March 3, 1942. E. KLUGE 2,274,797

VALVE MECHANISM FOR PNEUMATIC SHEET FEEDING DEVICES

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Fig. 2

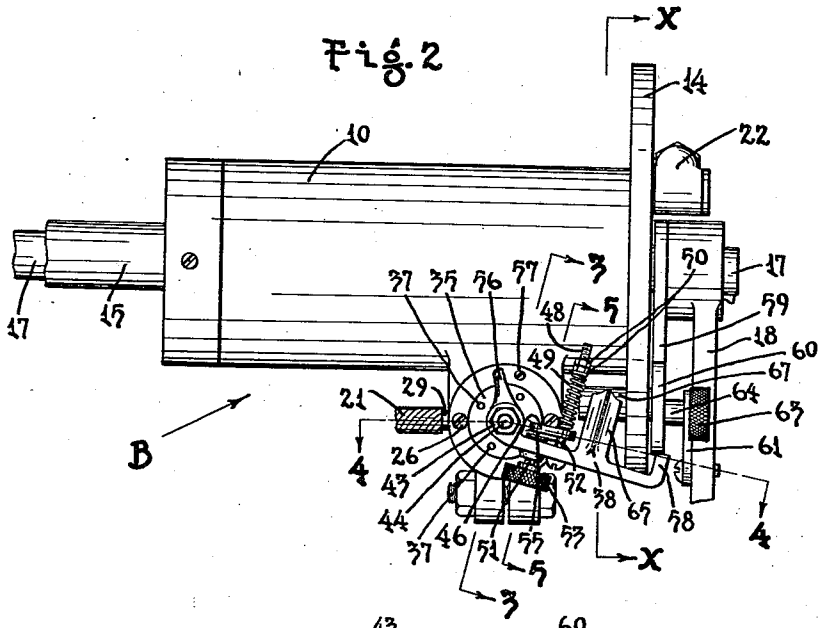
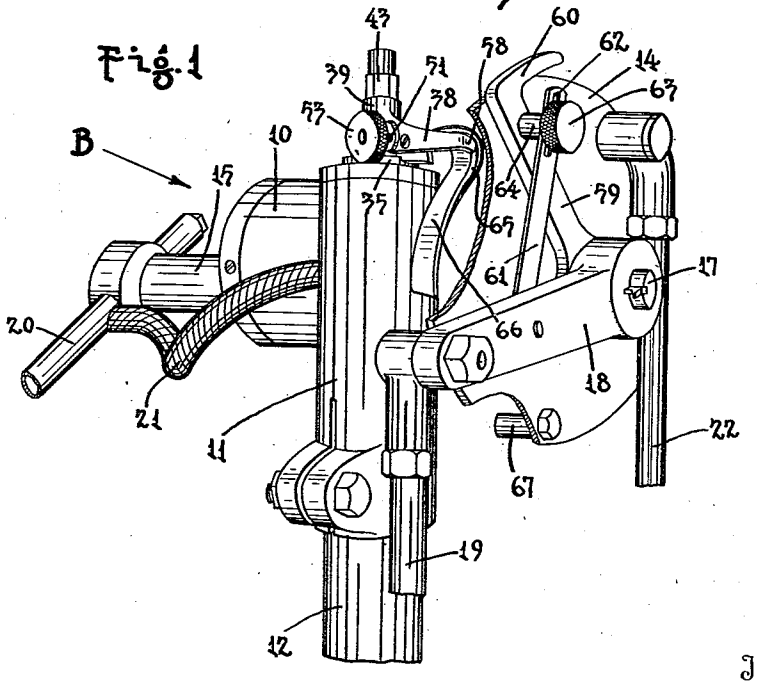


Fig. 1



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VALVE MECHANISM FOR PNEUMATIC SHEET FEEDING DEVICES

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Fig. 7

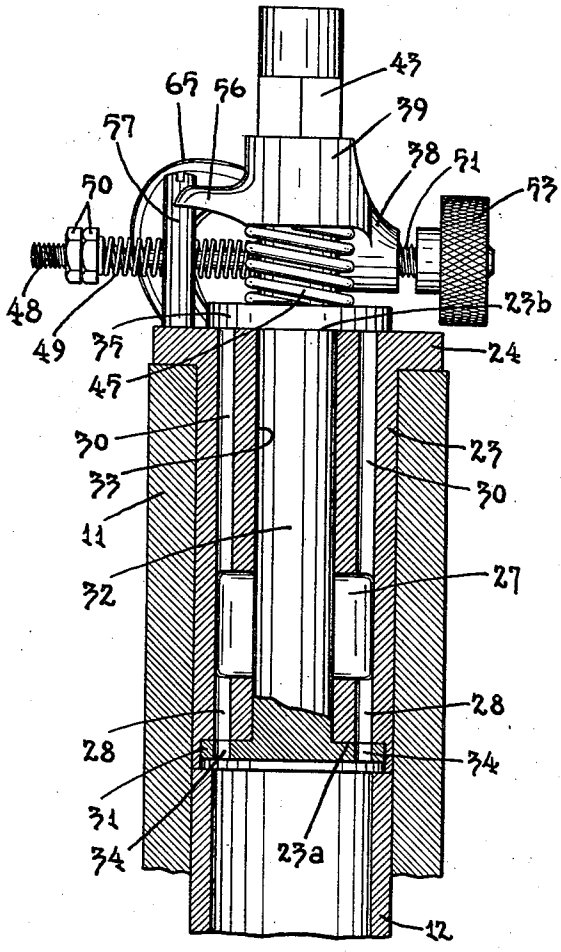


Fig. 8

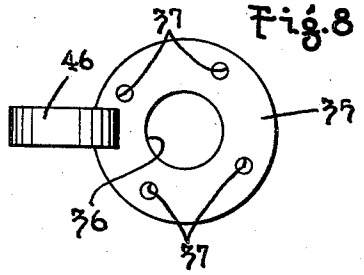


Fig. 9

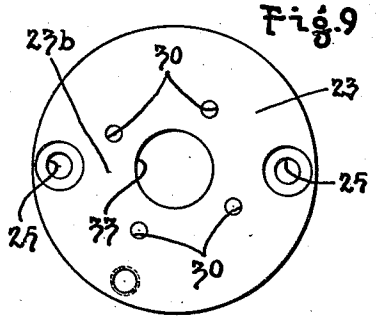


Fig. 10

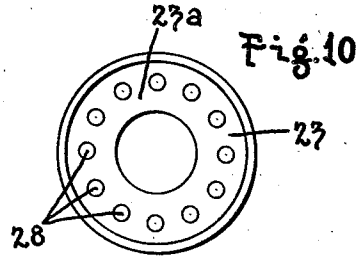
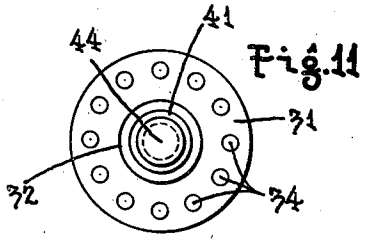


Fig. 11



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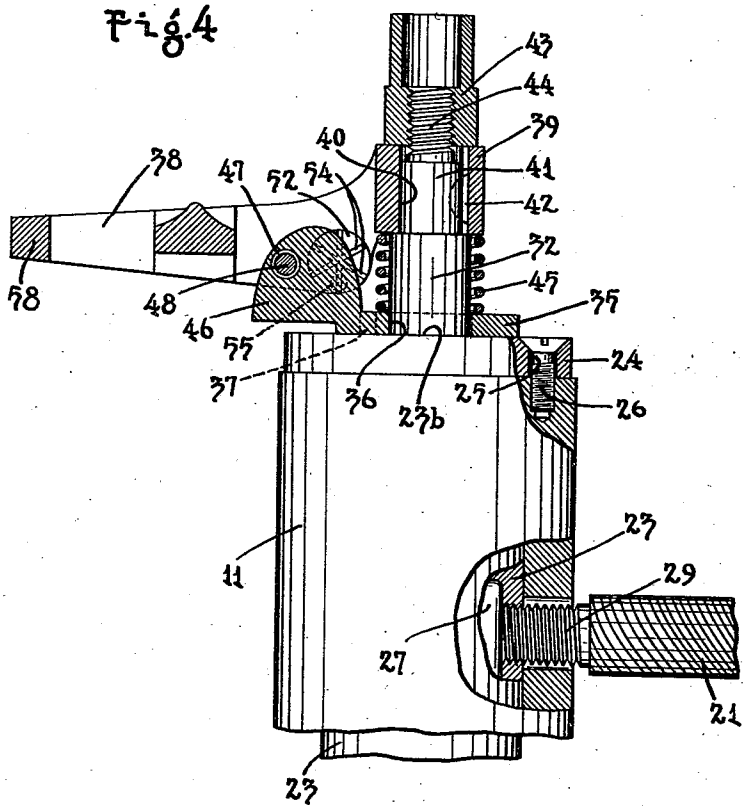
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VALVE MECHANISM FOR PNEUMATIC SHEET FEEDING DEVICES

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Fig. 4



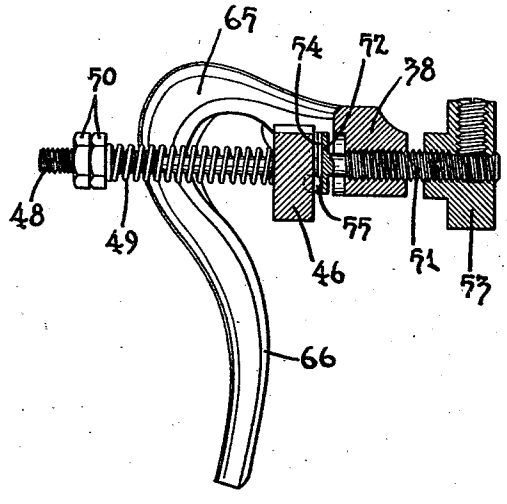


Fig. 5

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VALVE MECHANISM FOR PNEUMATIC SHEET FEEDING DEVICES

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Fig. 6

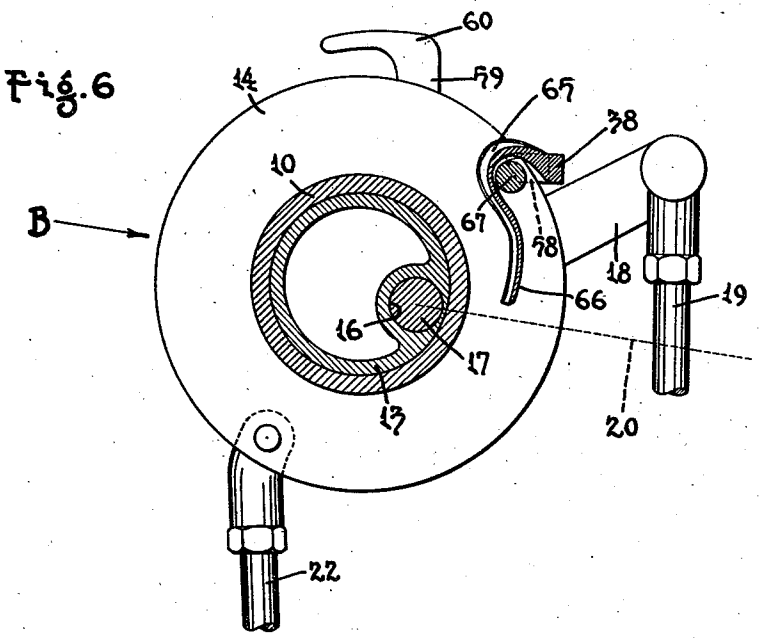
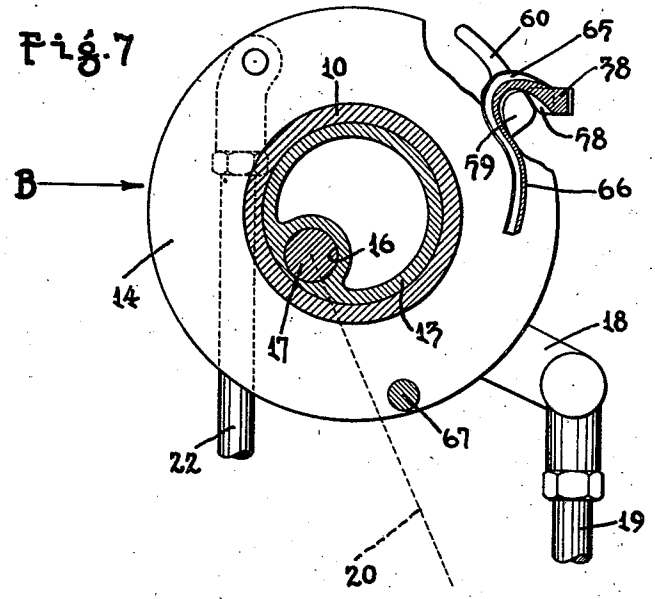


Fig. 7



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UNITED STATES PATENT OFFICE

2,274,797

VALVE MECHANISM FOR PNEUMATIC SHEET FEEDING DEVICES

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Application August 4, 1941, Serial No. 405,367

6 Claims. (Cl. 101—287)

My invention relates to improvements in valve mechanisms for pneumatic sheet feeding devices and particularly for sheet feeding devices for platen printing presses.

Patent No. 1,472,656, of October 30, 1923, and Patent No. 1,592,635, of July 13, 1926, both of which matured from applications made by Abel Kluge and myself, disclose valve mechanisms for pneumatic sheet feeding devices of the instant character and upon which the present invention is an improvement.

In the development of automatic printing units embodying bed and platen presses combined with pneumatic sheet feeding and delivering devices, it has been desired, insofar as possible, to improve such printing units whereby, among other things, they might be rendered more speedy and yet more quiet and of greater longevity in use and, further, of greater accuracy in operation.

An object of the present invention is to provide an improved valve mechanism for interrupting and reestablishing suction in the suction feed members of pneumatic sheet feeding devices particularly, though not exclusively, for automatic press units, it being a purpose of the invention to provide a mechanism of such character that is simple, relatively inexpensive, quiet in operation, readily adjustable and operable under different adjustments effectively to cause the sheets to be grasped and carried to a platen and accurately deposited thereon precisely in the locality selected notwithstanding the sizes of the sheets, the weights of the stock thereof, or the press speeds.

Other objects of the invention reside in the novel combination and arrangement of parts and in the details of construction hereinafter illustrated and/or described.

In the drawings, Fig. 1 is an elevational perspective view illustrating the head-piece of a sheet feeding device in which is incorporated a valve mechanism constructed in embodiment of my present invention; Fig. 2 is a plan view of the structure shown in Fig. 1; Fig. 3 is a vertical sectional view in detail taken on the line 3—3 of Fig. 2; Fig. 4 is a vertical sectional view in detail taken on the line 4—4 of Fig. 2; Fig. 5 is a vertical sectional view in detail taken on the line 5—5 of Fig. 2; Fig. 6 and Fig. 7 are vertical sectional views taken on the line x—x of Fig. 2 and showing different positions assumed by the valve lever in relation to different positions of other parts of the sheet feeding device; Figs. 8, 9, 10 and 11 are detail views of various parts of the presently illustrated embodiment of my invention, Fig. 8 being a plan view of the auxiliary valve head, Figs. 9 and 10 being top and bottom views, respectively, of the valve body and Fig. 11 being a plan view of the valve stem and of the main valve formed thereon.

Referring to the accompanying drawings, wherein similar parts are designated by similar reference characters throughout the several views, I have shown in Fig. 1 a headpiece B of a pneumatic sheet feeding device which, aside from the valve mechanism therein, is constructed and operated substantially the same as the similar structure in the sheet feeding device disclosed in said Patent No. 1,592,635. Said headpiece B includes a horizontally disposed tubular bearing 10 and an upright tubular housing 11 cast integrally with said bearing, the lower end of said housing being fitted over the upper end of the tubular standard 12 which communicates with suitable vacuum creating means and within which suction is maintained. Rockable in bearing 10 is an eccentric bushing 13 formed with a disc 14 at its outer end and with an axially offset extension 15 at its inner end. Within a bore 16 extending through said bushing 13, disc 14 and extension 15 is a rock shaft 17. A rocker arm 18 keyed to the outer end of the rock shaft 17 and operated through an upright rod 19 turns the rock shaft 17 and oscillates a feeder arm 20 mounted on the inner end of said rock shaft. This arm 20 is hollow and is connected with the interior of the hollow suction standard 12 through a flexible tube 21 and the hereinafter described valve mechanism contained within the housing 11, the free end of said feeder arm 20 being supplied with a conventional or any suitable suction grip or grips (not shown) for taking a sheet from a pack and depositing it upon the press platen. An upright connecting rod 22 connected with the disc 14 rocks the bushing 13 and lengthens and shortens the reach of the feeder arm 20 in its oscillatory travel. Both of said rods 19, 22 are reciprocated by and in time with the press mechanism with which the headpiece B is associated.

The valve mechanism embodied in the structure above described, includes a cylindrical valve body 23 disposed within the upright housing 11 of the headpiece B, said valve body having an annular flange 24 at its upper end formed with screw holes 25 receiving screws 26 threaded into the upper end of said housing 11. Intermediately of the valve body 11 is a cored-out chamber 27, the lower end portion of said body 11 having an annular series of axially offset suction bores 28 therein extending from the bottom thereof to the chamber 27 and bringing the interior of the suction standard 12 into communication with said chamber. Extending through the side of the housing 11 and threaded into the valve body 23 is a nipple 29 with which the flexible tube 21 is connected. The upper end portion of the valve body 23 has a series of axially offset air admission bores 30 therein extending from the top of said body 23 to the chamber 27 and

serving to bring said chamber into communication with the atmosphere. The central portion of the bottom of the valve body 23 is planiform to form a seat 23a and flatly seated thereagainst is a disc-like main valve head 31 which is formed integrally with a valve stem 32 revoluble and slidable in an axial bore 33 in said valve body 23. This main valve head 31 has an annular series of axially offset ports 34 therein, said ports being registrable with the lower ends of the suction bores 28 at the bottom of said body, said main valve head 31 being adapted to clear said suction bores 28 when the ports 34 are in registration therewith and to obstruct said bores when said ports are out of registration therewith. An auxiliary valve head 35, disc-like in form, has a central opening 36 therein in which the upper portion of the valve stem 32 is revoluble and slidably received. Said auxiliary valve head 35 is angularly adjustable about said stem 32 and flatly seated on the top of the valve body 23 which is made planiform to provide a seat 23b for said valve head 35. This auxiliary valve head 35 has a series of ports 37 therein annularly disposed about said opening 36, said ports being registrable with the upper ends of the air admission bores 30 and shiftable into and out of such registration to clear and to obstruct said bores 30.

A lever 38 for reversely turning the valve stem 32 has a boss 39 thereon with an axial bore 40 therein which fits over a reduced portion 41 of said stem 32. This boss 39 is keyed to said reduced portion 41 of said stem 32 by a key 42 and is axially held in place thereon by means of an end nut 43 fitted to a reduced threaded terminal portion 44 of said stem 32. A helical spring 45 interposed between the boss 39 of said lever 38 and the top of the auxiliary valve head 35 yieldingly holds the latter seated on the seat 23b at the top of the valve body 23 and likewise holds the main valve head 31 seated on the seat 23a at the bottom of said valve body 23. Said auxiliary valve head 35 is adjustably tied to the valve lever 38 to effect the angular adjustment of the former relative to the valve stem 32. To this end, a shifting lug 46 is formed on said valve stem 35, the same having an opening 47 (Fig. 4) therethrough freely receiving the intermediate portion of a tie-bolt 48, the headed end of which extends through and is caught upon the valve lever 38. The threaded end of the tie-bolt 48 is encircled by a helical spring 49 which is compressed between the shifting lug 46 of the auxiliary valve 35 and tensioning nuts 50 on said tie bolt 48. The action of said spring 49 is to thrust said shifting lug 46 toward the valve lever 38 and turn the auxiliary valve head 35 relative to the valve stem 32 in a clockwise direction as seen in Fig. 2. Countering this action of said spring 49 is an adjusting screw 51 threaded through the valve lever 38. Said screw 51 has a disc-like head on the end thereof at the rear side of the lever 38 adjacent said shifting lug 46 and at its other end has a finger-piece 53 disposed at the rear side of said lever 38. Said screw head 52 has radial grooves 54 in its face and said face marginally engages a hardened spherical protuberance 55 issuing from the shifting lug 46 at a locality offset from the axis of the adjusting screw 51. By turning said screw 51 to advance the same, the auxiliary valve head 35 is turned on the valve stem 32, counter-clockwise as seen in Fig. 2, against the action of the spring 49 on the tie-bolt 48, and by turning said screw 51 to retract the same, said auxiliary valve head 35 is reversely turned on said valve stem 32, by the force of said spring 49, as above indicated. The grooves 54 in the face of the head 52 of said adjusting screw 51 catch on the protuberance 55 and prevent any substantial unpremeditated turning of said screw 51.

The inner end of the valve lever 46 is formed with a finger 56 which occupies a position near a guide pin 57 threaded into the top of the valve body 23. This finger 56 and guide pin 57 are provided to assist in securing the proper assemblage of parts of the valve mechanism.

The outer end of the valve lever 38 overreaches the disc 14 of the head-piece B and has at its extremity a rearwardly turned lug 58. An arm 59 swung on the rock shaft 17 between the rocker arm 18 and disc 14 is formed with a cam 60 at its free end to engage the lug 58 on the valve lever 38 and swing said lever forwardly. A link 61 joining the rocker arm 18 and cam arm 59 is pivoted at one end to the former and supplied with a slot 62 at the other end thereof. A binding screw 63 threaded in a boss 64 on the arm 59 extends through said slot 62 and binds the link 61 against said boss. Said slot 62 permits of various angular adjustments of the cam arm 59 with respect to the rocker arm 18, whereby the valve lever 38 will be engaged and swung by the cam 60, earlier or later, through greater or less distances in the latter portion of the feeding sweep of the feeder arm 20. To swing the valve lever 38 back from whatever forward position it may have assumed under the action of cam 60, I provide a down-turned hook-like finger 65 issuing from the rear side of the valve lever 38 and disposed alongside the inner face of the rocking disc 14. The depending end portion of said finger 65 is arched forwardly and forms a cam 66 which is engaged at its forward side by a pin 67 on said disc 14 and forced rearwardly by said pin when it is elevated upon the turning of said disc.

In the rearward starting position of the valve lever 38, the ports 34 of the main valve head 31 on the valve stem 32 are in full registry with the suction bores 28 of the valve body 23, while the ports 37 of the auxiliary valve head 35 are fully out of registry with the air admission bores 30 of said valve body. Thus, the interior of the feeder arm 20 and the suction feed grips thereon subjected to the full suction existing in the standard 12. The forward swinging of said valve lever 38 from its said rearward starting position turns said valve stem 32 and shifts the ports 34 of said main valve head 31 out of registry with said suction bores 28, whereby suction to the feeder arm 20, created under vacuum maintained in the standard 12, is cut off. Prior to, after, or simultaneously with the cutting off of suction to the feeder arm 20 by the main valve head 31, according to the adjustment of the screw 51, the ports 37 of the auxiliary valve 35 are brought into registry with the air admission bores 30 of the valve body, air from the outer atmosphere being thus allowed to enter the suction conduit between the feeder arm 20 and the main valve head 31. Admitting air to the suction conduit, through the auxiliary valve head 35, prior to the closing of the main valve head 31 eases the suction in the feeder arm 20 and hastens the release of a sheet from the grips thereon upon the closing of said main valve head 31, while such admission of air to said suction conduit after

the closing of said main valve head 31 delays the release of the sheet.

During the return swing of the feeder arm 20 to the supply of sheets to be fed, the main valve head 31 is turned back into position clearing the suction bores 28 of the valve body 23 and, turning with said main valve head 31, the auxiliary valve head 35 is turned back into position obstructing the air admission bores 30 of said valve body.

In Fig. 6, the feeder arm 20 is diagrammatically shown in position for the taking of a sheet to be fed and in Fig. 7, said feeder arm 20 is shown at the end of its sheet feeding throw. When the feeder arm 20 swings to sheet taking position, the cam 66 on the valve lever 38 is engaged by the pin 67 on the rocking disc 14, said lever being thereby swung to its said rearward starting position (Fig. 6), and when said feeder arm 20 swings into the final stage of its feeding throw, the cam 60 engages the valve lever 38 (Fig. 7) earlier or later in said state, according to the adjustment of the cam arm 59, the valve heads 31, 35 being thereby turned to cut off suction to the feeder arm 20 and admit air thereto.

The adjustment of the cam arm 59 is made while the mechanism is idle and in a manner whereby the main valve head 31 will fully obstruct the suction bores 28 of the valve body 23 when the feeder arm 20 reaches position in substantial conformity with the selected ultimate or printing position of a fed sheet. The finger piece 53 of the adjusting screw 51 is readily manipulated while the mechanism is in operation, and said screw is adjusted at such time when the observable effect of its adjustment guides the operator in securing the particular angular relationship between the auxiliary valve head 35 and the main valve head 31 which best accords with the particular sheets being fed, the then speed of the press, and the selected ultimate position of a fed sheet.

The disc-like valve heads 31, 35 flatly seated on the valve body 23 and actuated through their common valve stem 32 make for an exceedingly simple construction that is noiseless and durable regardless of speeds of operation. The series of suction bores 28 and air admission bores 30 in the valve body 23, and the corresponding series of suction ports 34 and air admission ports 37 in the main valve head 31 and auxiliary valve head 35, respectively, are all circular in cross-section and provide for that sensitivity of operation through which extreme accuracy in the dispositioning of fed sheets may be readily effected.

Changes in the specific form of my invention, as herein disclosed, may be made within the scope of what is claimed without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. Valve mechanism for a pneumatic sheet feeding device including a suction member movable from a sheet-receiving position through a succession of selective sheet-releasing positions and back again, a suction conduit communicating with said suction member and a pair of actuating members movable to and fro in accord with the movement of said suction member, said valve mechanism comprising a cylindrical valve body having an intermediate chamber therein and a series of suction bores extending through one end portion thereof and communicating with said chamber, said suction bores and chamber constituting a portion of said suction conduit, a valve stem revoluble in the valve body, a main valve head fixed to said stem, said valve head being seated on said body and formed with ports therein registrable with said suction bores, said valve head being adapted to obstruct and to clear said bores, the other end portion of said valve body having a series of air admission bores extending therethrough and communicating with said chamber, an auxiliary valve head seated on said valve body and revoluble on said valve stem, means for angularly adjusting the auxiliary valve head relative to said valve stem, said auxiliary valve head being formed with ports therein registrable with said air admission bores and being adapted to obstruct and to clear said air admission bores, a lever secured to said valve stem and swingable in one direction by one of said actuating members to cause the main valve head to obstruct said suction bores and cut off suction to said suction member in the feeding throw thereof and, further, to cause the auxiliary valve head to clear said air admission bores and admit air to the suction conduit between said main valve and said suction member, said lever being swingable back to starting position by said other actuating member, said auxiliary valve having a shifting lug thereon, said angular adjusting means being interposed between said lug and said valve lever on the valve stem, the clearing by said auxiliary valve head of said air admission bores with reference to the obstruction of said suction bores by the main valve being relatively timed by the angular adjustment of the auxiliary valve head on said valve stem.

2. Valve mechanism, as set forth in claim 1, wherein said angular adjusting means comprises a screw threaded in the valev lever and engageable upon its advancement with the shifting lug on the auxiliary valve head to turn said auxiliary valve head in one direction relative to the valve stem, a bolt caught at one end thereof on the valve lever and intermediately slidably guided by said shifting lug, said bolt at its other end having a nut threaded thereon, and a spring encircling said bolt and compressed between said nut and said shifting lug, said spring serving to turn the auxiliary valve head relative to the valve stem upon the retraction of said screw and in the direction opposite to that in which it is turned by said screw upon its advancement.

3. Valve mechanism, as set forth in claim 1, wherein the shifting lug has a protuberance thereon facing the valve lever, and wherein said angular adjusting means includes a spring acting upon said lug and lever to shift the former toward the latter and thereby turn the auxiliary valve head in one direction relative to the valve stem, an adjusting screw threaded in the valve lever and axially offset from said protuberance, said screw having a head thereon bearing against said protuberance and formed with latching recesses therein engageable with said protuberance to prevent the unpremeditated turning of the screw, said screw being adapted to limit the turning of the auxiliary valve head relative to the valve stem under the action of said spring and being further adapted against the action of said spring, to turn said auxiliary valve head in the opposite direction relative to said valve stem.

4. Valve mechanism for a pneumatic sheet

feeding device including a suction member movable from a sheet-receiving position through a succession of selective sheet-releasing positions and back again, a suction conduit communicating with said suction member and a pair of actuating members movable to and fro in accord with the movement of said suction member, said valve mechanism comprising a cylindrical valve body having an intermediate chamber therein and a series of suction bores extending through one end portion thereof and communicating with said chamber, said suction bores and chamber constituting a portion of said suction conduit, a valve stem revoluble in the valve body, a main valve head fixed to said stem, said valve head being seated on said body and formed with ports therein registrable with said suction bores, said valve head being adapted to obstruct and to clear said bores, the other end portion of said valve body having a series of air admission bores extending therethrough and communicating with said chamber, an auxiliary valve head on said valve stem having angular adjustment relative thereto and seated on said valve body, said auxiliary valve head being formed with ports therein registrable with said air admission bores and being adapted to obstruct and to clear said air admission bores, a lever secured to said valve stem and swingable in one direction by one of said actuating members to cause the main valve head to obstruct said suction bores and cut off suction to said suction member in the feeding throw thereof and, further, to cause the auxiliary valve head to clear said air admission bores and admit air to the suction conduit between said main valve and said suction member, said lever being swingable back to starting position by said other actuating member, said angular adjustment being effected by means comprising a spring for turning the auxiliary valve head in one direction relative to the valve stem, and an adjusting screw against which said spring reacts for turning said auxiliary valve head in the opposite direction relative to said valve stem, the clearing by said auxiliary valve head of said air admission bores with reference to the obstruction of said suction bores by the main valve being relatively timed by the angular adjustment of the auxiliary valve head on said valve stem.

5. Valve mechanism for a penumatic sheet feeding device inculding a suction member movable from a sheet-receiving position through a succession of selective sheet-releasing positions and back again, a suction conduit communicating with said suction member and a pair of actuating members movable to and fro in accord with the movement of said suction member, said valve mechanism comprising a cylindrical valve body having an intermediate chamber therein and a series of suction bores extending through one end portion thereof and communicating with said chamber, said suction bores and chamber constituting a portion of said suction conduit, a valve stem revoluble and slidable in the valve body, a main valve head fixed to said stem, said valve head being seated on said body at the end of said end portion thereof and formed with ports therein registrable with said suction bores, said valve head being adapted to obstruct and to clear said suction bores, the other end portion of said valve body having a series of air admission bores extending therethrough and communicating with said chamber, an auxiliary valve head seated on the valve body at the end of said second end portion thereof and slidable on said valve stem and angularly adjustable relative thereto, said auxiliary valve head being formed with ports therein registrable with said air admission bores and being adapted to obstruct and to clear said air admission bores, a spring acting against the auxiliary valve head and against said valve stem yieldingly to hold both of said valve heads seated, a lever secured to said valve stem and swingable in one direction by one of said actuating members to cause the main valve head to obstruct said suction bores and cut off suction to said suction member in the feeding throw thereof and, further, to cause the auxiliary valve head to clear said air admission bores and admit air to the suction conduit between said main valve and said suction member, said lever being swingable back to starting position by said other actuating member, the clearing by said auxiliary valve head of said air admission bores with reference to the obstruction of said suction bores by the main valve being relatively timed by the angular adjustment of the auxiliary valve head on said valve stem.

6. Valve mechanism for a pneumatic sheet feeding device including a suction member movable from a sheet-receiving position through a succession of selective sheet-releasing positions and back again, a suction conduit communicating with said suction member and a pair of actuating members movable to and fro in accord with the movement of said suction member, one of said actuating members being adjustable, said valve mechanism comprising a cylindrical valve body having an intermediate chamber therein and a series of suction bores extending through one end portion thereof and communicating with said chamber, said suction bores and chamber constituting a portion of said suction conduit, a valve stem revoluble in the valve body, a main valve head fixed to said stem, said valve head being seated on said body and formed with ports therein registrable with said suction bores, said valve head being adapted to obstruct and to clear said bores, the other end portion of said valve body having a series of air admission bores extending therethrough and communicating with said chamber, an auxiliary valve head on said valve stem angularly adjustable relative thereto and seated on said valve body, said auxiliary valve head being formed with ports therein registrable with said air admission bores and being adapted to obstruct and to clear said air admission bores, a lever secured to said valve stem and swingable in one direction by said adjustable actuating member to cause the main valve head to obstruct said suction bores and cut off suction to said suction member at a selected point in the feeding throw thereof and, further, to cause the auxiliary valve head to clear said air admission bores and admit air to the suction conduit between said main valve and said suction member, said lever being swingable back to starting position by said other actuating member, the clearing by said auxiliary valve head of said air admission bores with reference to the obstruction of said suction bores by the main valve being relatively timed by the angular adjustment of the auxiliary valve head on said valve stem.

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