

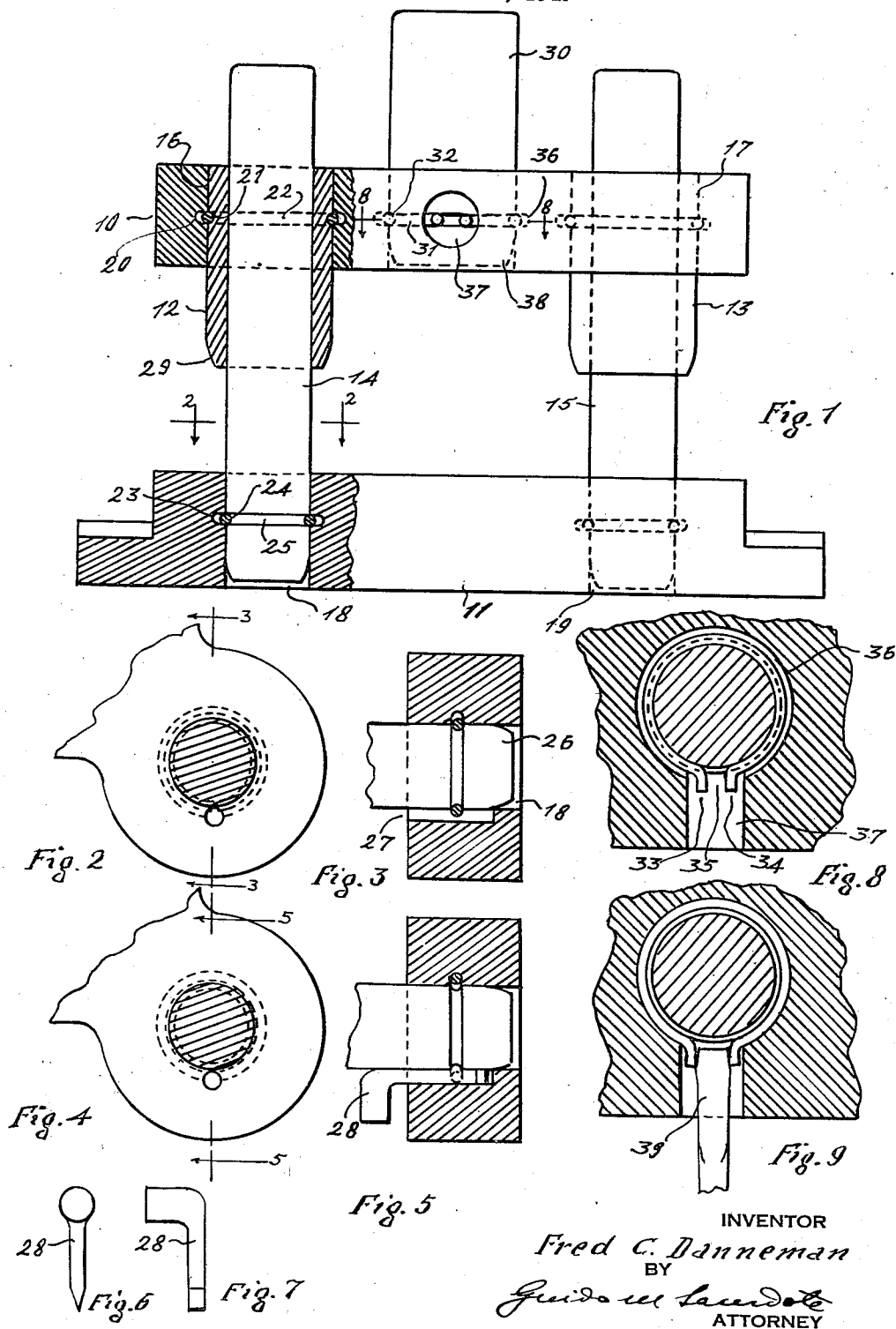
April 27, 1943.

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2,317,889

DIE SET PARTS ASSEMBLIES

Filed Feb. 10, 1942



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2,317,889

DIE SET PARTS ASSEMBLY

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Application February 10, 1942, Serial No. 430,316

6 Claims. (Cl. 164—118)

This invention relates to improvements in means for connecting a pin or shank or bushing to a holder, having an opening adapted to receive such pin or shank or bushing, and more particularly refers to improvements in the construction of die sets in which accurate alignment of the leader pins and bushings is an essential requirement.

The usual method now followed in machining die sets, comprising a die shoe and punch holder, is to drill perfectly aligned holes in both shoe and holder and then bore the holes thus produced to a diameter about $\frac{1}{1000}$ of an inch smaller than the diameter of the leader pins and bushings, respectively to be forced therein by a press fit.

However, these various operations do not insure that accuracy that the character of the device calls for. In die sets the alignment between leader pins and bushings cooperating therewith should be absolutely perfect in order to insure perfect register of the die parts to be mounted on the die set. In die sets of the usual type two or more leader pins are secured to the die shoe and are aligned with and slide within bushings which are secured to the punch holder.

The main cause of error lies in the necessity of forcing the leader pins or bushings within their respective holes by a press fit, calling for the application of powerful pressure. The pressure thus applied may cause the material to give unevenly, with the result that after the forcing operation is completed the center of the holes may be somewhat displaced from the original center.

As a result, the leader pins and bushings are rarely in perfect alignment and their axes may be displaced several thousandths of an inch with respect to one another so that friction and wear and lack of accurate register between the die parts will take place.

The primary object of the present invention is to provide novel and improved means for securing a leader pin or bushing or shank in position, insuring absolutely accurate alignment between such parts and the holes therefor provided, and between the cooperating parts themselves.

Another object is to provide a novel and improved arrangement for securing a leader pin or bushing or shank to a holder whereby the necessity of applying powerful pressure in assembling such parts will no longer be required.

A further object is to provide a novel and improved construction of die set in which the various parts are entirely free of distortion and in which the leader pins and bushings can be easily

set in place without the use of special equipment.

Other objects and advantages of the present invention will more fully appear as the description proceeds and will be set forth and claimed in the appended claims.

My invention is illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a front view in elevation, partly sectioned, of a die set embodying my invention;

Fig. 2 is a fragmentary horizontal section through line 2—2 of Fig. 1, showing the snap ring in its contracted position;

Fig. 3 is a cross section through line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 2, showing the snap ring in its expanded position to permit the insertion of the leader pin in place;

Fig. 5 is a cross section through line 5—5 of Fig. 4;

Fig. 6 is a front view in elevation of a wedge member which may be used to force the snap ring to its expanded position;

Fig. 7 is a side view thereof;

Fig. 8 is a fragmentary section through line 8—8 of Fig. 1, showing a clip ring used instead of a snap ring to connect the shank to the punch holder; and

Fig. 9 is a similar view illustrating a way of expanding the clip ring to permit the insertion of the shank in position.

Referring to Fig. 1, the same represents a die set, consisting of a punch holder 10 and a die shoe 11, one of said two parts, usually the punch holder, being reciprocable with respect to the other.

In order to maintain the proper alignment between the two parts the punch holder is provided with guide bushings 12, 13, and the die shoe is provided with leader pins 14, 15, coaxial with and slidable within said bushings.

According to my invention the punch holder is provided with holes 16, 17, the diameter of which exactly corresponds to the diameter of the bushings, and the die shoe is provided with holes 18, 19, the diameter of which exactly corresponds to that of the leader pins to be inserted therein.

As a result there will be a plug fit instead of a press fit relationship between the bushings and the leader pins and their respective holders, so that no pressure being required for setting said bushings and leader pins in position the main cause of distortion or lack of accurate alignment has been removed.

Once the bushings and leader pins have been set in position they should be restrained against

axial displacement, and this I obtain in a very simple manner by means of a snap ring embracing an annular groove provided in the bushing or leader pin and forming a circumferential bead around said bushing or leader pin, said snap ring being imprisoned within an annular groove outwardly extending from the opening through which the bushing or leader pin is inserted.

To better illustrate the inventive idea reference is made to Fig. 1, in which it is seen that the opening 16 in the punch holder is formed with an annular recess 20, outwardly extending therefrom, the width of said recess exactly corresponding to the width or thickness of the snap ring 21 which is inserted in annular groove 22 provided in the surface of the bushing.

The diameter of annular recess 20 is large enough to permit expansion of the snap ring to a point where it will clear the diameter of the bushing to be inserted therethrough.

In a similar manner, the opening 18 in the die shoe is formed with an annular recess 23, the width of which corresponds to the width or thickness of the snap ring 24 set in the annular groove 25 of the leader pin 14, the diameter of said recess 23 being large enough to permit expansion of the snap ring 25 to a degree where it will clear the diameter of the leader pin 14 to be inserted therethrough.

Figs. 2 to 7 illustrate a manner in which the parts mentioned can be assembled. First the snap ring 24 can be contracted and forced within the opening 18 until upon reaching annular recess 23 it is allowed to expand to its normal size. The lower end 26 of the leader pin tapers down to a smaller diameter so that said lower end can be inserted through the opening 18 and through the snap ring. By forcing the leader pin further down the snap ring is compelled to expand until upon the groove 25 coming to register with the snap ring, the snap ring will be free to contract and lock the leader pin in position.

If an easier action is desired, the die shoe can be provided with a hole 27 parallel with and adjacent the surface of the hole 18, and the two ends of the snap ring may be caused to fall directly in line with said hole 27 when the snap ring is forced in place. A suitable wedge pin or spike, such as shown at 28 in Figs. 6 and 7, can then be inserted within hole 27 and between the ends of the snap ring to force said snap ring to its expanded position shown in Fig. 4, making it possible to insert the leader pin in position without undue friction. The same system may be used in connection with the bushings, the lower end 29 of which may also be made tapering to a smaller diameter.

Instead of a snap ring it is possible to use as a locking member a clip ring, such as shown in Figs. 1, 8 and 9, for connecting the shank 30 to the punch holder.

Also in this case the shank is provided with an annular groove 31, in which is inserted a clip ring 32, the difference between said clip ring and the snap ring used in connection with the bushings and leader pins being that the two ends of said clip ring are turned outwardly, as shown at 33, 34, leaving a gap 35 between them.

The punch holder is provided with an annular recess 36, the diameter of which is large enough to permit expansion of the clip ring to a degree where it will clear the diameter of the shank.

The punch holder is also provided with a front

to rear opening 37, reaching from the outer wall to the recess 36, and when the clip ring is forced in position within recess 36 its two bent ends 33, 34 are caused to project within said opening 37.

The clip ring may be caused to expand to allow insertion of the shank into place by making the lower end 38 of the shank taper down to a smaller diameter and by forcing the shank through the ring, as previously explained.

However, an easier way can be employed by inserting a tool, such as a screw driver 39 through opening 37 and between the two bent ends 33, 34 of the clip ring and turning said screw driver to cause said clip ring to expand as shown in Fig. 9, whereupon the shank can be set in position with the greatest ease.

A notable advantage provided by the use of opening 27 and wedge member 28 in the case of Figs. 2 to 7, and opening 37 and tool 39 in the case of Figs. 8 and 9, is that the snap ring or clip ring, as the case may be, may be forced open in order to remove the leader pin or bushing or shank served thereby.

In die sets it is at times necessary to grind the surface of the die shoe or punch holder, or both, and the possibility of easily removing the leader pins and bushings from their settings is much to be desired.

From the foregoing it will be seen that the arrangements described are very simple and effective and that they do away with the difficulties heretofore encountered in securing perfect accuracy in the alignment of telescopically related parts.

My invention may vary in constructional details without departing from the inventive idea. The drawing should, therefore, be understood as being intended for illustrative purposes only and not in a limiting sense.

I, accordingly, reserve the right to carry my invention into practice in all those ways and manners which may enter, fairly, into the scope of the appended claims.

I claim:

1. A device of the character described comprising a cylindrical member, a holder therefor provided with an opening the diameter of which exactly corresponds to the diameter of said member, said cylindrical member being provided with an annular groove, an elastic split ring adapted to snap into said groove forming an annular projection laterally extending from the surface of said member, the opening in said holder being provided with an annular recess laterally extending therefrom, the width of said recess corresponding to the width or thickness of said annular projection, the diameter of said recess being sufficient to allow expansion of said elastic ring to a point where it will clear the diameter of said cylindrical member, whereby said ring will snap within said groove when said ring is inserted within said recess and said groove comes to register therewith as said cylindrical member is inserted within said opening, locking said cylindrical member against axial displacement, and locking means angularly fixedly securing said ring in said recess when it is inserted therein.

2. A device of the character described comprising a cylindrical member, a holder therefor provided with an opening the diameter of which exactly corresponds to the diameter of said member, said cylindrical member being provided with an annular groove, and an elastic split ring adapted to snap into said groove forming an

annular projection laterally extending from the surface of said member, the opening in said holder being provided with an annular recess laterally extending therefrom, the height of said recess corresponding to the thickness of said annular projection, the diameter of said recess being sufficient to allow expansion of said elastic ring to a point where it will clear the diameter of said cylindrical member, whereby said ring will snap within said groove when said ring is inserted within said recess and said groove comes to register therewith as said cylindrical member is inserted within said opening, locking said cylindrical member against axial displacement, the leading end of said cylindrical member tapering down to a smaller diameter to facilitate its passage through said ring.

3. A device of the character described comprising a cylindrical member, a holder therefor provided with an opening the diameter of which exactly corresponds to the diameter of said member, said cylindrical member being provided with an annular groove, and an elastic split ring adapted to snap into said groove forming an annular projection laterally extending from the surface of said member, the opening in said holder being provided with an annular recess laterally extending therefrom, the height of said recess corresponding to the thickness of said annular projection, the diameter of said recess being sufficient to allow expansion of said elastic ring to a point where it will clear the diameter of said cylindrical member, whereby said ring will snap within said groove when said ring is inserted within said recess and said groove comes to register therewith as said cylindrical member is inserted within said opening, locking said cylindrical member against axial displacement, said holder having a passage through which the split portion of said ring may be reached by an expanding tool, to expand the same, said ring having an extension engaged in said passage and aligning said split portion with said passage when said ring is inserted within said recess.

4. A die set comprising a die shoe provided with leader pin openings, a punch holder provided with bushing openings coaxial with said leader pin openings, leader pins insertable within and having a diameter exactly corresponding to that of said leader pin openings, bushings for said leader pins insertable within and having a diameter exactly corresponding to that of said bushing openings, said leader pins and bushings being each provided with an annular groove, elastic split rings adapted to snap into said grooves forming an annular projection laterally extending therefrom, the leader pin and bushing openings being each provided with an annular recess laterally extending therefrom, the height of each recess being equal to the thickness of the annular projection of the corresponding leader pin or bushing, the diameter of said recess being sufficient to allow expansion of the corresponding elastic ring to a point where it will clear the diameter of the corresponding leader pin or bushing, whereby said rings will snap within said annular grooves when said rings are inserted within their respective recesses and said grooves

come to register therewith, as said leader pins and bushings are inserted within their respective openings, locking said leader pins and bushings against axial displacement.

5. A die set comprising a die shoe provided with leader pin openings, a punch holder provided with bushing openings coaxial with said leader pin openings, leader pins insertable within and having a diameter exactly corresponding to that of said leader pin openings, bushings for said leader pins insertable within and having a diameter exactly corresponding to that of said bushing openings, said leader pins and bushings being each provided with an annular groove, elastic split rings adapted to snap into said grooves forming an annular projection laterally extending therefrom, the leader pin and bushing openings being each provided with an annular recess laterally extending therefrom, the height of each recess being equal to the thickness of the annular projection of the corresponding leader pin or bushing, the diameter of said recess being sufficient to allow expansion of the corresponding elastic ring to a point where it will clear the diameter of the corresponding leader pin or bushing, whereby said rings will snap within said annular grooves when said rings are inserted within their respective recesses and said grooves come to register therewith, as said leader pins and bushings are inserted within their respective openings, locking said leader pins and bushings against axial displacement, the leading end of said leader pins and bushings tapering down to a smaller diameter to facilitate their passage through their respective rings.

6. A die set comprising a die shoe provided with leader pin openings, a punch holder provided with bushing openings coaxial with said leader pin openings, leader pins insertable within and having a diameter exactly corresponding to that of said leader pin openings, bushings for said leader pins insertable within and having a diameter exactly corresponding to that of said bushing openings, said leader pins and bushings being each provided with an annular groove, elastic split rings adapted to snap into said grooves forming an annular projection laterally extending therefrom, the leader pin and bushing openings being each provided with an annular recess laterally extending therefrom, the height of each recess being equal to the thickness of the annular projection of the corresponding leader pin or bushing, the diameter of said recess being sufficient to allow expansion of the corresponding elastic ring to a point where it will clear the diameter of the corresponding leader pin or bushing, whereby said rings will snap within said annular grooves when said rings are inserted within their respective recesses and said grooves come to register therewith, as said leader pins and bushings are inserted within their respective openings, locking said leader pins and bushings against axial displacement, said die shoe and punch holder having passages through which the split portion of said rings may be reached by an expanding tool, to expand the same.

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