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F. M. LITTELL

2,494,396

AIR VALVE WITH ADJUSTABLE SHUTOFF CONTROL

Filed May 31, 1946

2 Sheets-Sheet 1

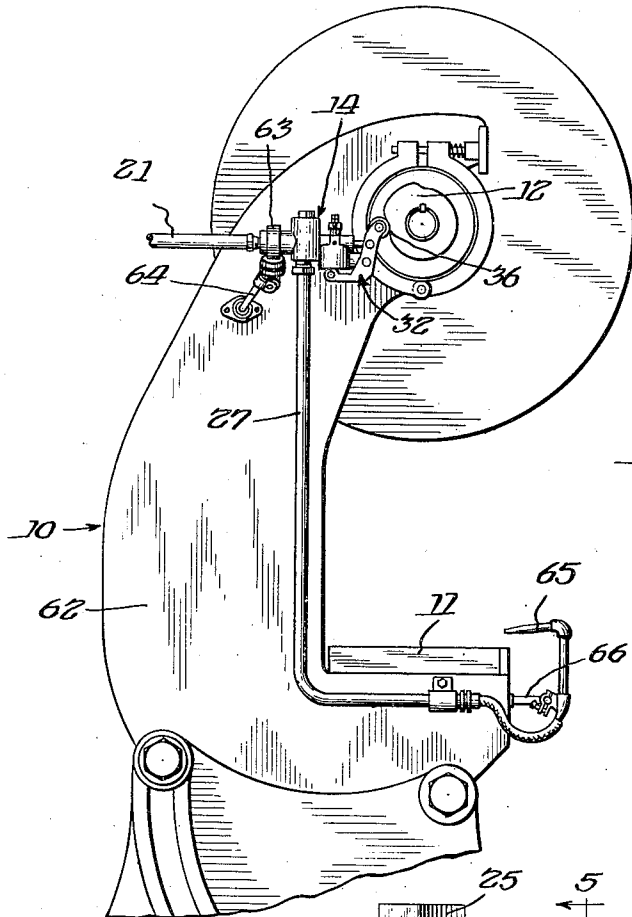


Fig. 1.

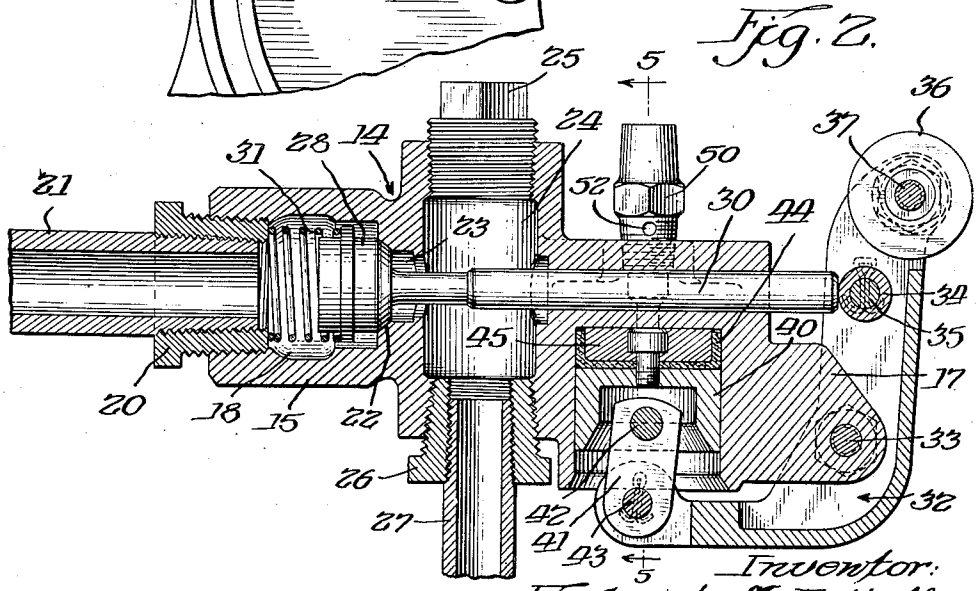


Fig. 2.

Inventor:
Frederick M. Littell

J. J. William Huxley Byam & Knight
Attorneys

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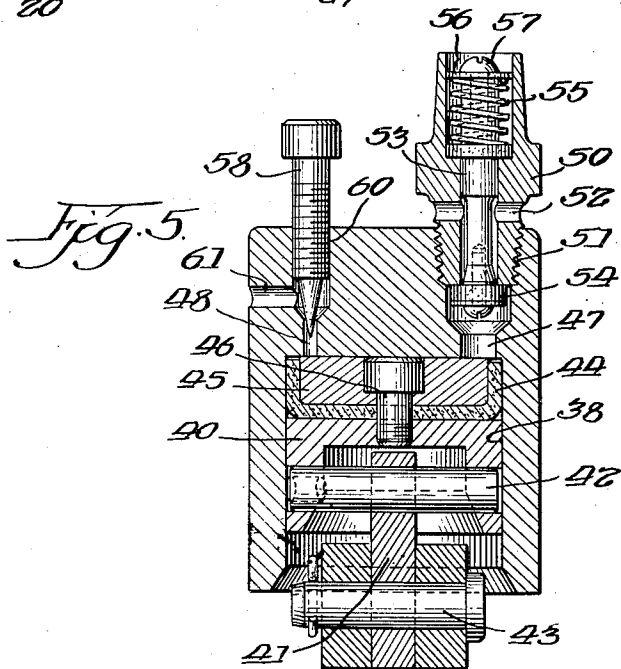
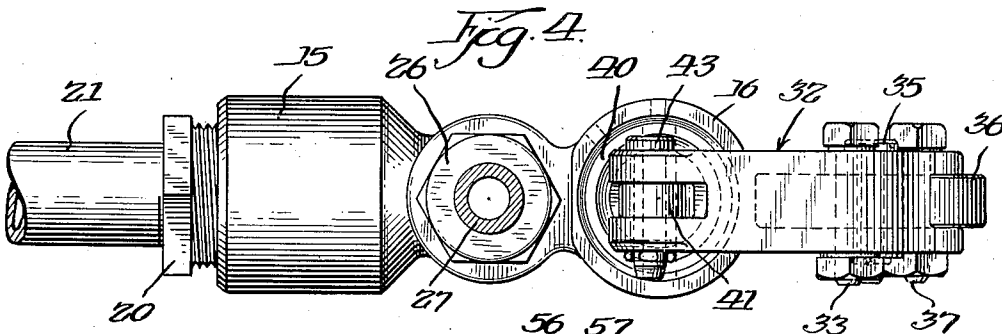
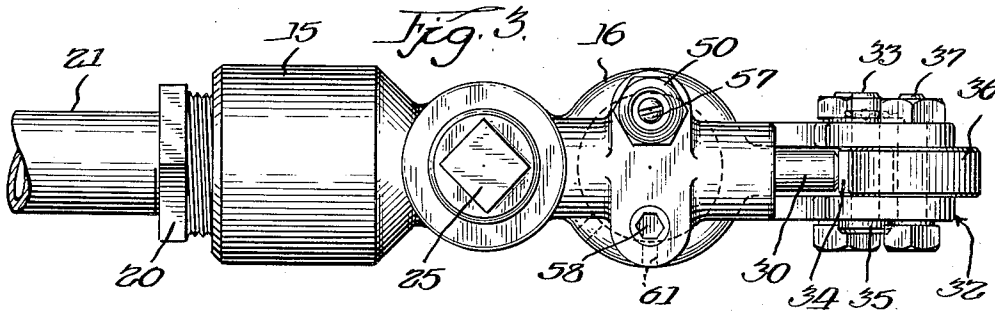
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2 Sheets-Sheet 2



Inventor:
Frederick M. Littell

By *William Wesley Byron & Knight*
Attys.

UNITED STATES PATENT OFFICE

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AIR VALVE WITH ADJUSTABLE SHUTOFF CONTROL

Frederick M. Littell, Detroit, Mich., assignor to
F. J. Littell Machine Company, Chicago, Ill., a
corporation of Illinois

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2 Claims. (Cl. 251-134)

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The invention relates to valves, particularly air blast valves of the special type as shown in Patents Nos. 2,080,724 and 2,302,242 and has for an object to provide improved valve structure for delivering a controlled air blast for removing workpieces and waste material from the working surface of punch presses or similar machines.

Another object of the invention resides in the provision of air blast valves for purposes as described having piston means of the dash pot type for regulating the closing of the valve member as regards each valve whereby opening of the valve member is followed by either a rapid or a delayed closing, depending on the adjustment of the piston means.

Another object of the invention resides in the provision of delayed action air blast valves which will employ piston and cylinder structure for regulating the closing action of the valve member of each valve and which may be adjusted over a wide range to suit all requirements as regards such valves.

With these and other objects in view the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is a side elevational view of a punch press showing a typical installation of the invention with an air blast valve supported by a side frame member and an air nozzle supported by the bed plate;

Figure 2 is a longitudinal sectional view taken substantially through the center of the air valve of the invention and showing structural details of the same;

Figure 3 is a top plan view of the valve structure shown in Figure 2;

Figure 4 is a bottom plan view of the valve structure; and

Figure 5 is a transverse sectional view taken along line 5-5 of Figure 2 and looking in the direction of the arrows.

The installation of the invention is adapted for attachment to a punch press 10, as shown in Figure 1, and includes an air nozzle connecting with an air valve for supplying a blast of air to the die 11 or other work-supporting surface for removing the workpiece from the press. The air valve of the invention is provided with operating means to be presently described adapted for intermittent actuation by a cam such as 12, which

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is rotated during operation of the press and accordingly the air valve is actuated at the end of each press operation to supply an air blast of controlled duration to thus remove the workpiece from the press and which also maintains the die clean for the next punching operation.

Referring to Figure 2 of the drawings, the improved valve structure of the invention essentially consists of a body portion of suitable metal such as brass or the like, designated in its entirety by 14. The rear end of the body portion 14 is provided with a tubular part 15 by means of which the body member is gripped and supported in adjusted position on the punch press in operative associated relation with cam 12. The forward end of the body portion 14 is formed with a cylinder part 16 which is cored for receiving a piston comprising an element of the dash pot means previously referred to. The extreme forward end of the body member 14 is provided with an extension or ear 17, the same having pivotally secured thereto the operating lever of the present valve structure and which operating lever is directly actuated by cam 12 of the punch press.

Referring again to the cylindrical portion 15, the same is tubular in shape, having a central chamber 18 extending longitudinally of the portion and which chamber is provided at the rear with the pipe coupling 20 by means of which the air inlet pipe 21 is suitably attached to the body portion 14 and in communicating relation with the said chamber 18. The end of chamber 18 opposite pipe coupling 20 is provided with a valve seat 22. A passage 23 leads from the valve seat in a transversely extending bore 24 formed internally of the body portion 14. The said body portion is threaded at opposite ends of the bore 24, the upper threaded end receiving the pipe plug 25 and the lower threaded end receiving the pipe coupling 26 by means of which the air delivery pipe 27 is secured to the body member in communicating relation with the bore.

The valve opening, defined by the valve seat 22, is normally closed by the valve member 28 which is integral with the valve stem 30. The stem 30 extends through bore 24 and through the cylinder part 16 of the valve body 14 to project from the forward end of the same, as clearly shown in Figures 2 and 3. The coil spring 31, located within chamber 18 and confined between valve member 28 and the pipe coupling 20 yieldingly maintains the valve member against its seat 22, permitting movement, however, of the valve member against the tension of the spring to open the passage 23. When valve member 28 is open

air under pressure from the inlet pipe 21 is delivered to bore 24 and thus to delivery pipe 27.

The forward end of the valve body, from which projects the valve stem 30, is provided with the extension or ear 17 to which is pivotally secured the actuating lever 32. The lever is suitably secured to extension 17 as at 33, which is approximately half-way between the extremities of the lever. It will be observed that the lever is approximately of right angular shape, having one leg extending vertically in front of the valve body 14 and having its other leg extending horizontally under the forward end of said valve body. Lever 32 may be considered as cored internally to provide spaced side members and within which the extension 17 is located. The roller 34 is also located within the spaced side members of the lever, the same being journalled by the pin 35. Roller 34 is positioned in alignment with the projecting end of stem 30 and said roller is adapted to contact stem 30 to reciprocate the stem and thus open valve member 28 upon actuation of the lever member in the proper direction. The lever member 32 also carries at its extreme upper end a roller 36 which is journalled by stud 37. Said roller is adapted to have contact with cam 12 and as the high point of said cam engages the roller the lever 32 will be oscillated in a counter-clockwise direction, Figures 1 and 2, with the result that stem 30 is reciprocated to open valve 28 as described. In accordance with the invention, the closing of valve 28 is delayed so that an air blast of the proper duration will be delivered to the die 11 or other work supporting surface of the press. This structure will now be described.

The cylinder part 16 of the valve body is cored to provide a cylinder 38 which opens on the under-surface of said part. A piston 40 is located in said cylinder for reciprocating movement, which movement is imparted thereto by the lever member 32. The piston 40 is connected to lever member 32 by the connecting link 41 pivotally secured at one end to the piston by means of pin 42 and at its opposite end to said lever member by pin 43. The compression end of the piston is provided with a leather washer 44 and which is effectively maintained in desired cupped formation by the metal insert 45, the insert being secured to the piston by screw 46. The cylinder 38 is provided with an air inlet passage 47 and an air discharge passage 48. The air inlet passage 47 is equipped with a valve element designated 50 which is suitably threaded as at 51 into cylinder part 16. The valve element 50 functions as a suction valve to admit air through passages 52 into the cylinder 38 upon a suction stroke of the piston. The valve stem 53 carries at its lower end the valve 54 and which is normally held in closed position against valve element 50 by means of the coil spring 55. Said spring is located within a bore formed in the upper end of valve member 50 and is confined between said valve element and washer 56 secured to the end of the stem 53 by screw 57. Valve 54 will open only upon downward movement of piston 40 since the vacuum created by said downward movement of the piston is operative to overcome the tension of spring 55. This downward movement of valve 54 allows air to enter chamber 38 from openings 52. The valve 54 closes since it is tensioned by spring 55 just as soon as the vacuum within chamber 38 has been relieved. On the up stroke of piston 40 the air within chamber 38 will be compressed and forced from the same through the discharge passage 48. However, said

discharge passage is provided with the needle valve screw 58 threaded at 60 to the cylinder part 16 and which may be adjusted to close off the air discharge passage 48 to any extent desired. The air flowing past the needle valve screw 58 is exhausted to the atmosphere through passage 61.

The air valve of the invention is suitably supported by the side frame member 62 of a punch press or the like having the die member 11, as previously described. The cylindrical portion 15 of the valve body is suitably fastened to the split collar member 63 supported by the adjustable ball socket structure 64 and which is secured to the side frame member 62. As a result of the ball socket structure 64 and the collar member 63 the air blast valve may be adjusted in proper longitudinal position with respect to the cam 12 and in proper rotative position as regards said cam. Air under pressure is supplied to the valve by means of the air inlet pipe 21 and in a controlled manner the pressure medium is supplied to the air delivery pipe 27 connecting with the nozzle 65 supported in adjusted position by 66 adjacent the die 11 comprising the work supporting surface of the press.

During operation of the press the cam 12 is rotated and upon each revolution thereof the high point of cam 12 will effect movement of lever member 32 in a counter-clockwise direction as previously explained. This movement of the lever member will produce reciprocation of stem 30 to open valve member 28, thereby admitting air under pressure through the air delivery pipe 27 to nozzle 65. Actuation of lever member 32, as above described, will also produce downward movement of piston 40. This downward movement or suction stroke of the piston will draw in a supply of air through the vacuum valve 54 which will immediately close when the suction within chamber 38 has been relieved. When the high point of cam 12 has passed beyond roller 36 the coil spring 31 will become effective for closing valve member 28. Opposition to this closing action, however, is offered by the piston 40 which in moving upwardly compresses the air within chamber 38 and a certain time interval is required before all the air from chamber 38 can escape through the adjustable orifice 48. The piston 40 in combination with the needle valve screw 58 functions as dash pot means to delay return of the valve member 28 to a closed position. By adjustment of the needle valve screw 58 the rate of discharge of the air within chamber 38 can be regulated so that the closing action of valve member 28 can be controlled to suit operating conditions for the particular press to which the valve structure is applied.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. An air blast valve of the character described, in combination, a body portion having an air passage provided with a valve seat, a valve for said seat having a stem extending through the body portion and projecting from the forward end of the same, resilient means located rearwardly of the valve in contact therewith for maintaining the valve closed, a lever member pivoted to the forward end of the body portion and operative to reciprocate the stem to

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cause opening of the valve upon pivotal movement of the lever member in one direction, said forward end of the body portion providing a chamber, a piston within said chamber, means operatively connecting the piston and said lever member so that the piston has a suction stroke upon pivotal movement of the lever to open the valve and has a compression stroke upon pivotal movement of the lever for closing the valve, and other means controlling the admission to and discharge of air from said chamber, whereby the pivotal movement of said lever member is delayed in a direction to delay losing of the valve.

2. An air blast valve of the character described, in combination, a body portion having an air passage provided with a valve seat, a valve for said seat having a stem extending through the body portion and projecting from the forward end of the same, resilient means located rearwardly of the valve in contact therewith for maintaining the valve closed, a lever member pivotally secured intermediate its ends to the forward end of the body portion, one leg of said lever member being operative upon pivotal movement of the member in one direction to reciprocate the stem to cause opening of the valve, said forward end of the body portion providing a chamber, a piston within said chamber, means operatively connecting the piston and said other leg of the lever member, whereby the piston has a suction stroke upon pivotal movement of the lever member to effect opening of the valve and a compression stroke upon pivotal movement of the lever member for closing the valve, and means controlling the discharge of the pressure medium from the chamber upon the compression stroke of the piston.

cate the stem to cause opening of the valve, said forward end of the body portion providing a chamber, a piston within said chamber, means operatively connecting the piston and said other leg of the lever member, whereby the piston has a suction stroke upon pivotal movement of the lever member to effect opening of the valve and a compression stroke upon pivotal movement of the lever member for closing the valve, and means controlling the discharge of the pressure medium from the chamber upon the compression stroke of the piston.

FREDERICK M. LITTELL.

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The following references are of record in the file of this patent:

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