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Peterson

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[54] **IMPACT DIE AND CARBIDE INSERT THEREFOR**

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[73] Assignee: **C. Hager & Sons Hinge Manufacturing Company**, St. Louis, Mo.

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[52] **U.S. Cl.** ..... **83/685**, 76/107 R, 83/686, 83/698

[51] **Int. Cl.** **B26f 1/14**, B26f 1/46

[58] **Field of Search** ..... 76/107 R; 83/685, 83/679, 697, 698, 926 G, 839, 840, 841, 843, 83/844, 686, 690, 692, 693, 694

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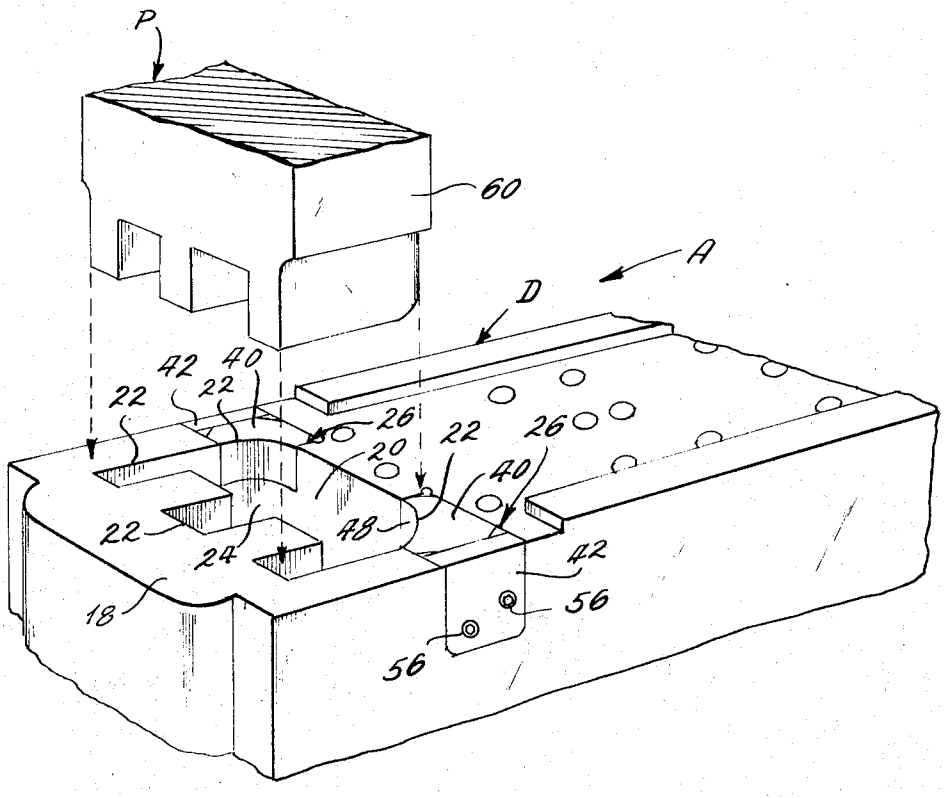
[57] **ABSTRACT**

A punch and die set for blanking or otherwise shearing pieces with curved edges from flat stock has carbide inserts on the punch and die thereof. The inserts are mechanically clamped in position and cut the rounded corners as the punch descends toward the die. Those corners are disposed so that the curved surfaces thereof merge into existing straight edges on the flat stock. The greatest wear occurs at these locations on existing punches and dies and the presence of carbide inserts at these locations greatly reduces wear and thereby extends the life of the entire punch and die set.

11 Claims, 9 Drawing Figures



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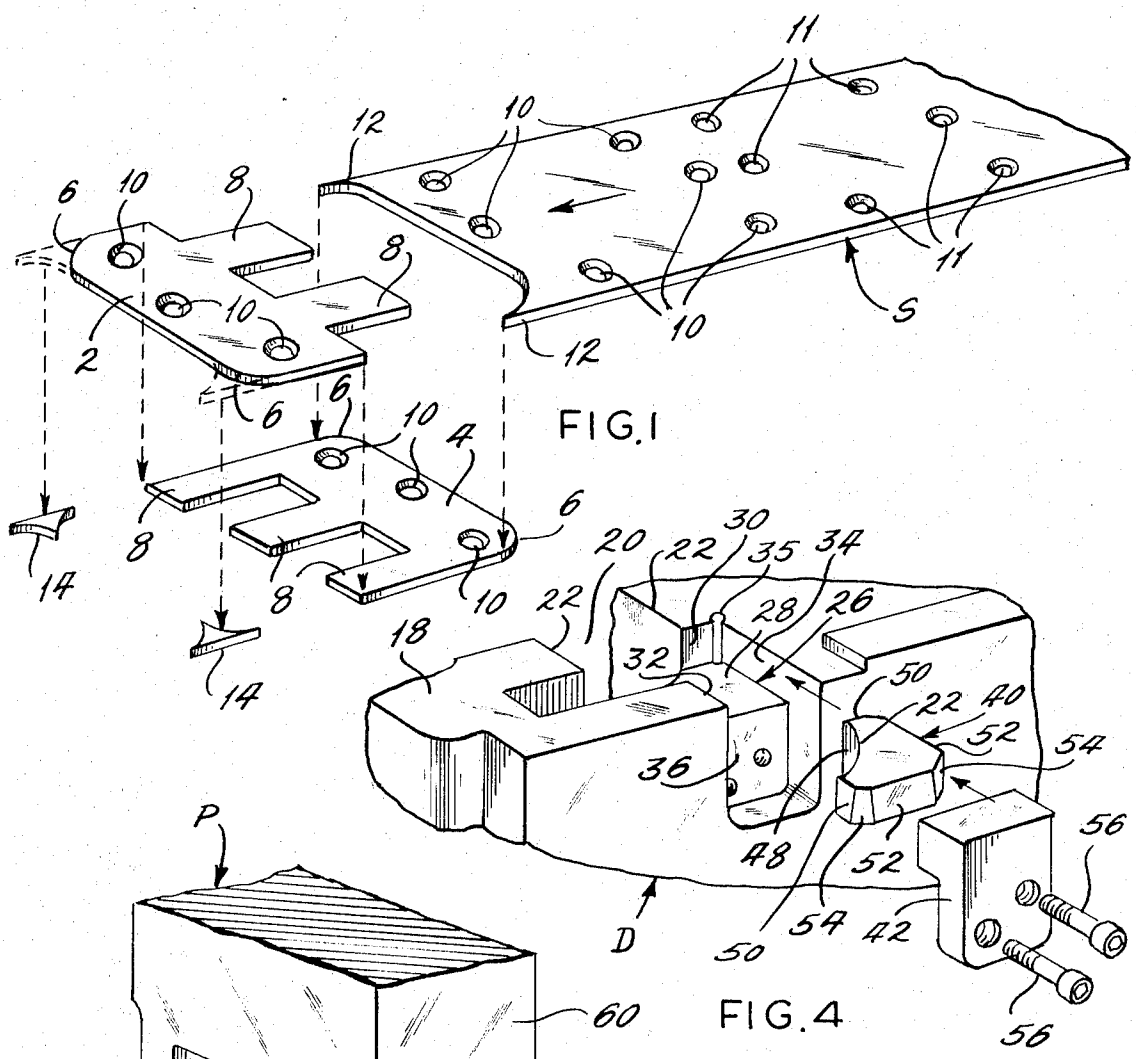

FIG. 1

FIG. 4

FIG. 2

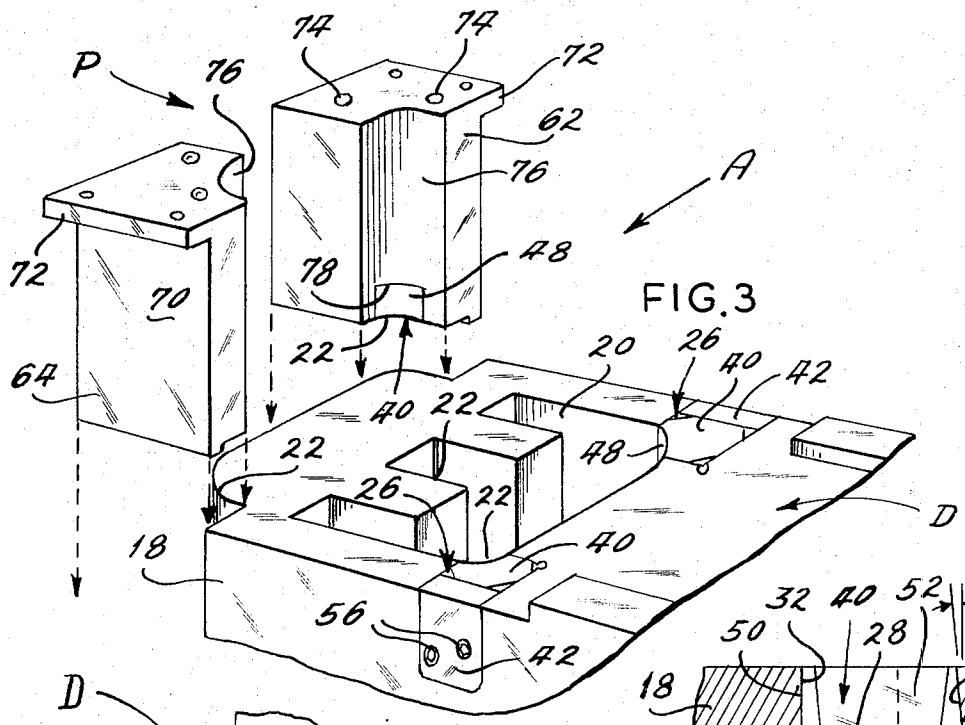

FIG. 3

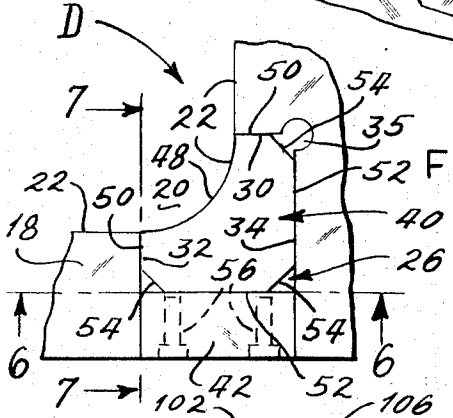

FIG. 5

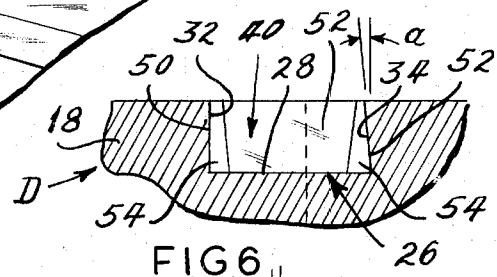

FIG. 6

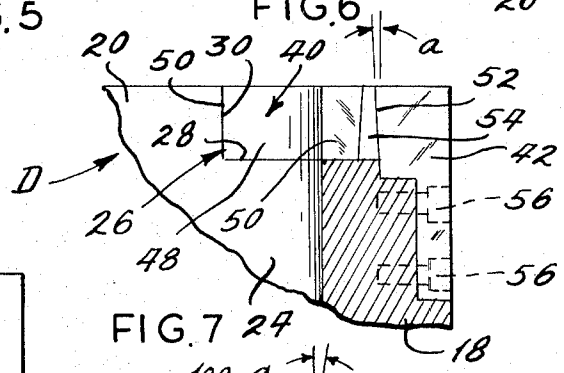

FIG. 7

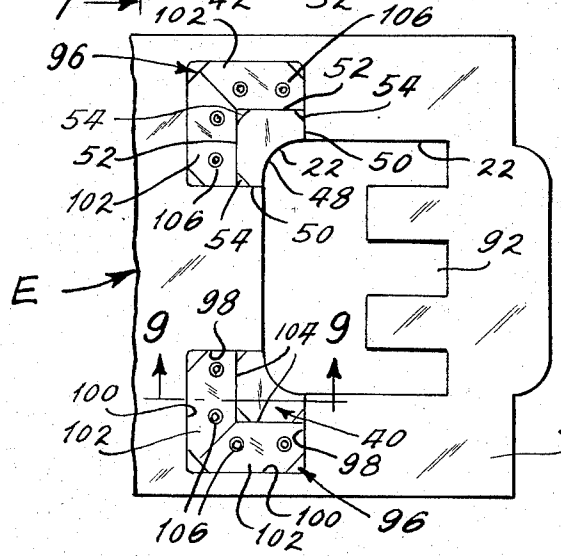

FIG. 8

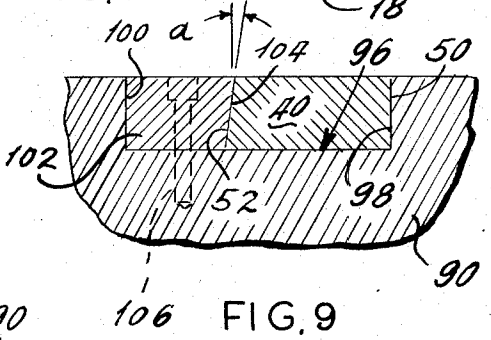

FIG. 9

IMPACT DIE AND CARBIDE INSERT THEREFOR

BACKGROUND OF THE INVENTION

This invention relates to an improved punch and die set or die assembly having high impact carbide inserts mounted therein at a point or points where the greatest wear would normally occur when the set is used for various shearing operations. This invention relates to the punch and die set itself and to the high impact carbide insert adapted to be mechanically clamped therein without adhesive, brazing, dowels or other means extending into said insert.

There are numerous punch presses in operation having punch and die sets therein adapted to punch out parts of different configurations. Generally speaking, prior art punch and die sets comprise a plurality of accurately dimensioned tool steel parts which are secured together in the proper shape. Sometimes they are made from a single piece of metal which has been accurately machined to the proper dimensions. When the punch press with the punch and die set therein is in operation, one or two cooperating members punch out a part of a desired shape. In general, the punch and die wear at points near curved portions, or more particularly, where a curved portion meets with a straight line.

For example, hinge leaves may be generally rectangular in shape along at least three edges, but have two curved corners between said edges. Punches and dies for punching out these curved corners tend to wear at either end of the curved corner at a point where the curved corner intersects with the straight side and end portions. In practice, a typical punch and die set for punching hinge leaves wears out after about 150,000 leaves have been punched, but this varies with the materials used, the shape and thickness of the hinge leaf, the speed of the machine, and other factors. Such a worn die must then be removed from the punch press and either reworked by machining the worn portion from it or must be replaced entirely. A typical die having a life of 150,000 pieces usually requires one die man about three days to re-finish. A die can be refinished only a limited number of times before it must be replaced. The foregoing is simply one example of die wear relating to curved portions on hinge leaves, but there are numerous other examples of high wear on certain shapes of other forms of workpieces.

The present invention provides high impact carbide inserts of predetermined shape in a punch or die which has been formed to receive said inserts without adhesive or brazing or means extending through the insert itself. The insert or inserts are positioned at points of highest wear in the punch or die. In practice, such inserts have increased the life of the punch or die from about 150,000 pieces in the past up to 2,000,000 pieces per life of the present punch and die set. When the carbide insert has become worn, replacement thereof requires one man about one-half day to replace the insert and remove any other scratches from the die that may have resulted from punching out about 2,000,000 pieces. The present invention increases the punch and die life many times and allows the punch and die to be replaced in only a fraction of the time it takes to rework or replace present all-steel punches and dies. This also represents a direct labor saving, in addition to effecting great savings due to less down time of high speed and expensive punch presses.

SUMMARY OF THE INVENTION

The principal object of the present invention is to provide a long lasting punch and die set for various shearing operations, which punch and die set has replaceable high impact carbide inserts therein at the points where the greatest wear would normally occur. Another object of the invention is to provide a punch and die set which has a longer life and which can blank or otherwise shear out more pieces than with present sets. Still another object is to provide a steel punch or die having predetermined means for receiving high impact carbide inserts of predetermined shape, so that the two can be joined into a fixed assembly without any means extending through the insert and without any adhesive or brazing (which often destroys the temper of the steel and/or insert). Still another object of this invention is to provide a high impact carbide insert having sloping sides at various points in order to enable the insert to be fitted into a steel punch or die and remain in fixed accurate position by mechanical means only even under continued high impact conditions. These and other objects and advantages will become apparent hereinafter.

The present invention is embodied in a punch and die set and an insert therefor for punching out workpieces having configurations which ordinarily cause a punch or die to wear out rapidly at certain points. A high impact carbide insert is mounted within the steel punch or die at the position or positions of greatest wear, and insert being maintained in fixed accurate position by mechanical means extending into said insert. The invention also consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of this specification and wherein like numerals and symbols refer to like parts wherever they occur:

FIG. 1 is a perspective view of strip stock showing hinge leaf blanks stamped therefrom with the punch and die set of the present invention;

FIG. 2 is a perspective view of a punch and die set with only the rearmost punch segment illustrated;

FIG. 3 is another perspective view of the punch and die set with only the foremost punch segments illustrated;

FIG. 4 is an exploded perspective view showing the manner in which the carbide inserts are installed in the die body;

FIG. 5 is a fragmentary plan view of the die at the corner of the die cavity where the carbide inserts are located;

FIG. 6 is a sectional view taken along lines 6—6 of FIG. 5;

FIG. 7 is a sectional view taken along lines 7—7 of FIG. 5;

FIG. 8 is a plan view of a modified die; and

FIG. 9 is a sectional view taken along lines 9—9 of FIG. 8.

DETAILED DESCRIPTION

Referring now to the drawings, A designates a punch and die set for stamping hinge leaf blanks 2 and 4 (FIG. 1) from strip stock S which is of uniform width and thickness and is usually supplied in large coils. The

hinge leaf blanks 2 and 4 are generally rectangular, but have rounded corners 6 on one side and projections 8 on the other side. The projections 8 of the two blanks 2 and 4 are offset and after the blanking operation they are rolled to form hinge knuckles. In addition, the leaf blanks 2 and 4 have chamfered holes 10 for accepting flat head wood or machine screws. The blanks 2 and 4 are of equal width, and that width is the same as the width of the strip stock S. Thus, the rounded corners 6 merge into the existing straight edges on the strip stock S.

The punch and die set A is of the progressive variety and includes (FIGS. 2 & 3) a punch P which is mounted on the ram of a press and a die D which is mounted on the bed of the press in alignment with the punch P. As the strip stock S advances through the punch and die set A, holes 11 (FIG. 1) are stamped into it at the first die station and these holes are positioned at the locations for the screw holes 10. When the punch P withdraws from the die D, the stock S is advanced and the holes previously stamped therein move to the second die station. On the next descent of the punch P, the stock S is coined at the previously formed holes 11 so that these holes assume a chamfered configuration and become the holes 10. After the coining operation, the punch P again rises and the strip stock S is again advanced, the advancement bringing the coined holes 10 to the third station. On its next descent, the punch P blanks the leaf blank 4 from the portion of the stock S into which the holes 10 have been coined, and the blank 4 is driven through the die D while the leaf blank 2 remains on top of the die D. The blanking operation forms the leaf blank 4 with the rounded corners 6, and as a result the leading edge of the strip stock S is left with turned out ends 12. When the stock S is again advanced, the turned out ends 12 are on the portion of the stock S from which the leaf blank 2 is formed, and indeed the turned out ends 12 are trimmed from that portion of the stock as the punch P descends, leaving rounded corners 6 on the blanks 2 and triangular scrap segments 14. The foregoing operations are conventional in the manufacture of hinges.

COnventional punches and dies used in the manufacture of hinges as well as in other blanking or shearing operations are made entirely from tool steel. While the straight cutting edges of these punches and dies remain quite sharp for extended periods of time, the curved interior cutting edges by which the rounded corners 6 are formed experience considerably more wear, particularly where these curved cutting edges merge into existing straight edges on the stock S. It is believed that the metal tends to roll over the cutting edges at these points and dull the cutting edges. The punch P and die D of the present invention utilize carbide cutting edges at the points of greatest wear, that is at the curved cutting edges, and as a result the punch P and die D last considerably longer than their conventional counterparts which are made exclusively from tool steel.

As previously mentioned, the punch and die set A is of progressive variety, but since the first two stations thereof are conventional, only the third station, that is the portion which blanks and trims the leafs 2 and 4, will be described. The same is true of the individual die D and punch P.

The die D includes (FIGS. 2 & 3) a die body 18 which is formed primarily from tool steel and has a die cavity 20 therein, and the shape of the die cavity 20 is the same as the shape of the leaf blank 20. The upper surface of the die body 18 is flat and this surface intersects the vertical surfaces of the cavity 20 at cutting edges 22. At the back corners of the cavity 20, that is at the corners located closest to the preceding die station, the die body 18 has arcuate faces 24 (FIG. 2), the curvature of which corresponds to the curvature of the rounded corners 6 on the leaf blanks 4. At the arcuate faces the die body 18 is provided with recesses 26 (FIG. 4) which open laterally into the interior of the cavity 20 and outwardly through the side face of the body 18. Other than being mere reversals of each other, the recesses 26 on both sides of the die body 18 are identical.

Each recess 26 possesses a stepped configuration (FIGS. 4 & 6) with the step being set away from the arcuate face 24. By reason of the stepped configuration, the recess 26 has a relatively small inner section which opens into the die cavity 20 through the arcuate face 24 thereof and a relatively large outer portion which opens outwardly through the side of the die D. The small or inner portion of the recess 26, is defined by (FIG. 4) a base wall 28, a pair of converging end walls 30 and 32, and a back wall 34. The base wall 28 is set below the flat upper surface of the die body 18, but is parallel thereto, while the two end surfaces are perpendicular thereto. The back wall 34 is canted slightly with respect to the perpendicular (FIG. 6) so that the included angle between the back wall 34 and the base wall 28 is slightly less than a right angle. Preferably, the angle a is about 5°. At the juncture of the back wall 34 and the end wall 30, the die body 18 has a cylindrical relief 35 (FIG. 4) which is slightly deeper than the base wall 26. The canted back wall 34 and the perpendicular end wall 32 extend all the wall to the side of the die body 18 and accordingly define the sides of the larger outer portion of the recess 26. Aside from the back wall 34 and end wall 32, the outer portion of the recess 26 is further defined by a vertical wall 36.

The recess 26 accommodates a carbide insert 40 and a retaining member 42 (FIGS. 4, 5 & 7), the former being in the smaller inner portion of the recess 26 while the latter is in the outer or stepped portion of the recess 26. The carbide insert 40 is formed from so-called high impact carbide, and this material is available from the V. R. Wesson Division of Fansteel Corporation, Waukegan, Illinois. The insert 40 has parallel upper and lower surfaces and the distance between these surfaces, which is the thickness of the insert 40, equals the depth of the recess 26. That thickness, should be 3½ to 4 times the thickness of the strip stock S. Consequently, when the insert 40 is positioned properly in the recess 24 its upper or exposed surface lies flush with the upper surface of the die body 18. The insert 40 is peripherally defined (FIGS. 4 & 5) by an arcuate face 48, a pair of end faces 50, a pair of back faces 52, and three intermediate connecting faces 54. The curvature of the arcuate face 48, like the curvature of the arcuate face 24 of the die body 18, corresponds to the curvature of the rounded corners 6 on the leaf blanks 4 and when the insert 40 is properly positioned in the recess 26, the arcuate faces 24 and 48 of the die body 18 and insert 40 lie flush and are continuous. The intersection of the arcuate face 48 and the planar upper surface on the insert 40 forms a curved edge which aligns with the cutting edges 22 on the die body 18 and indeed forms part of the cutting edge 22 surrounding the die cavity 20. The end faces 50 are perpendicular to the upper and lower

surfaces on the insert **40** and intersect the arcuate face **48** at sharp edges. They abut against the end walls **30** and **32** of the recess **26.** Both of the back faces **52** are canted slightly with respect to the perpendicular (FIGS. **6** & **7**) and their angle of inclination equals that of the back wall **34** on the die body **18.** Indeed, one of the back faces **52** of the insert **40** abuts against the back wall **34** when the insert **40** is in position in the recess **26.** The other back face **52** is presented outwardly toward the stepped portion of the die body **18.** One of the connecting faces **54** is between the two back faces **52** while the other two are between end faces **50** and the back faces **52** (FIG. **4**).

The carbide insert **40** is clamped securely in the small inner portion of the recess **26** by the retaining member **42** (FIGS. **4, 5** & **7**) which fits into and fills the stepped outer portion of the recess **26.** The inside face of the retaining member **42** is canted slightly (FIG. **7**) with the amount of inclination being generally equal to the inclination of the outwardly facing back face **52** on the carbide insert **40.** Indeed, the canted face on the retaining member **42** abuts against outwardly facing back face **52** on the retaining member **42** so that the retaining member **42** urges the insert **40** against the end wall **30** of the recess **26.** The retaining member **42** is secured firmly in place by bolts **56** which extend through the vertical stepped wall **36** of the recess **26** and thread into the die body **18.**

The punch P is disposed above the die D (FIGS. **2** and **3**) and includes a holder (not shown) and three punch segments **60, 61** and **62** which are bolted to that holder. The punch segment **60** (FIG. **2**) possess the same configuration as the die cavity **20** and aligns with that cavity. When the punch P descends, the punch segment **60** enters the die cavity **20** and blanks the leaf **4** from the strip stock S. The punch segment **60** is formed entirely from the tool steel. The remaining punch segments **62** and **64** (FIG. **3**) are located opposite to the leading end of the die D, and aside from being mere reversals of one another, they are identical in configuration and construction. When the punch P descends, these segments **62** and **64** descend across the curved corners on the front of the die D and trim the triangular segments **14** from the leading end of the strip stock S so as to form the rounded corners **6** on the leaf blanks **2.**

Since the punch segments **62** and **64** are identical in construction, only the segment **62** will be described in detail. The punch segment **62** includes (FIG. **3**) a body **70** which is formed entirely from tool steel and has a flange **72** at its upper end. The punch segment **62** is bolted to its holder at the flange **72** as well as at threaded holes **74** in the body **70** of the segment **72.** The body **70** has an arcuate face **76** which possesses the same radius as the rounded corners **6** on the leaf blank **2,** and this arcuate face **72** aligns an arcuate face on the front of the die body **18,** passing by that die face as the punch P descends. The body **70** has a flat undersurface which is parallel to and presented opposite to the flat upper surface of the die body **18.**

In addition, the body **70** of the punch segment **62** is provided with a recess **78** (FIG. **3**) which opens inwardly through the arcuate face **76** on the body **70** and outwardly through the front face of the body **70.** Aside from its location and orientation, the recess **78** is identical in configuration to the recess **26** in the die body **18.** Like the recess **26,** the recess **78** receives a carbide insert **40** and retaining member **42.** The retaining member **42,** in turn, is held in place by bolts which thread into the body **70.** Thus, the carbide insert **40** is clamped securely in the recess **78** with the arcuate face **48** of the insert **40** being flush with the arcuate face of the body **70.**

OPERATION

The strip stock S is fed between the punch P and the die D in the usual manner. Since the punch and die set A is of the progressive variety, each drop of the punch P effects several stamping operations, but these operations of course occur at different sections of the stock S. At the first station in the set A, the holes **11** (FIG. **1**) are stamped in the stock. When the punch P rises the stock S is advanced to the second station, and upon the next descent the stock S is coined at the previously formed holes **11** to form the chamfered holes **10.** Thereupon, the punch P rises and the stock S advances to the next or third station, and it is at this station where the carbide inserts **40** act upon the stock S. The first two stations are conventional with punch and die sets used in the manufacture of hinges and therefore will not be described in further detail.

Referring now to the third or last station, as the punch P descends, the punch segment **60** engages the strip stock S into which the holes **10** have been punched and coined, and drives that stock S against the cutting edges **22** which are along the periphery of the die cavity **20.** These cutting edges **22** are not only on the body **18,** which is formed from tool steel, but are also on the carbide inserts **40** which are at the sides of the die body **18.** The punch segment **60** passes by the cutting edges **22** of the die D and enters the die cavity **20.** In so doing, it blanks the left blank **4** from the stock S. As the leaf blank **4** is cut from the stock S the metal at the outer ends of its rounded corners **6,** that is where the rounded corners **6** merge into the sides of the strip stock S, tends to roll over the cutting edge of the insert **40** and along the arcuate face **48.** Since the insert **40** is made from carbide, little wear occurs. The descent of the punch segment **60** into the die cavity **20,** leaves that portion of the strip stock S which is at the preceding die station with turned out ends **12.**

The turned out ends **12** of course exist on the leading edge of strip stock S at the third or last station also, since that portion of the stock S was merely advanced from the second station. These turned out ends **12** are removed by the punch segments **62** and **64** which descent contemporaneously with the punch segment **60.** In particular, as the punch segments **62** and **64** descend, the carbide inserts **40** thereon engage the turned out ends **12** of the stock S and shear them from the remainder of the stock S, leaving the leading end of the stock with rounded corners **16.** As the cutting edges of the inserts **40** on the punch segments **62** and **64** cut through the stock S, that portion of the stock S at the ends of the rounded corners **6** tends to roll along the arcuate faces **48** of the inserts **40,** for it is at these points that the rounded corners **6** merge into the existing straight and end edges of the stock S. In view of the fact that the inserts **40** are formed from carbide, very little wear occurs. The removal of the turned out ends **12** from the leading edge of the strip stock S leaves the leaf blank **2** on the upper surface of the die body **18.** This leaf blank **2** is pushed off the die D with the next advance of the strip stock S.

The fact that the back faces **52** on the inserts are disposed at the slight angle *a* and facewise abut rigid surfaces on the die body **18** and punch segments **62** and **64** holds the inserts **40** firmly in position. In effect the inserts **40** are wedge-shape and by reason of the wedge-shaped configuration they may be locked firmly in the die body **18** and punch segments **62** and **64.**

MODIFICATION

It is possible to provide a modified die E (FIGS. 8 & 9) which is quite similar to the die D, yet differs in the manner in which the carbide inserts **40** are held in place. The die E includes a die body **90** having a die cavity **92** (FIG. 8) provided with arcuate faces at two corners thereof. In addition, the die body **90** has upwardly opening recesses **96** adjacent to the arcuate faces, and these recesses **96** open into the die cavity **92** through the arcuate faces. Each recess **96** possesses a somewhat rectangular configuration and has end walls **98** leading away from the die cavity **92** and back walls **100** disposed beyond the cavity **92.**

The carbide insert **40** fits into the recess **96** and when so the its end faces **50** abut against the end walls **98** of the recess **96,** while its arcuate face **48** lies flush with the arcuate face **94** on the die body **90.** This leaves the canted back faces **52** of the insert **40** presented toward the back walls **100** of the recess **96.** In addition to the carbide insert **40,** each recess **96** also receives two retaining members **102,** and these retaining members have canted forward faces **104** (FIG. 9) which facewise abut against the canted back faces **52** of which insert **40.** The opposite sides of the retaining members **102** abut against the back walls **100** of the recess **96** so that in effect the retaining members are lodged or wedged between the back walls **100** of the recess **96** and the back faces **52** of the insert **40.**

The retaining members **102** are secured in place by bolts **102** which extend vertically through the retaining members **102** and thread into the die body **90** at the base of the recess **96** therein. Since the back faces **52** of the inserts **40** are disposed at a slight angle *a* with respect to the perpendicular as are the forward faces **104** of the retaining members **102,** the retaining members **102** serve as wedges which firmly position the inserts **40** at the corners of the die cavity **92.**

As previously mentioned, the inserts **40** are formed of so-called high impact carbide which is available from the V. R. Wesson Division of Fansteel Corporation, Waukegan, Ill. That company designates its high impact carbide as special carbide grade 9,784, and that carbide has the following physical characteristics:

Hardness - Rockwell A 91.5
Transverse Rupture Strength - 400×10^3 psi
Compressive Strength - 525×10^3 psi
Young's Modulus of Elasticity - 80×10^6 psi
Density - 14.50 g/cm^3

This invention is intended to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A punch and die set for shearing from stock a piece having a curved edge; said punch and die set comprising a punch member and a die member, one of the members being adapted to move relative to the other member between a parted position wherein the stock can be positioned between the members and a closed position wherein the members overlap, the members having curved edges which pass by each other as the movable member moves to its closed position, whereby a piece having a curved edge is sheared from the stock, at least one of the members having a recess defined by a base wall and also a backing wall inclined such that it projects slightly over the base wall and converging end walls, said one member carrying an insert formed from carbide and the curved edge for that member being disposed at least in part on the insert and being formed by the intersection of two surfaces on the insert with one of the surfaces being concave, the insert having a pair of inclined back faces disposed at an angle with respect to one another with one of the back faces abutting the inclined backing wall of the recess, the insert further having end faces at each end of its concave surface with the end faces facewise abutting the end walls of the recess; and a retaining element secured to said one member and engaged with the other inclined back face of the insert such that the insert is clamped in said one member.

2. A punch and die set according to claim **1** wherein the recess opens outwardly through the side of the member in which it is disposed so that the insert can be placed in the recess that the side of said member.

3. A punch and die set for shearing from stock a piece having a curved edge, said punch and die set comprising a punch member and a die member, one of the members being adapted to move relative to the other member between a parted position wherein the stock can be positioned between the members and a closed position wherein the members overlap, the members having curved edges which pass by each other as the movable member moves to its closed position, whereby a piece having a curved edge is sheared from the stock, at least one of the members having a recess provided with converging end walls and converging backing walls, said one member carrying an insert formed from carbide and the curved edge for that member being disposed at least in part on the insert and being formed by the intersection of two surfaces on the insert with one of the surfaces being concave, the insert at the ends of the concave surface thereon having end faces which facewise abut the end walls of the recess, the insert further having inclined back faces which are presented toward and face the backing walls of the recess; and a pair of retaining elements fitted between the inclined back faces of the inserts and the backing walls of the recess so as to urge the insert tightly against the end walls of the recess and to clamp the insert in said one member.

4. A punch and die set according to claim **3** wherein the retaining elements have inclined forward faces which facewise abut against inclined back faces of the insert; and wherein bolts extend through the retaining elements generally parallel to the backing walls of the recess and thread into the member which carries the insert.

5. A punch and die set for blanking complementary hinge leaf blanks from strip stock, the hinge leaf blanks having rounded corners and being equal in width to the width of the strip stock, said punch and die set comprising: a die body having a supporting surface against which the strip stock is positioned and a die cavity opening out of the supporting surface, the die cavity being substantially in the shape of one of the leaf blanks

and being defined in part by generally straight cutting edges located along the supporting surface of the die body, at least one of the substantially straight cutting edges extending transversely of the stock, the die body having at least one recess therein at the end of said one cutting edge with the recess opening into the die cavity and also out of the supporting surface; a replaceable insert in the recess and having an exposed surface positioned flush with the supporting surface of the die body and a concave surface facing the die cavity and intersecting said exposed surface to form a curved cutting edge on the insert, the cutting edge on the insert aligning with said one substantially straight edge on the die body and forming a continuation thereof without an abrupt change in direction and further curving around from that one cutting edge to generally align with the side edge of the strip stock; means for retaining the insert securely in the recess; and a punch having a segment sized to fit into the die cavity and being movable between a parted position wherein the punch segment is located beyond the supporting surface on the die body so that the stock may be inserted between the punch segment and the die body and a closed position wherein the punch segment projects into the die cavity, the punch segment having edges which pass close to the cutting edges of the die body and insert as the punch moves from its parted position to its closed position, whereby said one hinge leaf is blanked from the stock with a rounded corner and enters the die cavity, while the other complementary hinge leaf blank remains against the supporting surface of the die body.

6. A punch and die set according to claim **5** wherein the insert is made from high impact carbide and is at least about 3½ times the thickness of the stock.

7. A punch and die set according to claim **5** wherein the die body has a convex corner edge located beyond the die cavity and positioned such that at one of its ends it aligns with the sides of the strip stock and at its other end it aligns with the end of the strip stock; wherein the punch includes an additional punch segment having a recess therein in which another insert is contained with the insert oriented such that its curved cutting edge and concave surface passes close to and by the curved corner edge on the die body when the punch moves to its closed position, whereby the other complementary hinge leaf blank is left with a curved corner edge; and wherein the punch also has means for retaining the other insert in the additional punch segment.

8. A punch and die set according to claim **5** wherein the recess is defined in part by a base wall offset from, but extending generally in the same direction as the supporting surface and a pair of end walls which are located at an angle with respect to each other and extend to the die cavity; wherein the insert has end faces at the ends of the concave surface thereon and the end faces abut the end walls of the recess; and wherein the retaining means urges the insert tightly against at least one of the end walls of the recess.

9. A punch and die set according to claim **8** wherein the insert is provided with a pair inclined backing faces located on the opposite sides thereof from the end faces; and wherein the backing faces are inclined with respect to end faces such that the insert is narrower on the exposed surface thereof than on the surface thereof which lies against the base wall of the recess.

10. In a punch and die set for blanking from strip stock pieces having generally straight edges which are joined at curved corners, the punch and die set including a punch member and a die member, one of which is movable relative to the other between a parted position wherein the stock can be positioned between the members and a closed position wherein one member projects past the other member, one of the members having a convex surface thereon opposite the location on the stock where the curved corner is to be formed and the other member having a concave surface which generally conforms in curvature to the curvature of the convex surface and is in close proximity thereto as the movable member moves to its closed position, the member having the concave surface being provided with a recess which opens out of the concave surface and the recess being defined in part by a base wall and a pair of end walls with the end walls being located at an angle with respect to each other and extending away from the concave surface, and retaining means mounted on the member having the recess therein; a removable insert sized to fit in the recess and to bear against the base wall thereof, the insert having an exposed face arranged to be spaced from the base wall of the recess and such that the stock will be positioned against that face, the insert also having a pair of end faces arranged to abut against the end walls of the recess and a concave surface extending between the end faces and positioned such that it will be substantially flush with the concave face of the member having the recess when the end faces of the insert are against the end walls of the recess, the exposed face and the concave surface intersecting to form a cutting edge on the insert, the insert further having back faces located on the sides thereof opposite the end faces with each back face being inclined relative to the direction of movement for the movable member, the inclination being such that the insert is wider at the surface thereof presented toward the base wall of the recess than at the exposed surface thereof, the inclined back faces being adapted to be engaged by the retaining means to prevent withdrawal of the insert from the recess.

11. The structure of claim **10** wherein the insert is made from carbide.

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