32 in said inner portions of the jaw sections 29. The jaw sections 29 have upwardly convergent top cam surfaces 33 and these fit against, and are free to slide on, the cam surfaces 12, respectively. The cam surfaces function in the same manner as the bottom cam surfaces 17 on the jaw sections 13 of the lower jaw 8. When the jaw sections 29 are subjected to upward pressure in connection with downward shift of the supporting member 7 they coact with the cam surfaces 12 in such manner as to cause the jaw sections 29 to move inwards, that is, towards one another. When the jaw sections 29 are released from downward pressure in connection with upward shift of the upper supporting member 7 the compression springs 31 force the jaw sections 29 apart. The jaw sections 29 are held against lateral displacement with respect to the supporting member by way of longitudinally extending ribs 34. The latter are formed on the central portions of the cam surfaces 33 and fit loosely within the end portions of a shallow V-shaped longitudinally extending groove 35 in the face of the upper supporting member that defines or constitutes the upwardly convergent cam surfaces 12. The jaw sections 29 are removably held in connected relation with the upper supporting member 7 by way of a pair of end plates 36. These plates are the same in design and construction as the end plates 20 of the lower supporting member 6 except that they are arranged in an inverted position. They fit against the end faces of the upper supporting member 7 and are secured in place by way of cap screws 37. The lower margins of the end plates 36 project beneath the lower end edges of the supporting member 7 and have inwardly extending projections 38 which are V-shaped in cross section and have upwardly and outwardly chamfered flat inner faces 39. The latter underhang the end edges of the cam surfaces 12. The outer end portions of the jaw sections 29 are cut away so as to provide along the upper margins thereof outwardly extending projections 40 and these are of V-shaped cross section and have flat outer surfaces 41 which are chamfered or bevelled inwardly and downwardly and coact with the faces 39 to form interlocking connections for holding the jaw sections 29 in connected relation with the upper supporting member 7 when they are released and shifted outwards to their fullest extent by the compression springs 31. The jaw sections 29 are removed in the same manner as the jaw sections 13 of the lower jaw 8. They are provided at one side thereof with sockets 42 for receiving the laterally extending pins 27 on the jaws of the special pliers 28.

The jaw sections 13 and 29 are formed of tough zinc alloy or like metal composition. Preferably the jaw sections are formed of the type of zinc alloy composition which is used in the making of die cast parts. The gripping surfaces of the jaw sections are roughened by having embedded therein minute steel particles 43. Such particles are preferably formed by suitably crushing steel and serve so to increase the coefficient of friction of the gripping surfaces that such surfaces in connection with use of the machine grip the work or sheet metal piece to be shrunk in a highly efficient manner. In practice it has been found that when minute steel particles having a mesh of approximately 90 are employed the gripping surfaces of the jaw sections are both satisfactory and efficient. The steel particles are embedded in the gripping surfaces of the jaw sections by sprinkling them on such surfaces and then hammering them into place. The hammering operation serves to embed the particles in the gripping surfaces of the jaw sections. If the gripping surfaces of the jaw sections become smooth it is only necessary to remove the sections as hereinbefore described and then recharge the gripping surfaces thereof by sprinkling additional minute steel particles on them and then hammering such particles into the surfaces.

When it is desired to use the machine a piece of sheet metal is placed upon the jaw sections 13 constituting the lower jaw 8. Thereafter the upper supporting member 7 is shifted down towards the lower supporting member 6. During downward shift of the upper supporting member 7 the jaw sections 29 constituting the upper jaw 9 are brought into engagement with the top face of the sheet metal piece. The piece is gripped or maintained in clamped relation between the two jaws. Further downward movement on the part of the upper supporting member 7 results in the jaw sections moving inwards and effecting shrinking of the sheet metal piece. The roughening effect that is formed by the minute particles 43 of steel results in the sheet metal piece being effectively and efficiently gripped by the jaw sections 13 and 29. After the shrinking operation the upper supporting member 7 is raised. This serves to release the shrunken sheet metal piece and results in the compression springs shifting the jaw sections outwards into their inoperative position. Should it be desired to remove either the upper or the lower jaw the sections constituting the jaw are shifted inwards by proper manipulation of the pliers 28 and are then moved laterally so as to disengage them from the supporting member, as hereinbefore described.

The herein described sheet metal shrinking machine is simple in design and hence may be manufactured at a low and reasonable cost. Because the gripping surfaces of the jaw sections are roughened by way of the minute steel particles 43 the jaw sections are not subject to wear and the gripping surfaces may readily be renewed in the event they become smooth as the result of constant use of the machine. Because of the manner in which the jaw sections are mounted in place they may be readily removed without raising the upper supporting member 7 beyond its normal up stroke.

The invention is not to be understood as restricted to the details set forth since these may may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, and comprising a pair of side by side jaw sections movable to and from one another, provided with cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, and having gripping surfaces adapted to engage or grip the sheet metal piece and

roughened by way of minute particles embedded therein.

2. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, mounted removably on the supporting member, and comprising a pair of side by side interfitting jaw sections movable to and from one another, provided with cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, and having in opposed relation with their own cam surfaces flat gripping surfaces adapted to engage or grip the sheet metal piece and roughened by having minute particles of hard material hammered into embedded relation therewith.

3. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, and comprising a pair of side by side complemental interfitting jaw sections movable to and from one another, provided with cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, and having in opposed relation with their own cam surfaces gripping surfaces with minute particles of steel embedded therein.

4. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for use in changing the size of a sheet metal piece, carried by the supporting member, and comprising a pair of side by side jaw sections formed of tough zinc alloy composition, movable to and from one another, provided with cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, and having opposite their cam surfaces gripping surfaces adapted to grip or engage the sheet metal piece and roughened throughout by having minute steel particles embedded therein.

5. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, and comprising a pair of side by side complemental interfitting jaw sections movable to and from one another, provided with cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, and having opposite their own cam surfaces flat gripping surfaces adapted to grip or engage the sheet metal piece and roughened by having embedded therein minute particles of hard material and with a mesh of approximately 90.

6. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, carried by the supporting member, and comprising a pair of side by side complemental interfitting jaw sections movable to and from one another, and having in opposed relation with their own cam surfaces flat gripping surfaces adapted to engage the sheet metal piece and roughened substantially throughout by having embedded therein minute steel particles having a mesh of approximately 90.

7. A composite jaw adapted in connection with a supporting member with a pair of adjoining angularly disposed cam surfaces to form part of a machine for changing the size of a sheet metal piece, and comprising a pair of side by side complemental interfitting jaw sections formed of tough zinc alloy composition, movable to and from one another, and having in opposed relation with their own cam surfaces flat gripping surfaces adapted to engage the sheet metal piece and roughened substantially throughout by having embedded therein minute steel particles having a mesh of approximately 90.

8. A machine designed for use in shrinking a piece of sheet metal and embodying a supporting member having a pair of adjoining inwardly convergent cam surfaces and provided with elements disposed adjacent and projecting beyond the outer edges of the cam surfaces and having undercut inner faces, and a composite jaw associated with the supporting member and comprising a pair of side by side jaw sections having cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, adapted when urged in the direction of the member to move towards one another as the result of the coaction of the various cam surfaces, provided between them with spring means for urging them apart, and embodying on the outer portions thereof and in opposed relation with the elements angularly disposed faces adapted in response to outward movement of the jaw sections by spring means to fit flatly against said undercut faces of the elements and coact therewith releasably to hold the jaw sections in connected relation with the member.

9. A machine designed for use in shrinking sheet metal pieces and embodying a supporting member having a pair of adjoining inwardly convergent cam surfaces and provided with a pair of removable plates disposed adjacent the outer edges of the cam surfaces having portions thereof projecting beyond said outer edges of the cam surfaces provided with undercut inner faces, and a composite jaw associated with the supporting member and comprising a pair of side by side jaw sections having cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, adapted when urged in the direction of the member to move towards one another as the result of the coaction of the various cam surfaces, provided between them with spring means for urging them apart, and embodying on the outer portions thereof and in opposed relation with the plates angularly disposed faces adapted in response to outward movement of the jaw sections by the spring means to fit flatly against said undercut faces of the plates and coact therewith releasably to hold the jaw sections in connected relation with the member.

10. A machine designed for use in shrinking a piece of sheet metal and embodying a supporting member having a pair of adjoining inwardly convergent cam surfaces and provided with elements disposed adjacent and projecting beyond the outer edges of the cam surfaces and having undercut inner faces, a composite jaw associated with the supporting member and comprising a pair of side by side jaw sections having cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, adapted when urged in the direction of the member to move towards one another as the result of the coaction of the various cam surfaces, provided between them with spring means for urging them apart, and embodying on the outer portions thereof and in opposed relation with the elements angularly disposed faces adapted in response to outward movement of the jaw sections

by the spring means to fit flatly against said undercut faces of the elements and coact therewith releasably to hold the jaw sections in connected relation with the member, and means in the form of rib and groove connections between the jaw sections and the portions of the member that define the first mentioned cam surfaces for preventing displacement of the jaw sections in a sidewise manner relatively to the elements when the jaw sections are in their operative position with respect to the member.

11. A machine designed for use in shrinking sheet metal pieces and embodying a supporting member having a pair of adjoining inwardly convergent cam surfaces and provided with a pair of removable plates disposed adjacent the outer edges of the cam surfaces having portions thereof projecting beyond said outer edges of the cam surfaces provided with undercut inner faces, a composite jaw associated with the supporting member and comprising a pair of side by side jaw sections having cam surfaces in sliding engagement with the cam surfaces of the supporting member, respectively, adapted when urged in the direction of the member to move towards one another as the result of the coaction of the various cam surfaces, provided between them with spring means for urging them apart, and embodying on the outer portions thereof and in opposed relation with the plates angularly disposed faces adapted in response to outward movement of the jaw sections by the spring means to fit flatly against said undercut faces of the plates and coact therewith releasably to hold the jaw sections in connected relation with the member, and means in the form of ribs on the cam surfaces of the jaw sections and rib receiving grooves in the cam surfaces of the supporting member for holding the jaw sections against sidewise displacement with respect to the plates when said jaw elements are in their operative position with respect to said supporting member.

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