Jan. 27, 1948. A. BOLDUC 2,434,983

DIE REMOVING DEVICE

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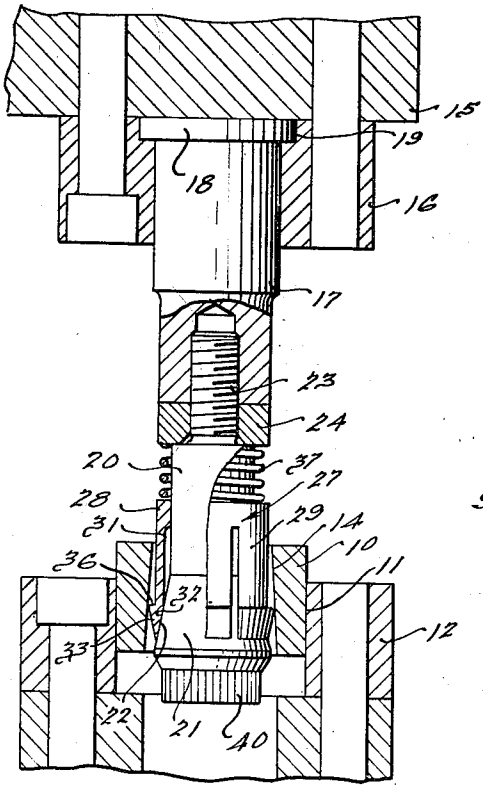


Fig. 1.

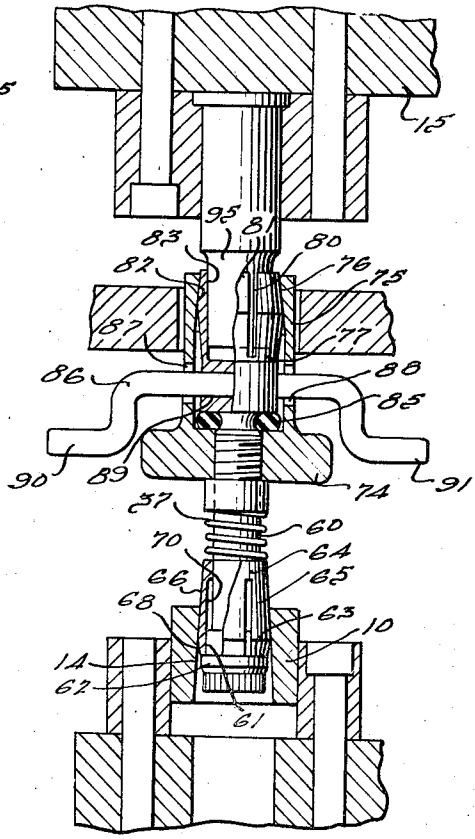


Fig. 2.

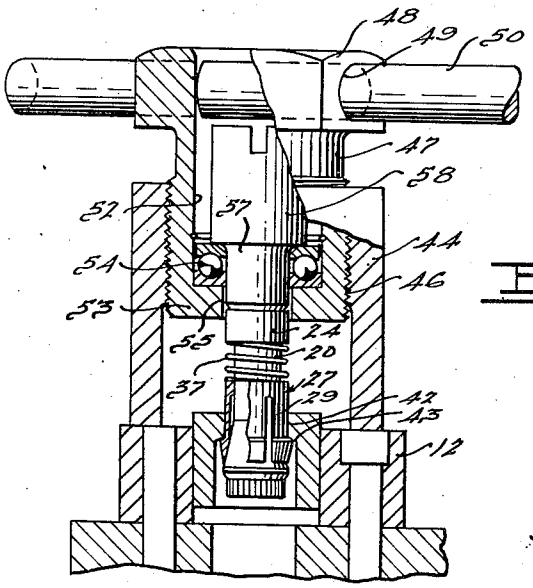


Fig. 3.

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DIE REMOVING DEVICE

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10 Claims. (Cl. 164—124)

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The invention relates generally to dies employed in perforating sheet metal or the like, and it has particular relation to a device for removing the dies from holders therefor.

In certain respects the invention relates to improvements over features embodied in my copending applications for patent, Serial No. 544,792, filed July 13, 1944, now Patent 2,413,943, granted Jan. 7, 1947, and Serial No. 574,589, filed January 25, 1945, now Patent 2,413,944, granted Jan. 7, 1947.

It is conventional to use a die element and a punch anchored on relatively movable parts of a machine for forming openings in sheet metal or the like. Usually the die is held in an opening in a plate or member and is more or less press fitted in the opening in order to positively resist displacement during use of the machine. In some instances, the die may be releasably held in the opening by a spring pressed ball or the like but in any event considerable pull usually is required before the die can be removed. The copending applications for patent are concerned with devices for pulling dies out of openings without requiring any removal of the plate or holder and the present invention is concerned with improvements in such devices.

One object of the invention is to provide an improved device for removing dies which includes a shank and an expansible element for engaging the die opening, wherein the expansible element will be more positively thrown or shifted through the die opening when the shank is moved in a direction to insert the element in the opening.

Another object of the invention is to provide an improved device of the general type stated which is particularly suitable for removing a deep die from the member or plate holding the die.

Another object of the invention is to provide an improved form of expansible element and cooperating shank so as in general to improve the operation of the device and to make it more durable and efficient.

Another object of the invention is to provide an improved type of die removing device which may be readily attached either to a punch having a stripper plate associated therewith or a punch where the stripper plate is not used.

Another object of the invention is to provide an improved type of die removing device which grips the outside of the punch and which is so constructed that it may be telescoped over the punch and then allowed to grip it in a positive manner.

Other objects of the invention will become apparent from the following specification, from the drawings relating thereto, and from the claims hereinafter set forth.

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For a better understanding of the invention reference may be had to the drawings wherein:

Figure 1 is a side elevational view of a device constructed according to one form of the invention with certain parts broken away for the purpose of clarity;

Fig. 2 is an elevational view of a modification of the device for removing a die which also includes means co-operable with the punch for retracting the die; and,

Fig. 3 is a similar elevational view illustrating a manually operable device for operating the die puller.

Referring to Fig. 1, the apertured die is indicated at 10 and is shown as disposed in an opening 11 of a holding plate or support 12. This holding plate or support 12 usually is a stationary part of the machine. The die is shown as having an opening 14 which increases from a smaller diameter at its upper end to a larger diameter at its lower end so as to provide a gradually tapered bore.

The upper part of the machine comprises a movable platen 15 having a support or the like 16 fastened thereto, and this support holds a punch element 17. It might be noted that the upper end of the punch is enlarged as indicated at 18 and this enlargement fits in a rabbeted end of an opening 19 in the support 16 so as to provide a positive anchor for the punch when the platen is moved upwardly.

The device for removing the die 10 comprises a shank 20 having a head 21 at its lower end which is formed with a tapered outer periphery indicated at 22. At its upper end the shank has a smaller screw threaded stud portion 23 threaded into the lower end of the punch element 17, and a collar 24 is provided around the stud and next to the punch. Between the collar 24 and the tapered head 21 on the shank, an expansible die engaging element 27 is provided and this element is in the form of a sleeve having an annular upper end portion 28 slidably fitting the shank body and a plurality of fingers 29 projecting downwardly from such annular end portion. The inside diameter of the fingers is substantially larger than the diameter of the shank body so as to provide a clearance indicated at 31.

The lower ends of the fingers have internal, tapered faces 32 adapted substantially to fit the taper 22 on the shank head and the outer surfaces of the end portions of the fingers are also

tapered but in the opposite direction, as indicated at 33, so as to provide a pilot facilitating entry of the element into the die opening 14. On each finger the upper end of the outer taper 33 joins a radially, inwardly directed shoulder 36 and this shoulder provides an abutment for engaging the die. The element 27 is normally urged downwardly by a coil spring 37 between the element and the collar 24.

Assuming that the die is in its lower position and it is desired to extract it, the upper platen 15 is moved downwardly and this causes the tapered head 21 on the shank to move into the opening 14 but the element 27 does not follow through the opening at once since the tapered peripheries 33 of the fingers will engage the edge of the opening. This engagement temporarily interrupts the movement of the element and the spring 37 compresses and at the same time the head 21 moves downwardly away from the fingers and this provides space for the lower ends of the fingers to contract to a smaller diameter. Therefore, as soon as the space mentioned is created and the spring force is sufficient, the ends of the fingers will contract and move into the die opening and this action is, of course, facilitated by the tapers 33. Continued movement of the element 27 occurs and if desired, its movement may be continued until the shoulders 36 actually move entirely through the die. As the die element enters the die opening in the die, it expands against the enlarging wall of the opening and moves downwardly.

Upon reverse movement of the platen 15 and upward movement of the shank 20, the element 27 tends to remain stationary and with the tapered head 21 engaging the tapers 32 on the fingers, the fingers will be pressed very forcefully against the die. This will cause the die to move with the shank and element 27 upon continued upward movement of the shank. After the die is removed, the shank 27 may be removed so as to permit easier separation of the die and the lower end of the shank is serrated so as to facilitate this operation.

The construction shown by Fig. 3 is substantially the same as that shown by Fig. 1 in so far as the expansible element and shank are concerned, although it will be noted that a different form of die is shown. This die has an opening 42 terminating inwardly in a shoulder 43 which is particularly adapted to be engaged by the shoulders on the fingers 29. In order to move the shank 20 upwardly, a manually operable device is provided which includes a bushing or sleeve 44 adapted to rest on the support 12, and this bushing is internally threaded as indicated at 46 and receives a threaded element 47 having a hexagonal head 48 at its upper end. This head may be apertured as indicated at 49 so as to receive a handle 50 adapted to be used in turning the element 47. The element 47 is centrally bored as indicated at 52 and the lower end of the element has an inwardly directed flange 53 adapted to provide a support for a ball bearing 54. The flange 53 is apertured as indicated at 55 to receive the threaded upper end of the shank 20 which in this case may be threaded into a pin 57 terminating upwardly in a head 58, and the head 58 rests on the ball bearing 54. From this it should be clear that if the element 47 moves upwardly, the shank 20 also must move upwardly.

The device functions in practically the same manner as described in respect to Fig. 1 in that the shank is moved downwardly into the die opening and the element 27 follows, and finally the fingers engage the die within the opening. Upward movement of the shank 20 is accomplished by turning the element 47 manually by means of handle 50, and of course, at the same time, the bushing 44 is held stationary. After removal of the die, the shank may be unscrewed from the head 57 in the same manner as it is removed from the punch 17 in Fig. 1, and the die thus may be separated from the device very easily.

In the construction shown by Fig. 2, a somewhat different type of shank is provided. This shank is indicated at 60 and at its lower end has an enlarged diameter 61 which terminates in a head 62 thereby forming an annular shoulder 63. The expansible element in this instance has an annular portion 64 engaging the shank body and fingers 65, but these fingers are somewhat different from those already described. More particularly, each finger has an outer tapered surface 66 adapted substantially to fit the tapered opening in die 10 while its lower end has a reversely tapered outer surface 68 adapted to serve as a piloting surface. The inner surface of the fingers in this case, are cylindrical as indicated at 70.

The shank is threaded into the base end of a thimble-like element 74 having a side wall 75 formed at its upper end with a conical or tapered surface 76. The thimble receives an expansible element 77 generally also of thimble shape, and such element is axially slotted as indicated at 80 to form fingers 81. Each of these fingers has an outer tapered surface 82 adapted substantially to fit the tapered surface 76 and the inner surfaces of the fingers are cylindrical as indicated at 83. A rubber bushing 85 is provided between the base portions of the two thimbles and it constantly acts to hold the tapered surfaces 76 and 82 together. A finger gripping element 86 extends through opposed openings 87 and 88 in the wall of thimble 74 and also through a diametrical opening 89 in the base portion of the thimble element 77, and this element terminates in finger engaging legs 90 and 91. The thimble 77 is adapted to grip a punch indicated at 95 fastened to the upper platen 15 as previously indicated in connection with Fig. 1.

It will be observed that the punch in this figure is associated with a stripper plate although it will be apparent that the die removing attachment can be used whether or not a stripper plate is present.

With the punch raised sufficiently, the device for removing the die may be placed between the punch and die and then by pressing upwardly against the base of thimble 74 with the thumbs and pulling downwardly with the fingers on the finger engaging legs 90 and 91 of element 86, the inner thimble may be pulled downwardly against the action of the rubber element 85 which allows the fingers 81 to expand. With the fingers expanded the inner thimble may be moved upwardly rather easily over the punch 95 and then upon release of the manual pressure, the fingers 81 will grip the surface of the punch. The upper platen now may be lowered so as to cause the element 64 and shank to move into the die opening, and it might be mentioned at this point that this movement downwardly of the shank causes the fingers 65 to contract and move into the die opening as soon as the cylindrical shoulder 61 on the shank moves downwardly past the ends of the fingers.

This allows the fingers to contract and move into the die opening but after sufficient movement through the die opening, the fingers expand against the wall of the die opening and then upon reverse movement of the shank, the cylindrical wall 61 moves within the fingers and the shoulder 63 engages the ends of the fingers. Upon further upward movement of the platen 15, the resistance to withdrawal of the die creates a pull on the outer thimble 74 and this, of course, causes the inner thimble to be contracted more forcefully about the punch 95 and therefore causes the fingers 81 to grip the punch more forcefully. This gripping force increases in accordance with the resistance to removal of the die. Continued movement of the platen therefore, will cause the die to be removed and removal of the die from the shank may be accomplished as previously described.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the claims.

What is claimed is:

1. A device for pulling a die element or the like out of a holder wherein the element has a die opening, which comprises a shank insertable into the opening, a head on the insertable end of the shank, a sleeve element slidable on the shank towards and from said head and having axial slots leading from an intermediate point in the sleeve to the end thereof next to the head so as to provide resilient fingers, a coil spring on the shank abutting at one end the opposite end of the sleeve, and abutment means on the shank engaging the opposite end of the spring.

2. A device for pulling a die element or the like out of a holder wherein the element has a die opening, which comprises a shank insertable into the opening, a head on the insertable end of the shank, a sleeve element slidable on the shank towards and from said head and having axial slots leading from an intermediate point in the sleeve to the end thereof next to the head so as to provide resilient fingers, a coil spring on the shank abutting at one end the opposite end of the sleeve, and abutment means on the shank engaging the opposite end of the spring, said fingers having axially tapered surfaces increasing in diameter towards the free end thereof and the head being axially tapered substantially to fit the tapered surfaces on the fingers.

3. A device for pulling a die element or the like out of a holder wherein the element has a die opening, which comprises a shank insertable into the opening, a head on the insertable end of the shank, a sleeve element slidable on the shank towards and from said head and having axial slots leading from an intermediate point in the sleeve to the end thereof next to the head so as to provide resilient fingers, a coil spring on the shank abutting at one end the opposite end of the sleeve, and abutment means on the shank engaging the opposite end of the spring, said fingers having cylindrical inner surfaces and the head having a cylindrical shoulder adapted to receive the ends of the fingers and an annular flange at the end of the shoulder adapted to engage the ends of the fingers.

4. A device for pulling a die comprising an outer cup-like element, an inner cup-like element having axial slots in its side wall to provide resilient fingers, axially tapered surfaces on the adjacent peripheries of the outer cup and the fingers of the inner cup to cause radial contraction of the fingers upon movement of the inner cup in an axial direction, and resilient means tending to move the inner cup in said axial direction so as to hold the tapered surfaces in contact.

5. A device for pulling a die comprising an outer cup-like element, an inner cup-like element having axial slots in its side wall to provide resilient fingers, axially tapered surfaces on the adjacent peripheries of the outer cup and the fingers of the inner cup to cause radial contraction of the fingers upon movement of the inner cup in an axial direction, and resilient means between the base portions of the cup elements urging them apart.

6. A device for engaging a die or the like comprising an outer sleeve means, an inner sleeve means having axial slots providing resilient fingers at one end of such sleeve means, resilient means between the sleeve means urging them in one direction relatively, and complementary tapered surfaces on the outer sides of the fingers and on the inner periphery of the outer sleeve means adapted to cause contraction of the fingers when the sleeve means are moved relatively in the direction indicated.

7. A device for engaging a die or the like comprising an outer sleeve means, an inner sleeve means having axial slots providing resilient fingers at one end of such sleeve means, resilient means between the sleeve means urging them in one direction relatively, complementary tapered surfaces on the outer sides of the fingers and on the inner periphery of the outer sleeve means adapted to cause contraction of the fingers when the sleeve means are moved relatively in the direction indicated, and accessible means connected to the inner sleeve means for enabling manual movement thereof against the action of the resilient means.

8. A device for engaging a die element or the like comprising inner and outer concentric members movable relatively in an axial direction, said members having their adjacent peripheral surfaces tapered in an axial direction substantially in fitting relation, one of the members having axial slots through the tapered surface portion so as to provide resilient fingers, and resilient means operatively connecting the members and acting constantly to urge the tapered surfaces together so as to move the fingers radially.

9. A device for removing a die element having a die opening comprising a shank insertable into the die opening and having a head on its insertable end, a slidable element on the shank and having portions expansible to engage the die, resilient means on the shank urging the element towards the shank head, and means on the other end of the shank for engaging a punch element and comprising relatively slidable sleeve elements one within the other and having their adjacent peripheries tapered axially in substantially fitting relation with the tapered portion of the inner sleeve element axially slotted to provide fingers for gripping the punch, and resilient means constantly urging the sleeve elements axially and relatively so as to hold the tapered surfaces in contact.

10. A device for removing a die element having a die opening comprising a shank having one end adapted to be inserted into the die opening, means on the insertable end of the shank for engaging the die element so as to enable pulling the latter when movement of the shank is re-

versed, and means on the other end of the shank adaptd to engage a punch element cooperable normally with the die element so that the die element may be withdrawn when the punch element is moved away from the die element after the shank is inserted into the die opening, the last means including means adapted to telescopically receive and grip the punch element.

ALBERT BOLDUC.

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