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DEMOUNTABLE PIN OR SHANK ASSEMBLIES

Filed Feb. 10, 1942

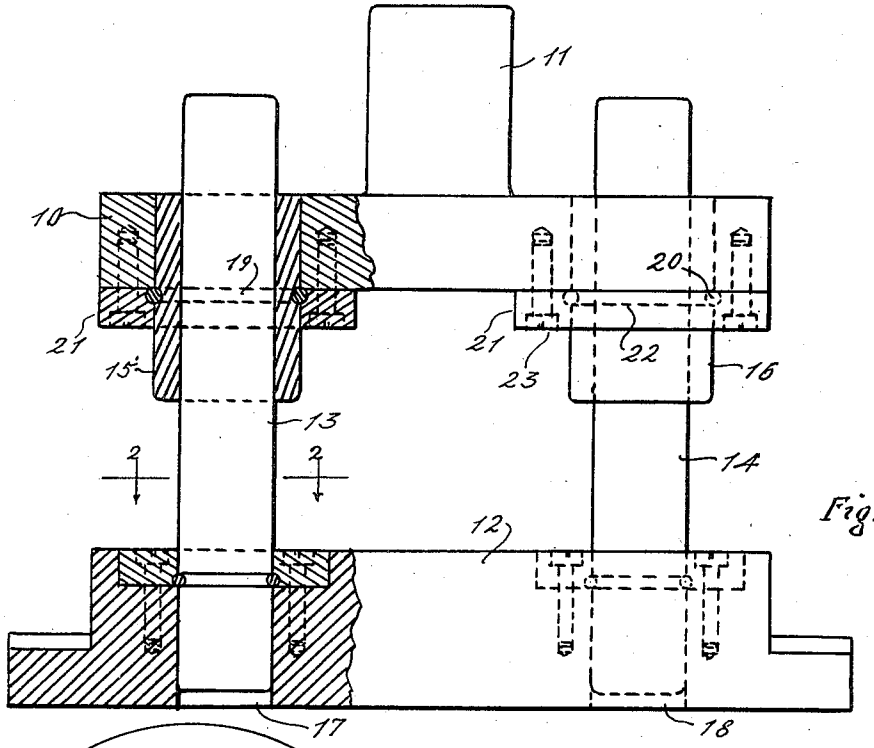


Fig. 1

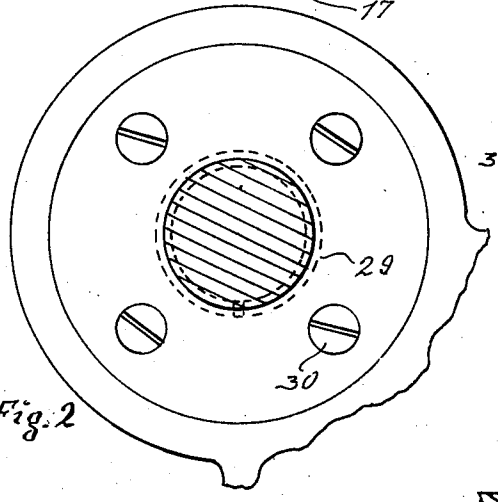


Fig. 2

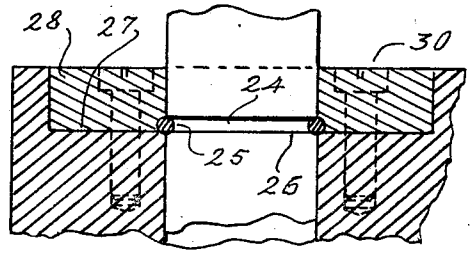


Fig. 3

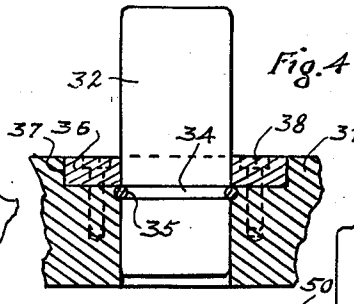


Fig. 4

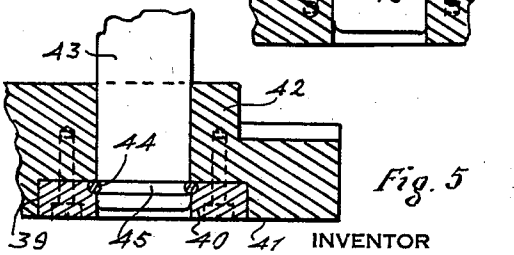


Fig. 5

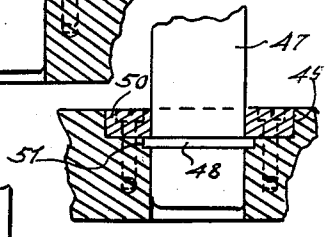


Fig. 6

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DEMOUNTABLE PIN OR SHANK ASSEMBLY

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Application February 10, 1942, Serial No 430,315

11 Claims (Cl. 164—113)

This invention relates to mechanical equipment, such as, for instance, die sets, and more particularly refers to improvements in the construction of parts in which accurate alignment of a guide member with respect to a holder, or with respect to another guiding member coaxial therewith, or both, is an essential requirement.

As an example, in die sets comprising a die shoe or base and a punch holder or top, it is absolutely essential to achieve a maximum of accuracy in the alignment of the leader pins and bushings cooperating therewith, in order to insure the accuracy of register of the die parts 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 in telescopic relation with bushings which are secured to the punch holder.

The usual method is to drill holes in perfect alignment in both die shoe and punch holder and then to bore the holes thus produced to a diameter about $\frac{2}{1000}$ of an inch smaller than the diameter of the leader pins and bushings, respectively to be forced therein by a press fit.

This procedure is not conducive to that accuracy which is so essential in mechanical equipment of the character mentioned because distortion is apt to occur due to various inaccuracies that may result during one or more of the manufacturing operations.

When the leader pins and bushings are forced into their respective holes the material may 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 so that the sum of these possible variations may, and often does, result in poor alignment with consequent friction and wear and lack of accurate register between the die parts.

Another objectionable feature of the method heretofore employed in securing leader pins and bushings in place is the fact that they can only be removed by the application of powerful pressure, with the consequent danger of increasing the ovalization of the holes and the lack of alignment.

In die set operations it is frequently desirable to grind the surface of the die shoe or punch holder, or both, and therefore it would be an advantage to have the leader pins and bushings removable so as to clear the entire surface of the die shoe or punch holder to the action of the tool used in machining such surface.

The primary object of the present invention is to provide a novel and improved construction of leader pin or bushing and holder therefor, whereby absolute accuracy of alignment between the pin or bushing and the hole provided therefor in its respective holder will be assured.

Another object is to provide in a die set a leader pin and bushing assembly in which the various parts will be aligned with a maximum of accuracy and in which the various parts can be easily assembled without the use of any forcing pressure.

A further object is to provide a novel and improved arrangement for securing a leader pin or bushing or shank to a holder so that the various parts can be easily taken apart and reassembled without difficulty and without loss of alignment.

A still 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 removed and replaced 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, in an enlarged scale, through line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical section thereof;

Fig. 4 is a fragmentary vertical section showing my invention as applied in an alternative form to securing a shank to a punch holder;

Fig. 5 is a fragmentary vertical section of a die shoe illustrating another alternative embodiment of my invention; and

Fig. 6 is another fragmentary vertical section of a die shoe illustrating still another alternative embodiment of my invention.

Referring to Figs. 1, 2 and 3 of the drawing, 10 designates the punch holder of a die set, provided with a shank 11, and 12 designates the die shoe of the same set, said parts being movably positioned with respect to each other by leader pins 13, 14 carried by the die shoe, said leader pins being coaxial with and slidable within bushings 15, 16 carried by the punch holder.

According to my invention the die shoe is provided with openings 17, 18, within which the lower end of the leader pins can be inserted and retained, the diameter of said openings exactly corresponding to the diameter of the leader pins,

so that instead of the usual press fit there will be a plug fit relationship between such parts.

In a similar manner the punch holder is provided with openings adapted to receive bushings 15, 16, the diameter of such openings being exactly the same as the diameter of the bushings.

It is thus obvious that the leader pins and bushings can be inserted in position without the application of pressure so that the main cause of distortion or inaccurate alignment is removed.

In accordance with my invention the pins and bushings are secured in position by providing such leader pins and bushings with an annular groove adapted to receive and retain a snap ring forming a circumferential bead projecting from the surface thereof and by imprisoning such bead within a groove provided in a retaining washer secured to the die shoe or punch holder by means of screws, or provided in such die shoe or punch holder, or provided partly in a retaining washer and partly in the die shoe or punch holder. In other words, the leader pins and bushings exactly fit within the holes therein provided in the die shoe and punch holder and are maintained in a fixed relation with respect to said die shoe and punch holder by annular projections registering with grooves, resulting from the cooperation between the part carrying such leader pins or bushings and retaining washers removably connected thereto.

For instance, in Fig. 1 it will be seen that the bushings 15, 16 are provided with an annular groove 19 in which is housed a snap ring 20, which tightly fits within said groove and projects outwardly therefrom to form an annular bead around the surface of the bushing. Such bead forms a stop limiting the axial extension of the bushing within the body of the punch holder, and the bushing is secured against axial displacement by means of a washer 21 embracing said bushing, the inner surface of said washer being provided with a countersunk recess 22, concentric with the bushing, of a depth corresponding to the diameter of the snap ring.

Said washer is secured to the punch holder by means of screws 23, so that when it is placed in position the bead formed by the snap ring will be imprisoned within the cavity formed by recess 22 and the surface of the punch holder, and the bushing will be securely locked against axial displacement.

An obvious advantage of the arrangement described is, of course, that the washer can be easily removed, simply by unscrewing screws 23, thus making it possible to remove the bushing without any difficulty.

In a similar manner, referring to Figs. 1, 2 and 3, it will be seen that each leader pin is provided with an annular groove 24, in which is housed a snap ring 25 forming a bead around the surface of the leader pin, which forms an axial stop against the surface 26 of the die shoe.

In the arrangement illustrated the die shoe is countersunk to form a recess 27, adapted to receive the retaining washer 28 which, as in the previous case, is provided on its inner surface with a central recess 29, the depth of which corresponds to the thickness of the snap ring 25.

When said retaining washer is placed in position and retained by the screws 30, the leader pin is locked against axial displacement, as previously explained.

The arrangement shown, in which the retaining washer does not project above the surface of the die shoe, is particularly advantageous in that it results in a greater useful clearance between the lower end of the bushings carried by the punch holder and the die shoe than would be the case if the retaining washer were projecting from the upper surface of the die shoe in the same manner that the washers 21 for the bushings 15, 16 project from the lower surface of the punch holder.

My invention can also be applied to provide a punch holder with a separate shank instead of an integral shank such as shown in Fig. 1. In Fig. 4, 31 designates a punch holder and 32 designates the shank therefor, said punch holder being provided with an opening 33, the diameter of which exactly corresponds to the diameter of the shank. Also in this case the shank is provided with an annular groove 34 in which is inserted a snap ring 35 forming an annular bead around the shank.

The shank is retained in position by a retaining washer 36 secured within a recess 37, provided in the punch holder by means of screws 38. Also in this case the retaining washer serves to lock the bead formed by the snap ring within a cavity, the depth of which corresponds to the diameter of the snap ring, but the drawing shows that as an alternative the cavity within which the snap ring is housed may be provided in the punch holder itself, the flat inner surface of the retaining washer merely forming the top of the cavity.

In Fig. 5 I illustrate the possibility of using the reverse arrangement in which the recess 39 for the retaining washer 40 is provided in the lower surface 41 of the die shoe 42. As in the previous cases, the leader pin 43 is provided with a snap ring 44 forming a circular bead around it, and the retaining washer 40 is formed with a recess 45, forming with the inner surface of recess 39 a housing for the bead formed by the snap ring preventing axial displacements of the leader pin.

It is obvious that in practice it is an advantage to provide the circular bead around the leader pin or bushing or shank by means of a snap ring because this makes it possible to use round stock of the proper diameter, requiring no rough turning operations. However, it is entirely within the scope of my invention to form an annular bead or projection in the leader pin or shank or other cylindrical piece by turning down to pin or shank diameter bar stock, the diameter of which is sufficient to provide the annular bead or projection.

Such a possibility is illustrated in Fig. 6 in which 46 designates a die shoe and 47 a leader pin, formed integral with an annular projection 48. The upper surface of the die shoe is countersunk to form a recess 49 within which can be placed a retaining washer 50 and the bottom surface of said recess 49 is countersunk to form a recess 51, within which will be received and retained the annular projection 48, as will be easily understood.

It is, of course, conceivable that the annular projection may have a diameter sufficiently large to directly fulfil the function of the retaining washer.

Such an arrangement is shown and claimed in applicant's companion application Serial No. 470,333, filed December 28, 1942, for Pin and bushing locks for die sets.

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 a retaining projection laterally extending from its surface, a disk having an opening through which said cylindrical member may be inserted, and means for securing said disk to said holder, said disk and holder together forming a housing for said projection, whereby said cylindrical member will be locked against axial displacement when said disk is secured to said holder.

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 projection laterally extending from its surface, a disk having an opening through which said cylindrical member may be inserted, and means for securing said disk to said holder, said disk and holder together forming a housing for said projection, the depth of said housing exactly corresponding to the thickness of said projection, whereby said cylindrical member will be locked against axial displacement when said disk is secured to said holder.

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, a snap ring inserted in said groove forming an annular projection laterally extending from the surface of said member, said ring having a portion of greatest width part of which fits said groove and part of which projects from said groove, a disk having an opening through which said cylindrical member may be inserted, and means for securing said disk to said holder, said disk and holder together forming a housing for said projection, the depth of said housing exactly corresponding to the greatest thickness of said projection, whereby said cylindrical member will be locked and secured against axial displacement in both directions when said disk is secured to said holder.

4. 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 projection laterally extending from its surface, and a disk having an opening through which said cylindrical member may be inserted, said disk being adapted to be secured to said holder, one of the said two last mentioned elements being provided with a recess adapted to house said projection, the depth of said recess exactly corresponding to the thickness of said projection, whereby said cylindrical member will be locked against axial displacement when said disk is secured to said holder.

5. 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, a snap ring inserted in said groove forming an annular projection laterally extending from the surface of said member, said ring having a portion of greatest width part of which fits said groove and part of which projects from said groove, and a disk having an opening through which said cylindrical member may be inserted, said disk being adapted to be secured to said holder, one of said two last mentioned elements being provided with a recess adapted to house said projection, the depth of said recess exactly corresponding to the greatest thickness of said projection, whereby said cylindrical member will be locked and secured against displacement in both axial directions when said disk is secured to said holder.

6. 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 projection laterally extending from its surface, a disk having an opening through which said cylindrical member may be inserted, said holder being provided with a recess adapted to receive said disk, and means for securing said disk to said holder, one of said two last mentioned elements being provided with a recess adapted to house said projection, the depth of said recess exactly corresponding to the thickness of said projection, whereby said cylindrical member will be locked against axial displacement when said disk is secured to said holder.

7. 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 projection laterally extending therefrom, a disk for each leader pin having an opening through which said leader pin may be inserted, means for securing said disks to said die shoe so as to imprison the leader pin projections therebetween, a disk for each bushing having an opening through which said bushing may be inserted, and means for securing said bushing disks to said punch holder so as to imprison the bushing projection therebetween, whereby said leader pins and bushings will be locked against axial displacement.

8. 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, a snap ring inserted in said groove forming an annular projection laterally extending therefrom, a disk for each leader pin having an opening through which said leader pin may be in-

serted, said disks being adapted to be secured to said die shoe, said disks and die shoe together forming housings for the leader pin projections, the depth of said housings corresponding to the thickness of said projections, and a disk for each bushing having an opening through which said bushing can be inserted, said disks being adapted to be secured to said punch holder, said disks and punch holder together forming housings for the bushing projections, the depth of said housings corresponding to the thickness of said projection, whereby said leader pins and bushings will be locked against axial displacement when said disks are secured in position.

9. 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, and means for restraining said leader pins and bushings against axial displacement.

10. 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, and demountable means for restraining said leader pins and bushings against axial displacement.

11. Means for detachably securing thrustwise, against stresses in both axial directions, a cylindrical member in the closely fitting bore of a support, comprising, in combination with such a cylindrical member and with a support having such a bore, an annular groove in said member, a split ring adapted substantially to fill said groove and being of such resiliency that it may be slid over an ungrooved portion of said member to snap into said groove, said split ring having a circular bead which projects beyond the periphery of said member when the ring is in the groove, said ring being longitudinally fixedly allocated in said groove when snapped into said groove, and a disc adapted to be detachably affixed to said support, having an opening registering with the bore of said support and longitudinally fixedly locking said bead onto said support, when it is thus affixed over the said ring lodged in said groove.

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