Feb. 24, 1953 A. BOLDUC 2,629,274

PUNCH-REMOVING DEVICE

Filed April 19, 1948 2 SHEETS—SHEET 1

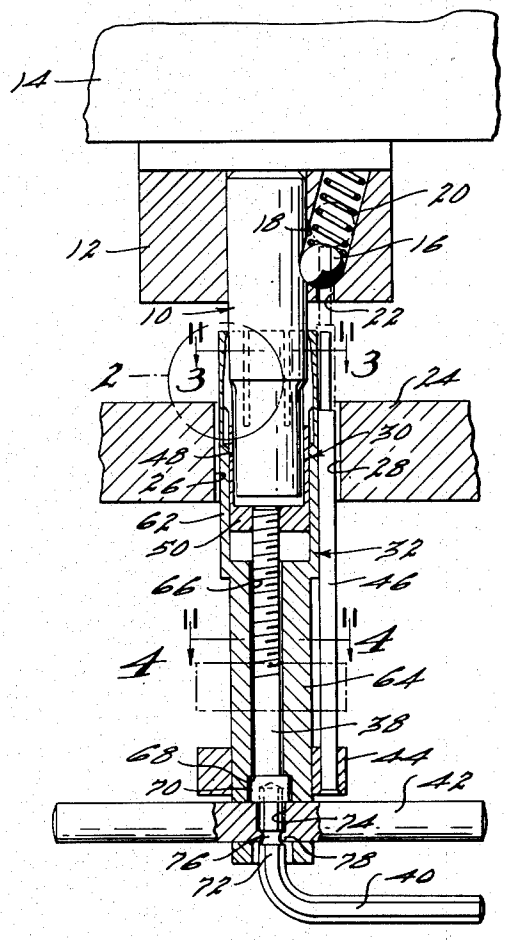

Fig. 1.

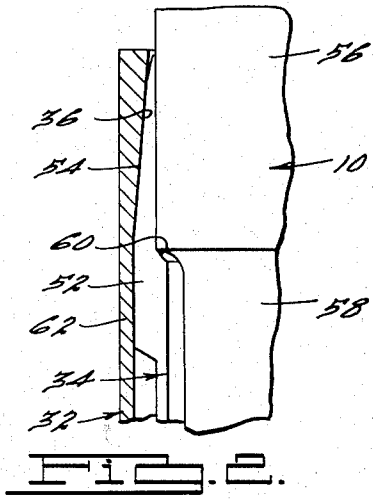

Fig. 2.

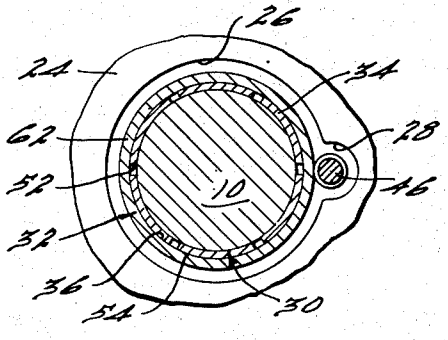

Fig. 3.

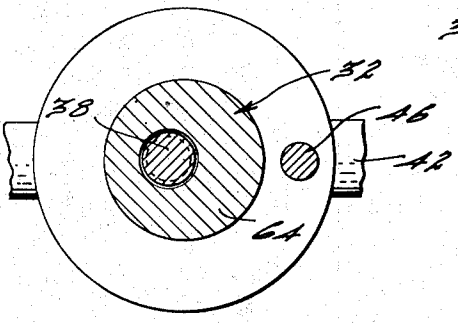

Fig. 4.

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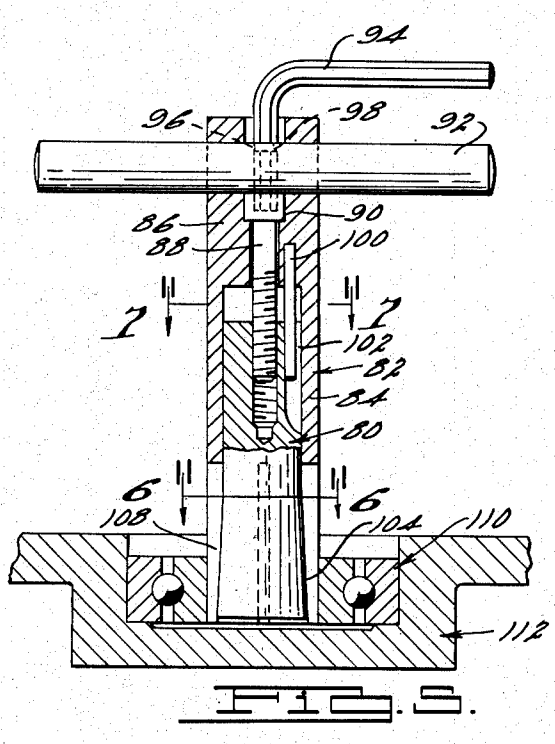

FIG. 5.

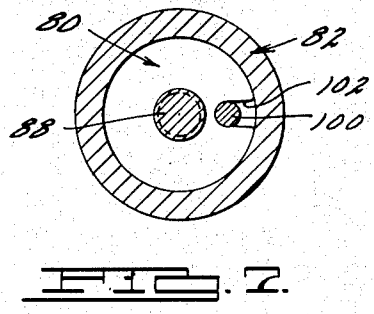

FIG. 7.

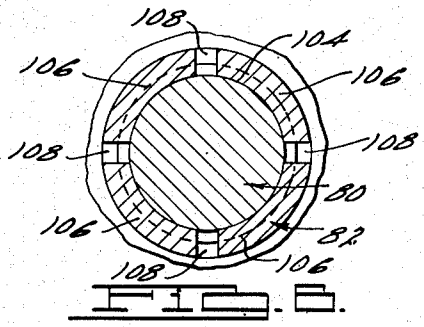

FIG. 6.

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PUNCH-REMOVING DEVICE

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4 Claims. (Cl. 81—3)

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This invention relates to new and useful improvements in pulling devices for removing punches, bearings and the like from their holders or retainers.

In conventional punch presses, the punches are carried by a hydraulically or mechanically-operated platen. The platen frequently is quite large, and a large number of punches may be employed in a single punching operation. The punches may be distributed over a relatively large area, since they are arranged in different positions on the platen, depending on the exigencies of the particular situation.

Each punch usually fits snugly in a punch retainer and is held securely in the retainer by a spring-loaded ball detent. It is necessary that the punches be held securely on the platen in order to prevent them from being inadvertently pulled from the retainers when they are withdrawn from the work.

Also, it is conventional practice to provide a stationary stripper plate in front of the platen which holds the work down when the platen is raised to remove the punches. The punches operate through holes in the stripper plate, and when the platen is retracted the punches are disposed entirely behind the plate. The large area of the platen and the fact that the punches are disposed behind the stripper plate when the platen is retracted makes it very difficult to remove the punches. Also, it will be readily apparent that if a punch is broken, it is even more difficult to remove than an undamaged punch, since it can be reached only through the hole in the stripper plate, unless the latter or other parts of the machine are disassembled. In this connection it should be noted that the travel of the platen is relatively small, so that the maximum space between it and the stripper plate is always relatively small.

Heretofore removal of punches has been a difficult and arduous task. The present invention is concerned with a device for removing punches easily and expeditiously from their retainers.

Ball bearings and the like frequently are mounted with the outer races thereof press fitted into suitable bearing retainers. These bearings frequently are difficult to remove, and this is particularly true if the bearing retainer is cup-shaped or otherwise closed behind the bearing. The present invention also is concerned with means for removing bearings from their holders or retainers.

An important object of the present invention is to provide a pulling device that is readily insertible through and into relatively small openings to grip an object to be removed.

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Another object of the invention is to provide a pulling device having a gripping element which acts positively and quickly to engage an object to be removed and which effectively holds such object during removal thereof.

Still another object of the invention is to provide a pulling device which fixedly engages the object to be removed and which clamps the object in such manner as to resist any tendency to pull off of the object.

Yet another object of the invention is to provide a pulling device which is particularly adapted for removing punches and which includes means for releasing the ball detent from the punch before the latter is removed from the punch retainer.

A further object of the invention is to provide a pulling device having novel means permitting easy manual operation and manipulation thereof.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the drawings forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a longitudinal sectional view of a puller embodying the invention adapted for pulling punches or the like from their retainers, said figure showing the puller applied to a punch and illustrating the relationship between the punch and the puller with adjacent parts of a punch press;

Fig. 2 is an enlarged, fragmentary view showing the portion of Fig. 1 enclosed in the circle 2;

Fig. 3 is an enlarged, fragmentary, transverse sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary, transverse sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a side elevational view showing a modified puller construction embodying the invention, and adapted for pulling bearings or the like from their retainers, said figure showing the puller applied to a conventional bearing which is to be removed from a bearing retainer and parts of the puller being shown in section for clearness of illustration;

Fig. 6 is an enlarged, fragmentary, transverse sectional view taken on the line 6—6 of Fig. 5; and

Fig. 7 is an enlarged, transverse sectional view taken on the line 7—7 of Fig 5.

The form of the invention adapted primarily

for pulling punches or the like shown, and particularly in Figs. 1–4, is first described.

A punch is indicated at 10 and is shown mounted in the usual punch retainer 12 which in turn is carried by the usual movable platen 14. A ball detent 16 within the punch retainer 12 is pressed into a recess 18 inside of punch 10 by a spring 20. The punch 10 fits tightly in the punch retainer 12 and the ball detent 16 locks the punch in the retainer.

In order to remove the punch 10 from the retainer 12, it is necessary to push the ball detent 16 upwardly away from the punch and then pull the punch downwardly out of the retainer. Usually an elongated rod or pin is applied against the ball detent 16 through an opening 22 in the punch retainer 12.

A stationary stripper plate 24 is positioned below and parallel to the platen 14, and the punch 10 operates through a hole 26 in the plate. At one side of the hole 26 and in register with the hole 22 is a lateral recess 28 which permits a pin to be inserted upwardly through the stripper plate and into the hole 22 to disengage the ball detent 16 from the punch 10.

The device for removing the punch 10 comprises inner and outer telescoping members 30 and 32. The outer member 32 is insertible through the opening 26, and the inner member 30 is adapted to fit snugly over the punch 10, as shown in Fig. 1. Resilient, radially flexible fingers 34 are provided at the forward end of the inner member 30, and the outer member 32 is formed with an internal cam surface 36 which presses the fingers 34 radially inwardly against the punch 10 when the inner member is advanced axially in the outer member. In this connection it will be readily apparent that the fingers 34 can be released from the punch 10 merely by retracting the inner member 30 in the outer member 32.

Any suitable means may be employed for moving the inner member 30 back and forth in the outer member 32. In the form of the invention here shown by way of illustration, I mount an Allen-head screw 38 for free rotation in the rearward portion of the outer member 32. The screw 38 extends axially through the member 32 and the projecting inner end thereof is threaded into the inner member 30. As shown in Fig. 4, the screw 38 is located eccentrically with respect to the inner member 30 so as to prevent the latter from rotating in the outer member 32 during operation of the screw. The screw 38 is rotated by a conventional manually operable Allen wrench 40.

A handle 42 extends transversely through the outer member 32 and provides a convenient handgrip for pulling the punch 10 from the punch retainer 12 after the device has been clamped solidly on the punch.

In order to release the ball detent 16, a collar 44 is mounted for sliding movement on the outer member 32, and this collar carries a pin 46 which extends forwardly alongside the outer member. When the device is applied to the punch 10, the pin 46 extends through the recess 28, and the forward terminal portion thereof is disposed in alignment with the hole 22. When the collar 44 is advanced from the full-line to the dotted-line position in Fig. 1, the pin 46 is inserted through the hole 22 and forces the ball detent 16 from the full-line to the dotted-line position to release the punch 10. The punch may then be readily removed from the retainer 12 by pulling downwardly on the handle 42. Pin 46 holds the ball detent 16 away from the punch 10 during initial downward movement of the latter and until the recess 18 moves downwardly into a position where it can no longer be engaged by the detent. The detent 16 may then be released by pin 46 without appreciably affecting further withdrawal of the punch.

More specifically the inner member 30 here shown has an annular wall portion 48 and an integral, relatively thicker transverse portion 50 at the rearward end of the annular wall 48. The flexible fingers 34 preferably are formed integrally with the annular wall portion 48. In the drawings the fingers 34 are defined by a plurality of longitudinal slots 52 which extend from an intermediate point in the wall portion 48 axially through the forward end thereof. The terminal portions of fingers 34 are formed with tapered external surfaces 54 and the fingers preferably are tapered to a relatively thin edge, as perhaps best shown in Fig. 2. According to conventional practice, the rearward portion 56 of the punch 10 is somewhat larger in diameter than the forward work-engaging portion 58 thereof, and the inner surfaces of fingers 34 preferably are offset, as at 60 (Fig. 2), to compensate for this difference in diameter.

In use, the fingers 34 are supported internally by the punch 10 and externally by the outer member 32; consequently, they may be made relatively thin without danger of breakage. It is an advantage to be able to use relatively thin metal fingers, since they act positively and quickly to engage the punch 10. Further, they are more flexible and sensitive and therefore are less likely to slip on the punch when the latter is being pulled from the retainer 12. It is essential that all parts of the device be maintained as thin as possible, since the radial dimension between the punch 10 and the wall of opening 26 is relatively small. One of the primary problems here is to provide a device that will enter the very small space which is available and at the same time is strong and rugged enough to serve its intended purpose.

The outer member 32 comprises a forward skirt portion 62 and a rearward shank portion 64. The skirt portion 62 is generally cylindrical in transverse section and fits snugly but slidably over the inner member 30. Also, it will be observed that the skirt portion 62 is somewhat longer than the inner member 30 so that the latter is free to move a substantial distance axially therein. As suggested, the forward terminal portion of the skirt 62 is formed with an internal, forwardly tapered, annular cam surface 36 which engages the tapered external surfaces 54 of fingers 34 when the inner member 30 is advanced by the screw 38 to force or flex the fingers into pressed engagement with the punch 10. When the inner member 30 is retracted in the outer member 32, the external cam surfaces 54 disengage the internal cam surface 36, and the fingers 34 are permitted to expand sufficiently so that they can be easily and quickly fitted over the punch 10.

The rearward shank portion 64 preferably is relatively elongated and conveniently may be made approximately as long as the forward skirt portion 62. Also, the shank 64 preferably is somewhat smaller in diameter than the skirt portion 62 in order to bring the pin 46 as closely as possible to the skirt. A bore 66 extends axially through the shank 64 to accommodate the screw 38, and the rear terminal portion of the bore is

countersunk to provide a radial seat 68 for the enlarged head portion 70 of the screw.

The handle 42 extends transversely through the shank portion 64 behind the head 70 and thus serves as a retainer for the screw 38.

The wrench 40 is generally L-shaped, according to conventional practice, and a portion 72 thereof extends into the socketed head 70 through a transverse hole 74 in handle 42. According to the present invention the portion of the wrench which extends through handle 42 is formed with an annular peripheral groove 76, and the handle is peened over to provide an annular bead 78 which projects into the groove 76. The annular bead 78 effectively fastens the wrench 40 to the handle 42 but permits the wrench to be freely rotated to operate the screw 38.

In operation, the device is first slipped over the punch 10, as shown in Fig. 1, with the inner member 30 retracted in the outer member 32. The wrench 40 is then actuated manually to rotate the screw 38 so that the latter advances the inner member 30 to press the flexible resilient fingers 34 against the internal annular cam surface 36. As the inner member 30 advances, the flexible fingers 34 are wedged solidly between the cam surface 36 and the punch 10. An effective grip is thus afforded between the fingers 34 and the punch 10 so that the device can not be pulled axially off the punch. The ball detent 16 is then released by manipulating the collar 44 and pin 46 in the manner hereinabove described, and a downward pull is exerted against the handle 42 to pull the punch 10 from the punch retainer 12.

The instant device is effective for removing either damaged or undamaged punches. A punch very seldom, if ever, breaks within the retainer 12. Usually there is a stub which projects from the retainer, and this stub can be engaged by the device for removal in the manner hereinabove described.

The bearing puller shown in Figs. 5–7 is generally similar to the form of the invention first described. However, in the latter construction, the device is adapted to be expanded instead of contracted against the element to be removed.

The bearing puller here shown by way of illustration comprises an inner member 80 in the form of an elongated generally cylindrical plug, and an outer member 82 having a forward sleeve-like portion 84 which fits snugly around the inner member 80. The rearward portion of outer member 82 is in the form of an elongated, generally cylindrical shank 86. Mounted for free rotation in the shank 86 is an Allen-head screw 88. The head of screw 88 seats forwardly against an annular shoulder 90, and the threaded shank portion thereof is screwed axially into the inner member 80. A handle 92 extends transversely through the shank 86 behind the screw 88, and an Allen wrench 94 extends diametrically through the handle 92 into the socketed head of the screw. The wrench 94 preferably is provided with an annular, peripheral groove 96, and the handle 92 preferably is peened to provide an annular bead 98 which enters the groove to hold the wrench 94 associated with the screw 88. A guide pin 100 embedded in the shank 86 projects forwardly into a guideway 102 in the inner member 80 to prevent relative rotation between the latter and the outer member 82.

Except for the specific means for preventing relative rotation between the inner and outer members 80 and 82, the above construction is generally similar to the form of the invention first described. This form of the invention differs primarily from the first form in that the inner member 80 is formed with a flared terminal portion which provides an external, annular cam surface 104, and the outer member 82 is provided with overlying terminal fingers 106. In the form of the invention here shown, the fingers 106 are formed integrally with the outer member 82 and are defined by axial slots 108 which extend from an intermediate point in the skirt portion 84 through the forward end thereof. The inner surfaces of fingers 106 are longitudinally tapered, and the taper angle preferably complements or coincides with the angle of cam surface 104.

In operation, the fingers 106 may be flexed radially by retracting the inner member 80 axially in the outer member 82. As the inner member 80 moves rearwardly or inwardly, the cam surface 104 presses against and expands the fingers 106. Conversely, the flexible fingers 106 may be contracted from an expanded position merely by advancing the inner member 80 in the outer member 82. It will be readily apparent that the inner member may be moved back and forth in the outer member by rotating the wrench 94.

In Fig. 5 I have shown the device associated with a ball bearing 110 of conventional design which is disposed within a conventional bearing retainer 112. For the purpose of this discussion, it is assumed that the outer race of the bearing 110 is press fitted in the retainer 112 and that it is desired to remove the bearing from the retainer.

In use, the device is inserted into the inner race of the bearing 110 with the inner member 80 fully advanced and the fingers 106 contracted. The outer member 82 should fit the inner race of the bearing snugly but slidably. The inner member 80 is then retracted in the outer member 82 by rotating the wrench 94 and the screw 88. As the inner member 80 retracts, the cam surface 104 is tightened against the flexible fingers 106 to expand the latter solidly against the inner race of the bearing. When the inner member 80 has been retracted as far as possible, the fingers 106 are wedged solidly between the bearing and the cam surface 104, and the bearing may be removed from the retainer 112 by pulling on the handle 92.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the size, shape, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the invention, I claim:

1. A device for pulling a punch element out of a punch retainer through an opening in a stripper plate comprising telescoping inner and outer sleeve members having forward terminal portions insertable through the opening and over the punch element, the forward terminal portion of said outer sleeve member formed with an internal tapered cam surface and said inner sleeve member having axial slots extending from an intermediate portion in the sleeve member to the forward end thereof to provide flexible fingers; means for moving the inner sleeve member axially in both directions in said outer sleeve member so that the resilient fingers can be contracted and held solidly against the punch element by advancing the inner sleeve member in the outer

sleeve member to press the ends of said resilient fingers against said cam surfaces and so that the resilient fingers can be expanded to release the punch element by retracting the inner sleeve member in the outer sleeve member, the last-mentioned means comprising a manually operable screw mounted to rotate freely in said outer sleeve member and threaded into said inner sleeve member; and including means for holding said screw against axial movement relative to said outer sleeve member, whereby rotation of said screw moves the inner sleeve member axially in said outer sleeve member.

2. The combination as set forth in claim 1 wherein said screw is eccentrically received by said inner sleeve member, so that the inner sleeve member will not be rotated in said outer sleeve member by operation of said screw.

3. A device for releasing the ball detent which conventionally holds a punch element in a punch retainer and then pulling the punch out of the punch retainer through an opening in a stripper plate comprising telescoping inner and outer sleeves having forward terminal portions insertable through the opening and over the punch element, a collar slidable on said outer sleeve; a pin carried by and movable with said collar, said pin extending forwardly alongside the outer sleeve and engageable with the ball detent when the inner sleeve is inserted over the punch element so that the detent can be released from the punch element by advancing the collar on said outer sleeve, an internal annular cam surface at the forward end of said outer sleeve tapering toward the end of the sleeve; contractible resilient fingers at the forward end of said inner sleeve engageable with and contractible by said internal cam surface; and means for advancing and also retracting the inner sleeve in said outer sleeve so that the resilient fingers can be contracted and held solidly against the punch element by advancing the inner sleeve in the outer sleeve to press the ends of said resilient fingers against said internal cam surface and so that the resilient fingers can be expanded to release the punch element by retracting the inner sleeve in said outer sleeve to disengage said flexible fingers from said internal cam surface.

4. A device comprising inner and outer members, one of said members having flexible resilient fingers and the other of the members having a cam surface coactive with said fingers upon relative axial movement between said members to flex the fingers radially, an Allen-head screw extending axially through the outer member and threaded into said inner member a substantial distance behind said fingers and said cam surface; a handle extending transversely through the outer member behind said screw, said handle extending across the head of the screw and holding the latter against axial movement in one direction; an Allen wrench having angularly related portions, one of said portions extending axially into said outer member and transversely through said handle into the socket head of said screw, said wrench being freely rotatable in said outer member and in said handle to rotate said screw; an annular peripheral groove in the portion of said wrench within said handle; and a radially projecting stop means on said handle extending into said radial groove to prevent withdrawal of said wrench from said screw.

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