Nov. 23, 1954 G. J. WEYMOUTH ET AL 2,694,994

AIR OPERATED EJECTOR FOR PRESSES

Filed May 27, 1950 2 Sheets-Sheet 1

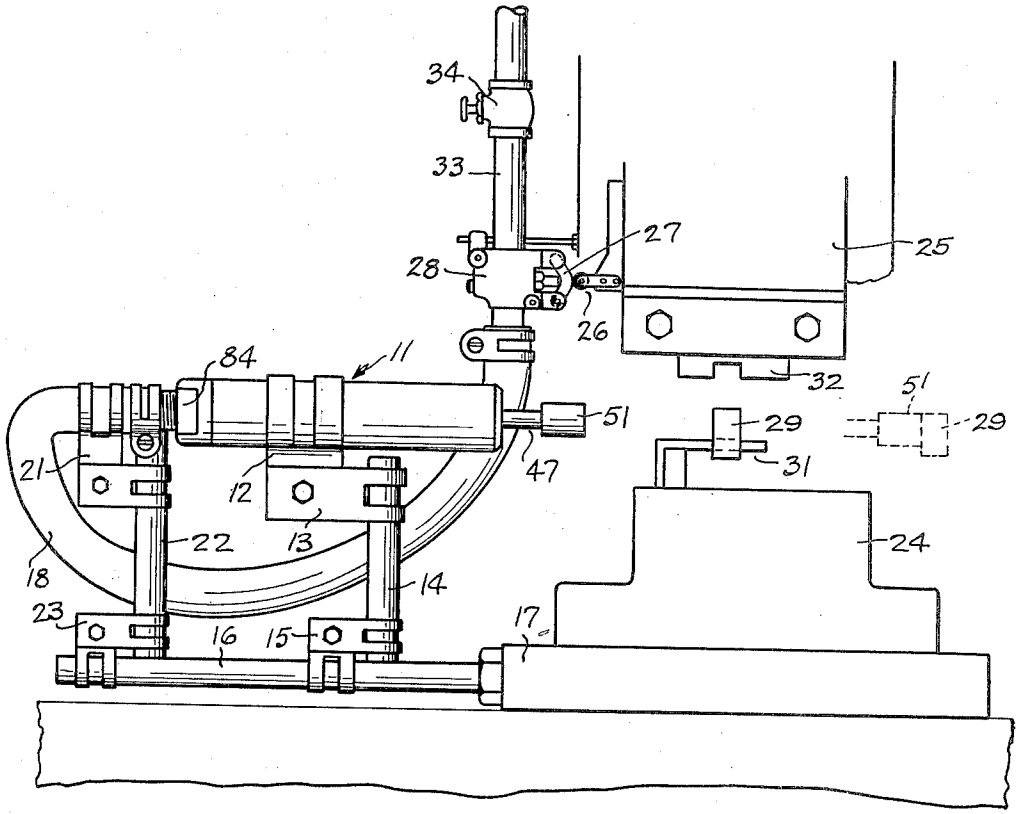


Fig. 1.

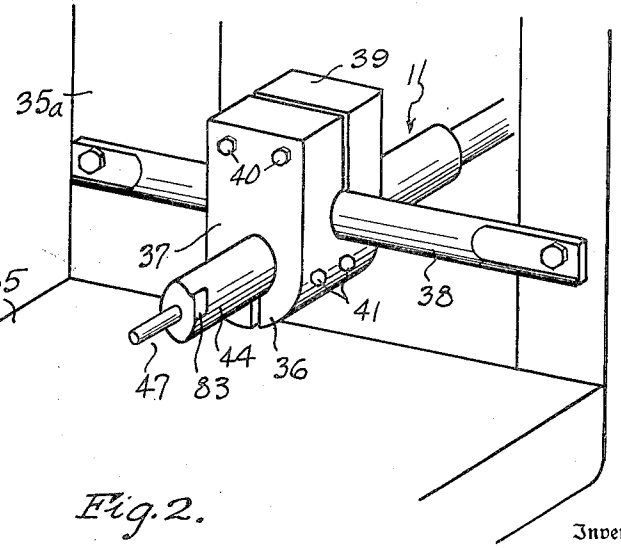


Fig. 2.

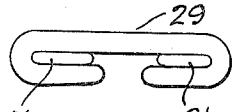


Fig. 10.

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AIR OPERATED EJECTOR FOR PRESSES

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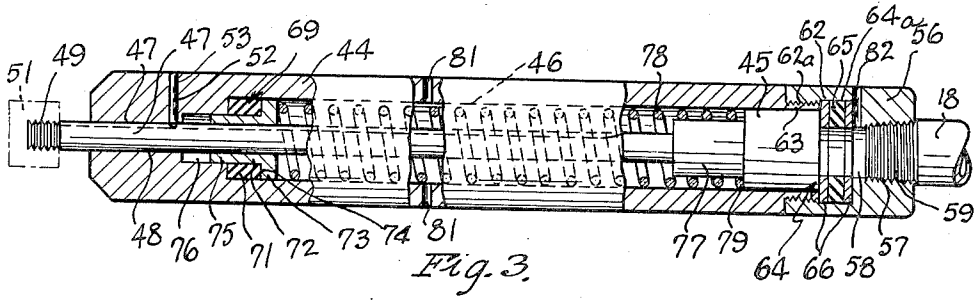


Fig. 3.

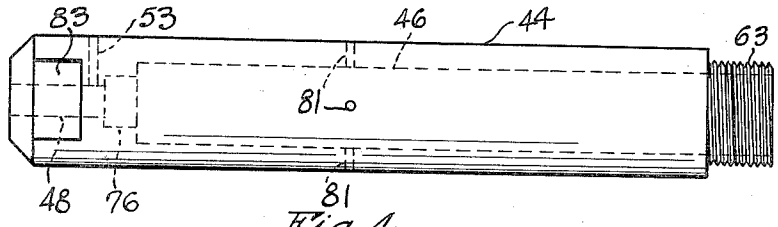


Fig. 4.

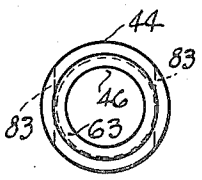


Fig. 5.

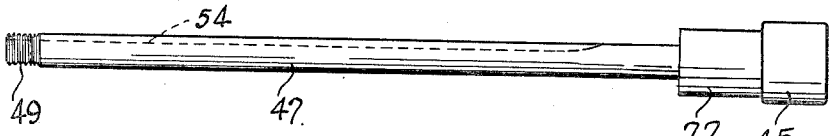


Fig. 6.

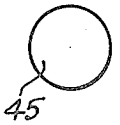


Fig. 7.

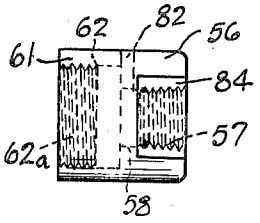


Fig. 8

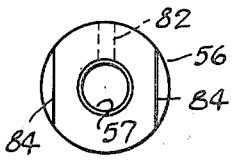


Fig. 9.

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2,694,994

AIR OPERATED EJECTOR FOR PRESSES

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Application May 27, 1950, Serial No. 164,688

2 Claims. (Cl. 113—50)

This invention relates to work ejectors for ejecting work pieces from a machine after the completion of a working or forming operation, and more particularly it relates to ejectors employing fluid pressure in the form of a relatively short sudden blast of air, for example, to accomplish the ejecting operation.

Heretofore, such ejectors have usually delivered an air blast directly against the work piece to be ejected. In power presses, for example, a ram controlled mechanism is operated after each stroke of the ram to direct a short, sharp blast of air against a work piece and blow it from the forming die or other work holder under the ram. However, ejection by this means is not sufficiently positive to be entirely reliable. Frequently the work piece will stick to the die or other holder and will not be ejected, with resulting damage to the work or the machine, or both, on the next operation of the ram.

An object of the present invention is to provide a work ejector employing a blast of fluid pressure, but constructed and arranged to positively eject a work piece.

A further object is to provide a pneumatically operated positive work ejector capable of use with the standard air blast supply and control equipment heretofore employed in connection with conventional air ejectors.

A further object is to provide an ejector having a pneumatically operated ejecting member arranged to be instantly retracted upon completion of the ejecting operation to avoid any interference with the operation of the associated ram.

With the foregoing and other objects in view, we have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a side elevation of an ejector mechanism constructed in accordance with one embodiment of the invention, and showing one arrangement for mounting the ejector on an associated press;

Fig. 2 is a perspective view showing a different arrangement for mounting the ejector shown in Fig. 1;

Fig. 3 is a longitudinal section of the ejector shown in Figs. 1 and 2;

Fig. 4 is an elevation of the fluid pressure cylinder forming a part of the ejector shown in Fig. 3;

Fig. 5 is an end elevation of the cylinder shown in Fig. 4;

Fig. 6 is an elevation of the plunger and plunger rod forming a part of the illustrated embodiment;

Fig. 7 is an end view thereof;

Figs. 8 and 9 are side and end views respectively, of a detail, and

Fig. 10 is a side view of a work piece to be ejected looking from the right of Fig. 1.

The ejector of the present invention is designed to be mounted in any suitable manner, for example on a universal supporting fixture permitting adjustment of the ejector to the proper position; or it can be rigidly supported as a permanent part of the machine. In Fig. 1 the ejector **11** is mounted in a supporting bracket **12** having an arm **13** vertically adjustable on an upright supporting post **14** which is secured in a bracket **15** horizontally adjustable on a supporting shaft **16** mounted on and extending outwardly from the machine bolster **17**. The adjacent end of an air supply line **18** is connected to

the outer end of the ejector **11** and is mounted on a similar adjustable support including a bracket **21** vertically adjustable on a post **22**, in turn supported by a bracket **23** for horizontal adjustment on the shaft **16**. The press illustrated in Fig. 1 comprises a bed plate **24** supported on the bolster **17**, and a ram **25**, the reciprocations of which control the operation of the ejector. For example, a roller type tripper **26** is shown in Fig. 1 mounted on the ram **25** in position to engage an angle or cam lever **27** on an air valve **28** to deliver a quick, short blast of air to the ejector **11** after the completion of each working stroke of the ram and the die is retracted. For this operation the tripper **26** is pivoted to yield upwardly on downward movement of the ram so as not to open valve **28**, but does not yield on upward or retracting movement of the ram and so opens the valve for a short time on this movement. Compressed air is delivered to the valve **28** through a supply line **33** and shut-off valve **34**. However, instead of applying this blast of air or other fluid directly to the work piece **29** in the die or work holder **31** on the bed plate **24** to eject it after it has been formed or shaped by the die **32** on the ram **25**, the present invention is so constructed as to provide a positive ejection of the work piece **29** while continuing to employ the operating blast.

In Fig. 2, the ejector **11** is shown mounted on the back face **35***a* of the machine **35** as a permanent part of the machine. As shown, it is gripped between the lower jaws **36** of a bracket **37** for horizontal adjustment in an axial direction. The bracket **37** is in turn supported for horizontal adjustment in a direction at right angles to the ejector **11** on a supporting shaft **38** by upper jaws **39**. Both upper and lower jaws **36, 39** are respectively clamped together by suitable clamping screws or bolts **40, 41**.

The illustrated embodiment of the invention comprises a cylinder **44** having a plunger **45** slidable in the bore **46** of the cylinder with a sufficiently loose fit to permit some passage of trapped fluid past the plunger on the return stroke, as hereinafter described, for the purpose of facilitating the quick return of the plunger **45** after ejecting a work piece **29**. A plunger rod **47** is integral with the plunger **45** and extends through a reduced bore **48** at one end of the cylinder **44**. To prevent injury to the work piece as a result of being struck by the plunger rod **47**, the end **49** of the rod is threaded for connection to a cap **51** of rubber, plastic or other suitable material and shape, depending upon the work piece to be ejected. As illustrated, a key, such, for example, as a pin **52**, extends radially inward through a hole **53** and slidably engages a keyway **54** in the plunger rod to prevent turning thereof in the cylinder **44**.

In the illustrated embodiment, the pressure end of the cylinder opposite the projecting plunger rod **47** is connected to the fluid pressure supply line **18** by a fitting formed by a cap **56** which, in effect, forms the end of the cylinder and has a threaded bore or pipe tap **57** forming a continuation of the inlet port **58** to the cylinder **44**. The threaded end **59** of the line **18** is threaded directly into the bore **57**. The inner end **61** of the cap **56** has an enlarged bore **62**, the outer portion **62***a* of which is threaded to the external threads of an axial hollow stem **63** on the pressure end of the cylinder **44**. An annular cushioned stop member **64** is mounted in the inner unthreaded portion **64***a* of the bore **62** in the cap **56** to form a stop for limiting the retracting or return movement of the plunger **45** and rod **47**, and to accurately locate them when retracted. As illustrated, the stop member **64** is of laminated form with a center layer **65** of rubber, plastic or other suitable yieldable resilient material between outer protective layers **66** of steel or other harder protective material. This forms a cushion bumper or stop for the plunger. In the opposite end of the cylinder or bore **46** a resilient annular bumper **69** is provided to form a stop member for the plunger on its working stroke. As shown, it comprises an annular resilient ring **71** of rubber, plastic or other suitable material and a supporting bushing **72** of steel or other suitable relatively hard protective material. The bushing has a collar or flange **73** covering the inner face **74** of the ring **71** and a sleeve **75** extending through the ring and into a counterbore **76** at the end of the cylinder bore **46** around the plunger rod

47. The bushing protects the resilient collar **71** against being distorted out of shape by the repeated blows of the plunger **45** and hammered into the bore **48** around the plunger rod **47** with resulting trouble. The plunger **45** has a cylindrical extension **77** which strikes the collar **73** of the bushing **72** at the end of each working stroke of the plunger **45**, and means is provided for quickly returning the plunger to retracted position. As illustrated, a helical spring **78** is compressed between the plunger **45** and the collar **73** on the bumper bushing **72**, the end **79** of the spring adjacent the plunger **45** directly engaging the plunger and surrounding the plunger extension **77** which extends through the coils of the compressed spring to engage the stop collar **73** on the working stroke and also acts as an inner guide and support for the coils on compression.

The cylinder **44** is provided with radial exhaust ports **81** which are so located longitudinally of the cylinder as to be uncovered by the plunger adjacent the end of its working stroke, permitting the compressed air to escape and the spring **78** to retract the plunger immediately upon its reaching the end of the cylinder. A bleed or leak port **82** is provided in the end cap **56** at one side of the inlet port **58** to permit the air back of the plunger to escape and to enable the spring **78** to quickly return the plunger and rod to retracted position by allowing any fluid pressure that may be trapped ahead of the plunger **45** to escape through the leak port **82** on the return movement. At the same time, this operation is also expedited by the loose fitting of the plunger in the cylinder **44** by which trapped fluid can escape past the plunger **45** and out through the exhaust ports **81** during the return stroke, if necessary. The leak port **82** is so located with relation to the end of the supply line **18** and the inlet port **58** that the velocity of the fluid entering the cylinder through the inlet port has a jet effect which prevents the escape of any substantial operating pressure through the leak port **82** before operating the ejector plunger. If desired, flat wrench faces **83** can be provided on the outer face of the cylinder **44**, and similar faces **84** on the end cap **56**.

In operation, the cylinder **44** is mounted in properly adjusted position on a machine adjacent the forming or holding dies **31**, for example, as shown in Fig. 1, or permanently secured in place as shown in Fig. 2. In the case of a press, the ram **25** may actuate the blow valve **28** or its upward movement after the end of the ram's working stroke in the usual manner, delivering a short, quick blast of fluid pressure, usually compressed air, to the cylinder **44** through the inlet port **58** thereof, forcing the plunger **45** and rod **47** to the left as seen in Figs. 3 and 4, and to the right in Fig. 1, against the pressure of the spring **78**. This operation drives the cap **51** on the end of the plunger against the work piece **29** with such positive force and a hammer blow as to eject it with dependable certainty from the die or holder **31**. Adjacent the end of its stroke the plunger **45** uncovers the exhaust ports **81**, permitting exhausting of the operating pressure from the cylinder **44** and permitting the return spring **78** to quickly retract the plunger and rod and get it out of the way of the ram **25** on its next stroke. The resilient bumper **69** cushions the end of the plunger stroke and assists in quickly reversing the plunger movement and initiating the return movement thereof. The spring **78** is able to act quickly as a result of the exhaust of the working fluid through the exhaust ports **81** and the escape of any trapped fluid through the leak port **82** on the return movement of the plunger **45**, the looseness of the plunger in the cylinder being sufficient to also permit the escape of trapped fluid past the plunger and out the exhaust ports, if that is necessary.

The invention thus provides an ejector which operates on a work piece with a positive operation while employing a conventional air blast supply system and control mechanism. The plunger is retracted so quickly as to avoid interferring with the ram of a press or the like and without requiring any reduction in the speed of operation of the associated machine.

Having thus set forth the nature of our invention, we claim:

1. A work ejector comprising a fluid pressure cylinder, a plunger reciprocable therein, a work engaging and ejecting plunger rod connected to said plunger and projecting outwardly at one end of the cylinder, fluid pressure inlet means for delivering a short blast of plunger operating fluid pressure at the other end of said cylinder, said cylinder having exhaust ports located in the wall thereof spaced from the inlet and so as to be uncovered by said plunger to exhaust the operating pressure from said cylinder near the end of a working stroke of the plunger, an annular resilient bumper surrounding said plunger rod adjacent the first end of the cylinder to limit the working stroke of the plunger including a ring of resilient material surrounding said plunger rod and compressible against the adjacent end of the cylinder and a bushing of non-resilient material including a sleeve extending between said ring and said rod with one end extending into a counterbore in the end of the cylinder and a collar on the inner end of the sleeve interposed between the resilient ring and said plunger, spring means for returning said plunger to the inlet end of said cylinder, and a leak port adjacent the inlet end of said cylinder, so that after the blast is terminated the trapped fluid pressure is permitted to escape through said leak port and said means is enabled to quickly return said plunger to the inlet end of said cylinder.

2. A work ejector comprising a fluid pressure cylinder having a first end and an opposite inlet end, a plunger reciprocable therein and having a relatively loose fit in said cylinder to permit escape of fluid pressure past the plunger, a work engaging and ejecting plunger rod connected to said plunger and projecting outwardly at the first end of the cylinder, fluid pressure inlet means at the other end of said cylinder, said cylinder having exhaust ports located in the wall thereof spaced from the inlet end so as to be uncovered by said plunger to exhaust the operating pressure from said cylinder near the end of a working stroke of the plunger, an annular resilient bumper surrounding said rod at the first end of the cylinder to limit the working stroke of the plunger and rod, including a ring of resilient material surrounding said rod and compressible against the adjacent end of the cylinder and a bushing of nonresilient material having a sleeve extending between said ring and rod with one end extending into a counterbore in this end of the cylinder and a collar on the inner end of the sleeve between the resilient ring and said plunger, a helical spring adapted to be compressed between said bumper and said plunger on the working stroke for returning said plunger to the inlet end of said cylinder, a cylindrical extension on said plunger located within said helical spring in position to engage said collar at the end of each working stroke, and a leak port adjacent the inlet end of said cylinder so that after the fluid pressure is cut off any trapped fluid pressure escapes through said leak port and past the loosely fitting plunger to said exhaust ports and said spring means is enabled to quickly return said plunger and rod to the inlet end of said cylinder.

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