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VACUUM FEED ASSEMBLY FOR FLAT PIECES AND VALVE THEREFOR

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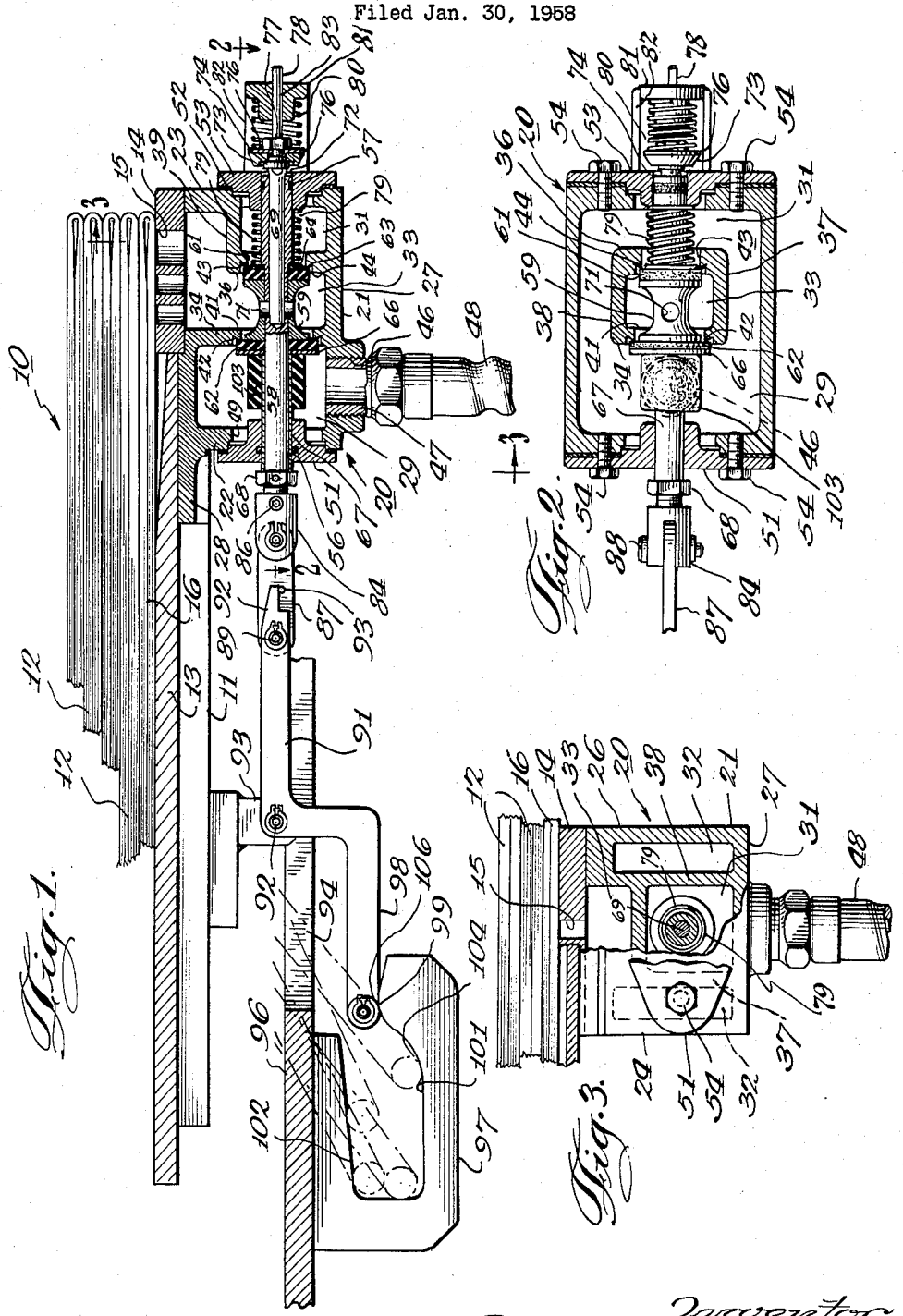


Fig. 1.

Fig. 2.

Fig. 3.

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VACUUM FEED ASSEMBLY FOR FLAT PIECES AND VALVE THEREFOR

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5 Claims. (Cl. 271—32)

This invention relates generally to improvements in machines for feeding flat articles such as magazines, newspapers and the like, and particularly to an improved valve for the shuttle feed of such machine.

Doane Patent No. 2,555,325 shows a feed mechanism for feeding mailing pieces, such as magazines or newspapers, to a conveyor for application to each piece of an address label. The feed mechanism shown in this patent has a vacuum device for advancing the bottom mailing piece of those piled in a feed hopper into the "bite" of a pair of feed rollers, such vacuum device consisting of a shuttle table having vacuum openings and arranged to apply vacuum to the bottom piece to move it to the feed rollers.

The invention herein is an improvement over that shown in the aforesaid Doane patent in that better control of the vacuum against the shuttle table is had.

One of the principal objects of this invention is to provide an improved vacuum control valve for the feed shuttle of a machine for handling flat articles such as newspapers, magazines or the like.

Another object is to provide a vacuum valve which can readily be ported to atmosphere for release of the vacuum or suction against an article moved by the shuttle table to a delivery position.

Still another object is to provide a valve of the class described and to operate the valve by a cam and toggle arrangement enabling the valve to be quickly and positively connected between a source of vacuum and a moving shuttle, and to be maintained in such condition during the operating stroke of the shuttle, the valve being rapidly ported to atmosphere at the end of the operating stroke.

Yet another object comprehends a shuttle table for moving flat pieces by vacuum and an improved valve therefor capable of rendering the feed movement more positive and efficient.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawing which together describe and illustrate a preferred embodiment of the invention and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein, and such other embodiments are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

In the drawing:

Fig. 1 is a vertical sectional view taken through a vacuum feed assembly and valve therefor constructed according to the present invention;

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Fig. 2 is a longitudinal sectional view, certain parts being shown in plan, of the vacuum valve seen in Fig. 1; and

Fig. 3 is a vertical section taken substantially along the line 3—3 of Fig. 1 looking in the direction of the arrows, certain parts being shown in end elevation.

Referring now particularly to Fig. 1, the vacuum feed assembly and vacuum valve therefor is referred to generally by the reference numeral **10**, and includes a shuttle table **11** upon which rests a number of flat articles **12** such as magazines, newspapers or the like. The shuttle table **11** includes a bed **13** having a wear plate **14** at the forward end thereof, wear plate **14** having a plurality of vacuum openings **15** therein to engage a bottom mailing piece **16** of the pile of newspapers or magazines **12**.

The shuttle table **11** is part of a feed mechanism such as is shown in the aforesaid Doane patent, the feed mechanism of said patent and according to this invention being arranged to move the bottom mailing piece **16** by means of the shuttle **11** into the "bite" of a pair of feed rollers, not shown. The pile of magazines **12** are confined in a feed hopper, not shown, and the shuttle table **11** forms the bottom of such hopper, shuttle **11** being arranged to reciprocate back and forth beneath the hopper and to advance the bottom article **16** upon forward movement thereof.

Means are provided for moving the bottom article **16** into the feed rollers, vacuum being applied to the bottom article during the forward movement of the shuttle table **11** so as to engage the bottom article **16**, the vacuum being cut off during the return stroke of the shuttle **13**, and not being available until the commencing of the forward stroke.

The means for advancing the bottom article **16** comprises a valve indicated generally by the reference numeral **20**, see also Figs. 2 and 3, and includes a valve body **21** having end walls **22** and **23**, opposed sidewalls **24** and **26**, a bottom wall **27** and a top wall **28**, the last named wall **28** being secured by any convenient means to the underside of the shuttle table **13**.

The valve body **21** has a pair of vacuum chambers **29** and **31** therein, the two chambers being connected by a passageway **32**. A chamber **33** is interposed between the vacuum chambers **29** and **31** and is defined by end walls **34** and **36** and a portion of the bottom wall **27** of valve body **21**. The chamber **33** is also defined by opposed side walls **37** and **38**, the chamber **33** being in communication with the openings **15** and the wear plate **14** as seen in Fig. 1.

The chamber **31** is also partly defined by the end wall **36**, a portion of the lower wall **27** of valve body **21** and a web member **39** extending from the wall **36** of the chamber **33** to the end wall **23** of the housing **21**.

The two chambers **29** and **31** are connected at times to the chamber **33**, wall **34** having a port **41** therein and a valve seat **42** thereat. Wall **36** likewise has a port **43** therein with a valve seat **44** thereat.

The two chambers **29** and **31** are constantly connected to a source of pressure less than atmospheric, chamber **29** having a port **46** thereto and a fitting **47** connected to a supply hose **48** in turn connected to the source of sub-atmospheric pressure, not shown.

The end wall **27** has an opening **49** therein, and a closure **51** fits over the opening **49**. The opposite end wall **23** of the housing **21** likewise has an opening **52**,

and a closure 53 is provided for the opening 52. The closures 51 and 53 are held in position to the housing 21 by means of cap screws 54, as seen in Fig. 3.

Both of the closures 51 and 53 have aligned bores 56 and 57 respectively to support a valve stem 58. Valve stem 58 supports a valve spool member 59, one end of valve spool member 59 having a packing 61 arranged to engage the seat 44, and the other end of the valve spool member having a packing 62 arranged to engage the seat 42.

The spool valve member 59 and its packings 61 and 62 are located in proper position on the valve stem 58 and between a washer 63 bearing against a shoulder 64 formed on the valve stem 58 and a washer 66 bearing against the packing 62, pressure being maintained against the assembly described by means of a sleeve 67 and a nut 68 threaded to the stem 58. As seen in Figs. 1 and 2, the nut 68 is threaded to the stem 58 exterior of the housing 21.

Means are provided for causing the chamber 33 to be in communication with the atmosphere, and to this end the valve stem 58 has an axial passageway 69 therein which intersects a passageway 71 drilled at right angles to the longitudinal axis of the spool 59. The right end of the valve stem 58 is drilled with radial passages 72 intersecting the axial passage 69, and such passages together with the axial passage 69, the radial passage 71 and the chamber 33 can be sealed from the atmosphere when the valve stem 58 shifts to the left.

Means are provided for closing the chamber 33 from atmosphere, and such means consists of a generally truncated conical shaped valve member 73 held between a shouldered portion 74 on the valve stem 58 and a washer 76. The valve member 73 is held in position by means of a nut 77 threaded against the washer 76 on a reduced diameter portion 78 of the valve stem 58 and protruding beyond the closure 53.

Means are provided for biasing the valve stem 58 together with its spool valve member 59 to the left, and to this end a spring 79 is supported on the valve stem 58 and has one end abutting the inner end of the closure 53 with its other end bearing against the washer 61.

Such means also includes a spring 80 abutting the valve member 73 at the washer 76, and having its other end bottomed against a guide 81 having stirrup arms 82 secured by means, not shown, to the closure 53. The guide 81 has a bore 83 therein for movement of the portion 78 of the valve stem 58.

Means are provided for causing shifting of the valve stem 58 to the left with respect to the housing 21 to open the ports 41 and 44 to cause suction to be applied against the openings 15 when the shuttle 11 has moved to the end of its reverse stroke and while it is moving in a forward or operative stroke. The left end of the valve stem 58 is provided with a clevis 84 threaded thereto and held in position to valve stem 58 by a set screw 86. The clevis 84 is hingedly connected to a link 87 by means of a pin 88, and the other end of the link 87 is connected by a pin 89 to a cam follower 91 having a stop arm 92 engaging a stop 93 on the link 87 to provide an over-center or toggle connection with the link 87.

The cam follower 91 moves with the shuttle 11 and has a pivotal connection at 92 to a support 93 for the cam follower, the support 93 extending below the shuttle 11. The cam follower 91 moves in a slot 94 of a fixed table 96, a fixed cam 97 extending below the table 96 and cooperating with a follower arm 98 of the cam follower 91, a roller 99 being mounted at the end of the follower arm 98 to cooperate with a camming surface 101 of the fixed cam 97.

The operation of the structure thus far described is as follows: The valve 20 is shown in position at the start of its return stroke with the vacuum released against the bottom piece 16. As the shuttle table 13 moves on its return stroke to the left as seen in Fig. 1 the valve 20 moves therewith, and the follower arm 98 comes into contact with a first camming portion 102 which rocks the cam follower 91 in a counterclockwise direction to cause collapse of the toggle connection between it and the link 87. At such time the follower arm 98 will drop through the several dotted line positions shown and the valve stem 58 will be moved to the left by the bias of the springs 79 and 82, the movement to the left of the spool 58 being limited by a resilient bumper 103 supported on the sleeve 56 and between the packing 62 and the end closure 51. Upon collapse of the toggle connection described suction will be manifested against the openings 15. Ports 41 and 43 are open, and chamber 33 is closed to atmosphere since valve 73 will be closed against end closure 53.

The toggle connection described is maintained in the collapsed condition as the shuttle moves in its forward stroke, and ports 41 and 43 are open to maintain the suction against the bottom article 16. The suction applied against the bottom article will advance same from the pile 12 to the feed rollers, not shown.

As the shuttle 11 approaches the end of its forward stroke the follower roller 99 comes in contact with another camming portion 104 to rock the follower in a clockwise direction and to commence to reestablish the toggle connection between the link 87 and the cam follower 91.

The toggle connection is reestablished when the follower roller 99 reaches a succeeding portion 106 of the cam 97. At such time the shuttle 11 has reached the end of its forward stroke and valve stem 58 is shifted to the right with respect to the valve housing 21 to close the packings 62 and 61 against their respective seats 42 and 43 to seal the chamber 33 from the source of vacuum. The vacuum against the openings 15 is released since the conical shaped valve member moves from its seat on the end closure 53.

With the toggle connection between the cam follower 91 and the link thus reestablished, the valve stem 58 cannot move relatively to the valve housing 21 and the seal will be maintained between the chambers 29 and 31 and the chamber 33, the latter remaining at atmospheric pressure, since the valve member 73 will during such time be in position raised from its seat against the closure 53.

Structure according to the present invention makes it possible to have positively controlled suction to advance the bottom article 16 into the feed mechanism, and to have at the same time positive control of the cycling of the valve from its inoperative period during the return stroke of its operative period on the forward stroke.

While the invention has been described in terms of a preferred embodiment thereof, its scope is intended to be limited only by the claims here appended.

I claim as my invention:

1. A valve adapted for reciprocating movement, said valve comprising a valve body having a first chamber connected to a source of suction, a second chamber adapted at times to be connected to said first chamber, a valve port connecting said chambers, a valve stem having a valve element adapted to close said port, a passage in said valve stem adapted to connect said second chamber to atmosphere, valve means adapted to close said passageway, and means for actuating said valve including a fixed cam and a cam follower cooperating therewith having a toggle connection to said valve stem, said cam having a portion thereon coacting with said cam follower to cause collapse of said toggle connection when said valve body moves in return direction, means biasing said valve stem in a direction during such collapse to close said passageway, said cam having another portion thereon and cooperating with said cam follower to re-establish said toggle connection upon movement of said valve

body in a forward direction, and a further portion on said cam and cooperating with said cam follower for urging said valve stem in a direction to open said valve means and connect said second chamber to atmosphere near the end of the forward movement of said shuttle and at the start of the return movement of said shuttle.

2. In apparatus of the class described for feeding a flat article from the bottom of a pile thereof, a shuttle adapted to have reciprocating movement in contact with the bottom article of said pile, said shuttle having at least one suction opening therein against which suction is applied during movement of said shuttle in an article feeding direction and against which suction is not applied during a return movement thereof, a valve movable with said shuttle and controlling the suction at said opening during the aforesaid movement of said shuttle, said valve comprising a valve body secured to said shuttle, said valve body having a chamber connected to a source of suction, a second chamber adapted at times to be connected to said first chamber so that suction will be manifested at said suction opening, a valve port connecting said chambers, a valve stem having a valve element supported thereon adapted to close said port, a passage in said valve stem adapted to connect said second chamber to atmosphere, valve means adapted to close said passageway, a fixed cam and a cam follower moving with said valve body and cooperating with said cam, said cam follower having a toggle connection to said valve stem, said cam having a portion thereton coacting with said cam follower to cause collapse of said toggle connection when said shuttle moves in a return direction, means biasing said valve stem in a direction during such collapse so that said valve means closes said passageway, said fixed cam having another portion thereon and cooperating with said cam follower to move said cam follower in a direction to reestablish said toggle connection, and a further portion on said fixed cam and cooperating with said cam follower completing the reestablishment of said toggle connection and urging said valve stem in a direction to open said valve means and connect said second chamber to atmosphere at the end of the forward movement of said valve body and at the start of the return movement of said valve body.

3. In apparatus of the class described for feeding a flat article from the bottom of a pile thereof, a shuttle adapted to have reciprocating movement in contact with the bottom article of said pile, said shuttle having at least one suction opening therein against which suction is applied during movement of said shuttle in an article feeding direction and against which suction is not applied during a return movement thereof, a valve movable with said shuttle and controlling the suction at said opening during the aforesaid movement of said shuttle, said valve comprising a valve body secured to said shuttle, said valve body having first and second chambers connected to a source of suction, a further chamber located between said first and second chambers, said further chamber being adapted at times to be connected to said first and second chambers so that suction will be manifested at said suction opening, a pair of valve ports connecting said first and second chambers with said further chamber, a valve stem having a spool valve element supported thereon adapted to close said ports, a passage in said valve stem and said spool valve element adapted to connect said further chamber to atmosphere, valve means adapted to close said passageway, and means for operating said valve including a fixed cam and a cam follower moving with said valve body and cooperating with said cam, said cam follower having a toggle connection to said valve stem, said fixed cam having a portion thereon coacting with said cam follower to cause collapse of said toggle connection when said valve body moves in return direction, means biasing said valve stem in a direction during such collapse to close said passageway, said fixed cam having another portion thereon and

cooperating with said cam follower to move said cam follower in a direction to reestablish said toggle connection, and a further portion on said fixed cam and cooperating with said cam follower completing the reestablishment of said toggle connection and urging said valve stem in a direction to open said valve means and connect said further chamber to atmosphere at the end of the forward movement of said valve body and at the start of the return movement of said valve body.

4. In apparatus of the class described for feeding a flat article from the bottom of a pile thereof, a shuttle adapted to have reciprocating movement in contact with the bottom article of said pile, said shuttle having at least one suction opening therein against which suction is applied during movement of said shuttle in an article feeding direction and against which suction is not applied during a return movement thereof, a valve movable with said shuttle and controlling the suction at said opening during the aforesaid movement of said shuttle, said valve comprising a valve body secured to said shuttle, said valve body having a chamber connected to a source of suction, a second chamber adapted at times to be connected to said first chamber so that suction will be manifested at said suction opening, a valve port connecting said chambers, a valve stem having a valve element supported thereon adapted to close said port, a passage in said valve stem adapted to connect said second chamber to atmosphere, valve means adapted to close said passageway, means for operating said valve including a fixed cam and a cam follower moving with said shuttle and cooperating with said cam, said cam follower having a toggle connection to said valve stem, said cam having a portion thereon coacting with said cam follower to cause collapse of said toggle connection when said shuttle moves in return direction, means biasing said valve stem in a direction during such collapse to close said passageway, resilient means supported on said valve stem and within said first chamber to absorb impact upon such collapse, said cam having another portion thereon and cooperating with said cam follower to move said cam follower in a direction to reestablish said toggle connection, and a further portion on said cam and cooperating with said cam follower completing the reestablishment of said toggle connection and urging said valve stem in a direction to open said valve means and connect said second chamber to atmosphere at the end of the forward movement of said valve body and at the start of the return movement of said valve body.

5. In apparatus of the class described for feeding a flat article from the bottom of a pile thereof, a shuttle adapted to have reciprocating movement in contact with the bottom article of said pile, said shuttle having at least one suction opening therein against which suction is applied during movement of said shuttle in an article feeding direction and against which suction is not applied during a return movement thereof, a valve movable with said shuttle and controlling the suction at said opening during the aforesaid movement of said shuttle, said valve comprising a valve body secured to said shuttle, said valve body having a chamber connected to a source of suction, a second chamber adapted at times to be connected to said first chamber so that suction will be manifested at said suction opening, a valve port connecting said chambers, a valve stem having a valve element supported thereon adapted to close said port, a passage in said valve stem adapted to connect said second chamber to atmosphere, valve means adapted to close said passageway, means for operating said valve including a fixed cam and a cam follower moving with said shuttle and cooperating with said cam, said cam follower having a toggle connection to said valve stem, said cam having a portion thereon coacting with said cam follower to cause collapse of said toggle connection when said shuttle moves in return direction, means biasing said valve stem in a diretcion during such collapse to close

said passageway, resilient means supported on said valve stem and within said first chamber to absorb impact upon such collapse, said cam having another portion thereon and cooperating with said cam follower to move said cam follower in a diretcion to reestablish said toggle connection, and a further portion on said cam and cooperating with said cam follower completing the reestablishment of said toggle connection and urging said valve stem in a direction to open said valve means and connect said second chamber to atmosphere at the end of the forward movement of said valve body and at the start of the return movement of said valve body.

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