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2,331,167

EXPLOSION-TYPE PULLER

Filed May 23, 1942

Fig. 1.

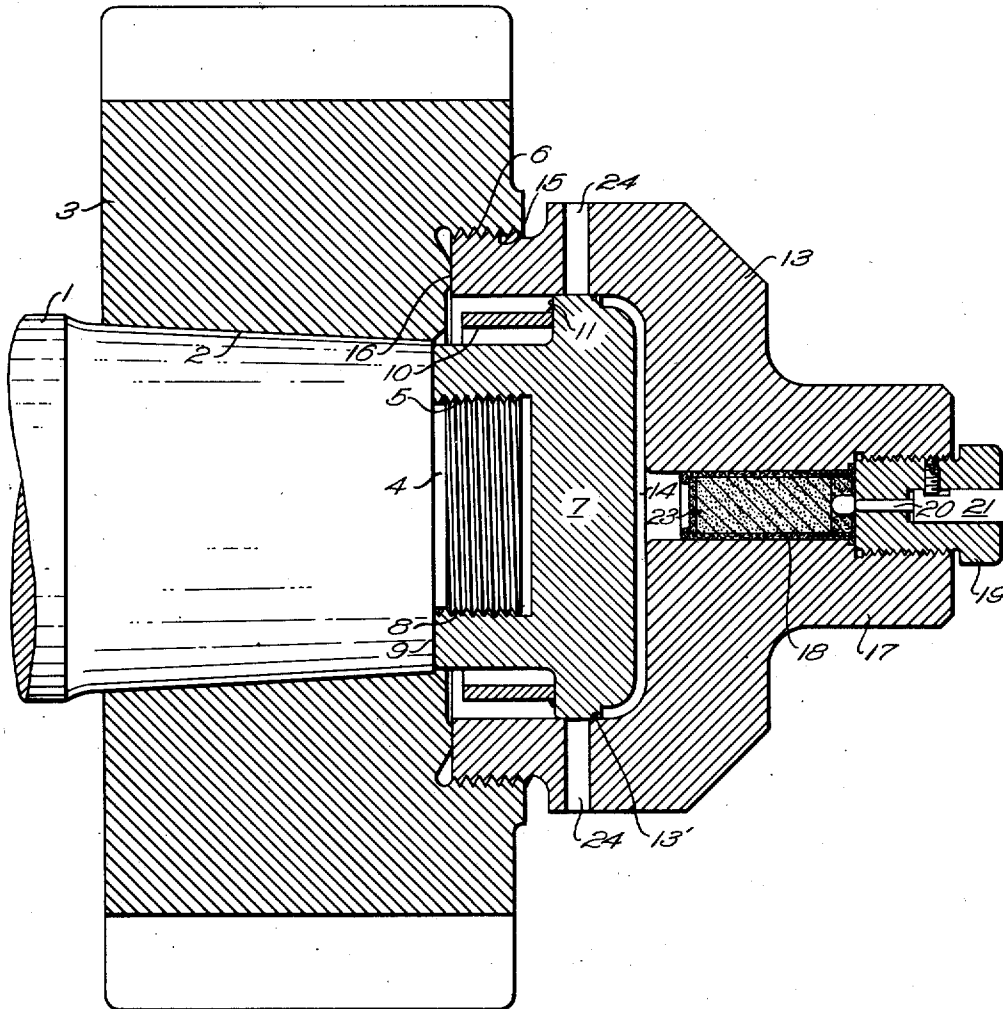
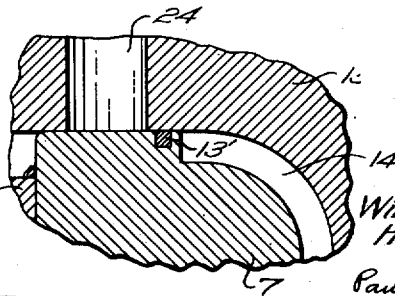


Fig. 2.



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EXPLOSION-TYPE PULLER

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5 Claims. (Cl. 29—35)

This invention relates to disassembling apparatus, and more particularly to apparatus for removing pinions, bearings, or other machine elements rigidly mounted, by a press or shrink fit, on a shaft.

Electric railway motor pinions get considerably greater wear than the other gear units in a gear transmission disposed between an electric motor and locomotive or street car wheel. This means that it is part of the regular maintenance work to remove worn pinions from the motor shaft. A similar situation also arises in many other applications.

One object of our invention is to disassemble members interconnected by a press or shrink fit without subjecting any of the members to sharp mechanical impacts.

Another object of our invention is the provision of means for disassembling members connected by a press or shrink fit by the use of fluid pressure without the use of complicated and expensive hydraulic equipment.

The objects recited are merely illustrative. Other objects and advantages will become readily apparent from a study of the following specification and the accompanying drawing, in which:

Figure 1 shows a longitudinal sectional view of our contribution to the art; and

Fig. 2 shows a detail in section of a modified construction.

Our invention, or pinion puller, as it may be designated, is of particular utility for removing pinions from the ends of railway motor shafts. These pinions are nearly always applied to their shafts, having a tapered end, by a heavy shrink or press fit. Regardless of whether shrunk fit or press fit on the shaft, the removal of these pinions is usually quite a task.

Larger shops usually have hydraulic presses available but many parts cannot be handled on such presses. Furthermore, such presses are not well adapted for removing pinions or other machine elements when all other parts are in position.

We provide a rugged portable device that can be applied where needed and which has all the advantages of a hydraulic press.

In Fig. 1, 1 designates a railway motor shaft upon the tapered end 2 of which the pinion 3 is rigidly mounted. The end of the shaft is usually provided with the stub end 4 having the threads 5 normally provided for some other purpose than the removal of the pinion. The pinion 3 is also provided with threads at 6, also normally provided for the removal of the pinion.

Our rugged pinion puller comprises a piston 7 threaded at 8 to be positioned on the stub end 4 of shaft 1. This piston 7 is screwed down tightly against the end of the shaft end at 9 to form a rigid structure with the shaft. Before positioning the piston on the shaft a soft copper ring 10 is placed between the piston head 11 and the pinion.

The piston head 11 is designed to fit snugly into the cylinder 13. The piston head may be provided with soft copper piston rings 13' as shown in Fig. 2. These rings prevent leakage of gases from chamber 14.

The cylinder 13 is provided with threads 15 at its left-hand extension, and when the puller is to be used the cylinder is screwed tightly against the pinion 3 at region 16. The cylinder and pinion thus form a rigid structure. When assembled, the parts are in the position as shown.

The cylinder is provided with a barrel portion 17 having its muzzle end opening into chamber 14. The barrel portion may be of just sufficient length to receive a blank shotgun shell 18 or similar shell, as shown. After a shell, as 18, is in position, the breech block 19 having the firing pin 20 is screwed in position, as shown.

To remove the pinion 3, the attendant then merely taps the head 21 of the firing pin 20 with a hammer to set off the charge 23 in the shell. As the charge in the shell explodes, a tremendous fluid pressure is set up in chamber 14 and relative movement is set up between the cylinder 13 and the pinion 3 rigidly attached thereto and the piston 7 rigidly attached to shaft 1.

The pinion 3 is thus removed from the tapered portion 2 of the shaft 1. As the piston 7 moves to the left with reference to cylinder 13, it uncovers the exhaust ports 24 to dissipate the pressure in chamber 14. By thus relieving the pressure in chamber 14 as soon as the pinion is loose on the shaft the "follow through" effect of the explosion is prevented. Further, the soft copper ring 10 takes up the shock, avoids excessive noise, and above all prevents the cylinder 13 and pinion 3 from being thrown toward the right like a projectile or bullet. It is thus apparent that our simple rugged structure provides means for rapidly and safely removing a pinion from a shaft and yet, after exploding a charge, the parts are all generally in the same relative position shown except that the exhaust ports are uncovered and the pinion is no longer stuck on the shaft.

Our device is not limited to the removal of pinions. Clearly, roller bearing races, or other

machine elements similarly positioned, may readily be removed from the end of a shaft.

We claim as our invention:

1. In a device for removing a machine element from the tapered end of a shaft upon which it is rigidly mounted by a pressure fit, in combination, a piston, having a head, rigidly secured to the end of the shaft, a loosely mounted cushioning ring disposed between the piston head and the machine element, a cylinder rigidly secured to the machine element and having a snug sliding fit over the piston head and designed to form a cylinder head chamber over the piston head, and means for detonating an explosive charge in the cylinder head chamber.

2. In a device for removing a machine element from the tapered end of a shaft upon which it is rigidly mounted by a pressure fit, in combination, a piston, having a head, rigidly secured to the end of the shaft, a loosely mounted cushioning ring disposed between the piston head and the machine element, a cylinder rigidly secured to the machine element and having a snug sliding fit over the piston head and designed to form a cylinder head chamber over the piston head, a barrel connected to the cylinder, said barrel being designed to receive a conventional gun shell at its breech end and having its muzzle end opening into the cylinder head chamber, a shell in the barrel, an explosive charge in the shell, a breech block for retaining the shell in position, and means for detonating the charge of explosive.

3. In a device for removing a machine element from the tapered end of a shaft upon which it is rigidly mounted by a pressure fit, in combination, a piston, having a head, rigidly secured to the end of the shaft; a loosely mounted cushioning ring disposed between the piston head and the machine element, a cylinder rigidly secured to the machine element and having a snug sliding fit over the piston head and designed to form a cylinder head chamber over the piston head, a barrel integral with the cylin-

der having its muzzle end opening into the cylinder head chamber, said barrel being designed to receive a conventional gun shell at its breech end, a shell in the barrel, a charge of explosive in the shell, and means for detonating the charge of explosive.

4. In a device for removing a machine element from the tapered end of a shaft upon which it is rigidly mounted by a pressure fit, in combination, a piston, having a head, rigidly secured to the end of the shaft, a loosely mounted cushioning ring disposed between the piston head and the machine element, a cylinder rigidly secured to the machine element and having a snug sliding fit over the piston head and designed to form a cylinder head chamber over the piston head, a barrel portion in the cylinder having its muzzle end opening into the cylinder head chamber, said barrel portion having such dimensions as to receive a conventional shotgun or similar shell, a shell containing a charge of explosive disposed in the barrel, and means for detonating the charge of explosive.

5. In a device for removing a machine element from the tapered end of a shaft upon which it is rigidly mounted by a pressure fit, in combination, a piston, having a head, rigidly secured to the end of the shaft, a loosely mounted cushioning ring disposed between the piston head and the machine element, a cylinder rigidly secured to the machine element and having a snug sliding fit over the piston head and designed to form a cylinder head chamber over the piston head, a barrel integral with the cylinder having its muzzle end opening into the cylinder head chamber, said barrel being designed to receive a conventional gun shell at its breech end, a shell in the barrel, an explosive charge in the shell, a breech block for retaining the shell in the barrel, and a firing pin in the breech block for detonating the explosive charge.

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