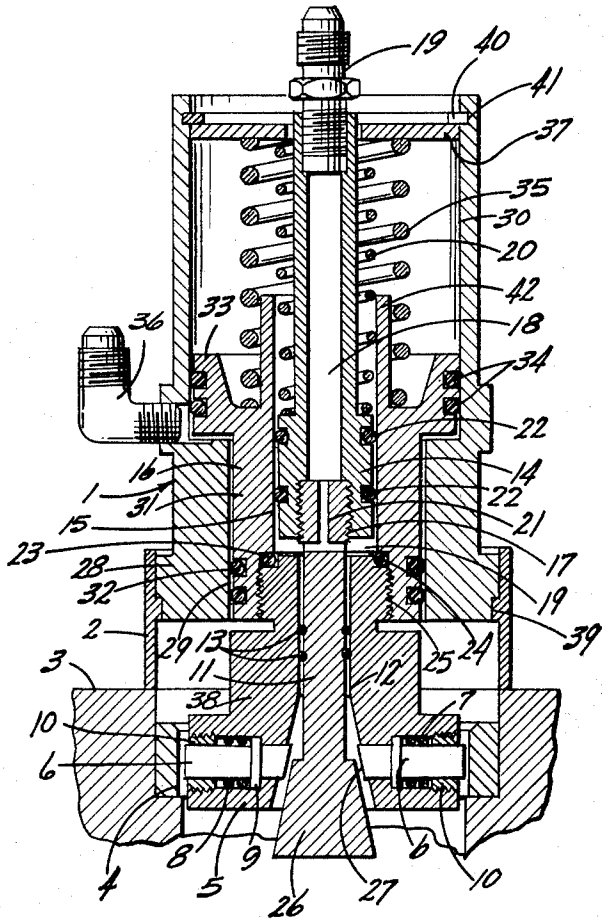
June 11, 1968 S. P. ROMERO 3,387,353

DEVICE FOR REMOVING VALVE SEATS AND THE LIKE

Filed March 11, 1966



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3,387,353

Patented June 11, 1968

3,387,353

DEVICE FOR REMOVING VALVE SEATS AND THE LIKE

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Filed Mar. 11, 1966, Ser. No. 533,657

6 Claims. (Cl. 29—213)

ABSTRACT OF THE DISCLOSURE

This is a two-stage device for removing valve seats and the like. A main large diameter piston is operable in a main cylinder under pressure from a first fluid pressure supply source against an action of a spring means bearing on the main piston, a secondary smaller piston reciprocable in a second cylinder, provided for compactness in the main piston, is connected with an expansion type chuck that is moveable with the main piston under action of fluid pressure from a separate second fluid supply source so as to be operable independently of the first mentioned piston and its retracting spring means, there being a second spring means in concentric relation to the other spring means for compactness tending to hold the second piston in retracted position. In that way there is good assurance of the valve seat to be removed being properly gripped before the main piston is operated to cause the removal of the valve seat. The chuck has a reduced inner end portion coaxial therewith threadedly engageable in the main piston so that the chuck is detachable and replaceable by another chuck suitable for operating on a different size of valve seat to be removed.

This invention relates to a device for removing valve seats and the like.

Removal of valve seats in aircraft engines has heretofore been done in either of two ways, both of them rather tedious and expensive, namely:

(*1*) By heating the cylinder sufficiently to make the valve seat less difficult to drive out and then using a drift pin and hammer for its removal, or

(*2*) Cutting the valve seat ring out in a machining operation.

It is, therefore, the principal object of my invention to provide a device of relatively simple and inexpensive construction adapted to be set up easily for removal of valve seat rings and the like at a small fraction of the cost of either of the old methods.

The device of my invention has a two-stage operation; in the first stage, the valve seat ring to be removed is firmly gripped by the radially movable, spring retractable jaws provided in a chuck that is provided of a size to fit inside the ring freely, the jaws being spread uniformly and simultaneously by means of a conical cam provided on the end of a hydraulically operable plunger. This plunger works inside another plunger, which, in the second stage of the operation, is actuated under hydraulic pressure in a main cylinder to pull the valve seat ring out with the chuck. Since both plungers are spring actuated in the return direction, it is a simple matter, after withdrawal of the valve seat ring, to relieve the hydraulic pressure acting on both plungers, whereupon they both return to their normal positions and the jaws on the chuck, which are spring actuated to a retracted position, return to retracted position, releasing the valve seat ring.

The invention is illustrated in the accompanying drawing, in which the single view is a longitudinal section through a device made in accordance with my invention, showing all of the parts in retracted position as at the commencement of a valve seat removal operation, the device being shown as mounted in place on a cylinder of an aircraft engine with the chuck in position inside the valve seat ring that is to be removed.

Referring to the drawing, the reference numeral **1** designates the device of my invention generally, supported on a spacer collar **2** on the aircraft engine cylinder head **3** from which the valve seat ring **4** is to be removed. The device **1** has a chuck **5** of a diameter to be freely received inside the ring **4** and in the chuck is a plurality of circumferentially spaced radially movable jaws **6** slidable in radial bores **7** and normally held in retracted position by means of coiled compression springs **8** that are caged between annular shoulders **9** on the jaws and bushings **10** threaded in the outer ends of the bores. A vertical spindle **11** is guided axially relative to the chuck **5** in a bore **12** and has O-rings **13** seated in annular grooves in the stem and slidable in the bore **12** to seal the same against loss of oil under pressure when the spindle **11** is moved upwardly by means of the piston or plunger **14** working in an axial bore **15** in another piston or plunger **16**, the stem **11** being threadedly connected, as at **17**, to the lower end of plunger **14** in the enlarged lower end of the axial bore **18** provided in the plunger **14**. Oil under pressure is delivered through the nipple **19** at the upper end of the bore **18** to the lower end of bore **15** in plunger **16** to force the plunger **14** upwardly against the action of a return spring **20**, the upper end of spindle **11** being provided with passages **21** connecting the bore **18** with the lower end of the bore **15**. O-rings **22** provided in annular grooves on the plunger **14** engage in the bore **15** and thereby serve to seal the same against leakage of oil under pressure. Another O-ring **23** is compressed between the upper end of chuck **5** and an annular shoulder **24** defined at the lower end of bore **15** by a counter-bore **25** in which the upper end of chuck **5** is threaded, as shown, this threaded connection at **25** enabling removal of chuck **5** and threading in of another chuck that is of a different diameter on its lower end to suit different sizes of valve seat rings on different jobs. When the plunger **14** is moved upwardly under oil pressure, the enlarged conical lower end **26** of the stem **11** slidably engaging the inclined inner ends **27** of the jaws **6** force the jaws outwardly into gripping engagement with the ring **4**. This is the first stage of operation previously mentioned.

The device **1** also includes a main cylinder **28** having concentric bores **29** and **30**, the smaller lower bore **29** receiving the reduced lower end portion **31** of the plunger **16**, which has O-rings **32** provided in annular grooves thereon and operating in sealing engagement with the bore **29**. The enlarged upper end portion **33** of the plunger **16**, which is also equipped with O-rings **34** disposed in sealing engagement in the larger upper bore **30**, has the lower end of a coiled compression spring **35** engaging the same normally holding the plunger **16** in the lower retracted position shown. However, when oil under pressure is delivered through the elbow fitting **36** after the first phase of operation, in which, as previously stated, the jaws **6** of the chuck **5** are forced outwardly into gripping engagement with the valve seat ring **4**, the plunger **16** is forced upwardly against the resistance of the springs **20** and **35**, as they are both in engagement with the end plate **37**, and the valve seat ring **4** is accordingly pulled out of the cylinder **3**, the reduced upper end portion **38** of the chuck **5** being movable upwardly into the lower end of the bore **29**. The spacer collar **2**, as indicated at **39**, fits on an annular shoulder on the lower end of the cylinder **28**. The end plate **37** is held in place in the upper end of the bore **30** by means of a snap-ring **40**, entered in an annular groove **41** provided in the wall of the cylinder **28**. An upwardly projecting sleeve portion **42** on the upper end of plunger **16** serves the double purpose of providing a stop for engagement with end plate **37** to limit the upward movement of plunger **16** while also serving as a separator between the

two concentrically arranged compression springs 20 and 35.

In operation, after the device 1 has been properly positioned on the cylinder head 3 with the chuck 5 inserted within the valve seat ring 4, oil under pressure is first admitted at 19 causing the spindle 11 to be raised and the jaws 6 to be moved outwardly into gripping contact with the valve seat ring 4, after which oil under pressure is admitted at 36 to raise the plunger 16 and thus pull out the ring 4. When the pressure at 19 and 36 is relieved, all of the parts are returned to their normal retracted position, springs 20 and 35 returning plungers 14 and 16 to the positions shown, and springs 8 serving to retract the jaws 6 so as to release the ring 4, making the device ready for the next operation on another valve seat ring. Removal of the chuck 5 and spindle 11 and replacement of these parts with a chuck of different diameter makes the present device useable on a range of different sizes of valve seat rings.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. A device of the character described comprising a main cylinder adapted to be supported in coaxially spaced relation to a generally cylindrical part that is to be moved axially relative to its support wherein it is frictionally engaged, said main cylinder having provided therein a main bore of one diameter and a communicating secondary bore coaxial therewith of a smaller diameter opening to the inner end of said main cylinder, a piston having one portion fitting in and reciprocable in the main bore and a reduced coaxial portion fitting in and reciprocable in the secondary bore, said piston defining therein a secondary cylinder in a through bore provided axially thereof of small diameter in relation to the main bore, a secondary piston fitting in and reciprocable in said secondary cylinder and having an axial bore provided therein, a closure for the outer end of said main cylinder, separate spring means bearing on the main piston and secondary piston caged between said pistons and said closure tending to hold said pistons in retracted position, a first fluid pressure supply means communicating with said main cylinder whereby to retract the main piston against the action of its spring means to transmit axial movement to the first mentioned cylindrical part, a second fluid pressure supply means communicating with the outer end of the axial bore in said secondary piston for delivery of fluid pressure to the secondary cylinder to retract said secondary piston against the action of its spring means independently of said first mentioned piston and its spring means, an expansion type chuck moving with said main piston in the secondary bore in the main cylinder in the retraction of said main piston, said chuck having a through bore provided therein and radially expansible chuck jaws, and an axial extension on said secondary piston reciprocable in said through bore in said chuck and having a flared inner end portion for expanding said chuck jaws when the secondary piston is retracted to project the jaws into gripping engagement with the cylindrical part to be moved axially so as to move it when the main piston is retracted.

2. A device as set forth in claim 1 wherein the chuck has a reduced inner end portion coaxial therewith threadedly engageable in the inner end of the through bore in said main piston whereby said chuck is detachable from said piston to be replaceable by another chuck suitable for operation on a different size of cylindrical part to be moved axially.

3. A device as set forth in claim 1 wherein the chuck has a reduced inner end portion coaxial therewith threadedly engageable in the inner end of the through bore in said main piston whereby said chuck is detachable from said piston to be replaceable by another chuck suitable for operation on a different size of cylindrical part to be moved axially, the axial extension of said secondary piston being threaded on its inner end for detachable threaded engagement in the inner end of the axial bore in said secondary piston whereby to facilitate removal of said chuck and substitution of another chuck and/or axial extension.

4. A device as set forth in claim 1 wherein the chuck has a reduced inner end portion coaxial therewith threadedly engageable in the inner end of the through bore in said main piston whereby said chuck is detachable from said piston to be replaceable by another chuck suitable for operation on a different size of cylindrical part to be moved axially, the axial extension of said secondary piston being threaded on its inner end for detachable threaded engagement in the inner end of the axial bore in said secondary piston whereby to facilitate removal of said chuck and substitution of another chuck and/or axial extension, the inner end portion of said axial extension having ports provided therein establishing communication between the axial bore in said secondary piston and the inner end of the secondary cylinder.

5. A device as set forth in claim 1 wherein the separate spring means are two concentric coiled compression springs, the device including a tubular extension on said main piston disposed in concentric relation to and between the two springs at their inner ends to serve as a separator therebetween.

6. A device as set forth in claim 1 wherein the separate spring means are two concentric coiled compression springs, the device including a tubular extension on said main piston disposed in concentric relation to and between the two springs at their inner ends to serve as a separator therebetween, said tubular extension being engageable with said closure to limit retraction of said main piston.

References Cited

UNITED STATES PATENTS

1,506,886	9/1924	Clay	29—252
1,506,948	9/1924	Siegerist	29—252
2,617,181	11/1952	D'Haem	29—252
2,641,831	6/1953	Helton	29—255
2,697,872	12/1954	Armstrong	29—252

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