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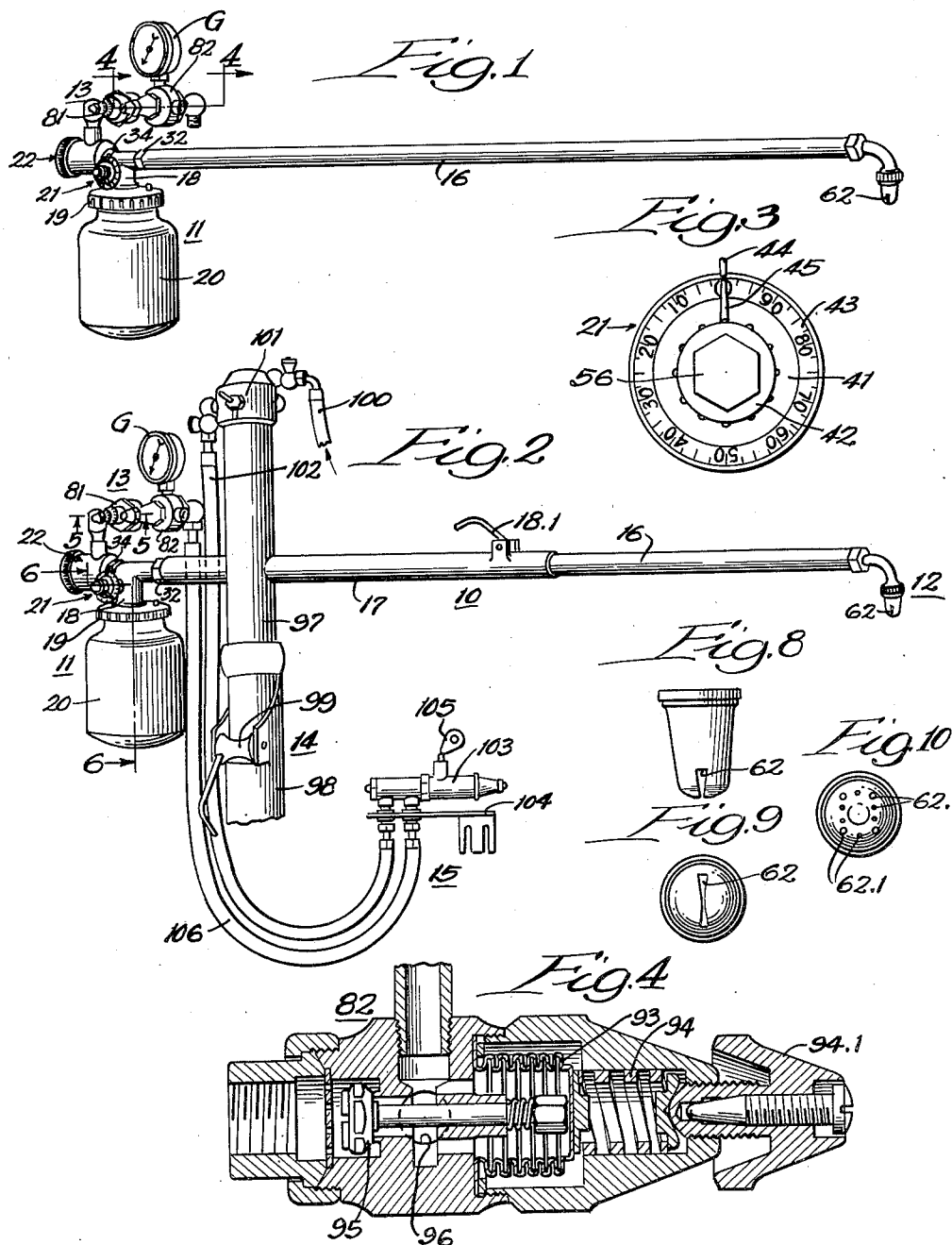
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2,595,600

POWDER COATING ASSEMBLY

Filed Aug. 18, 1949

2 SHEETS—SHEET 1



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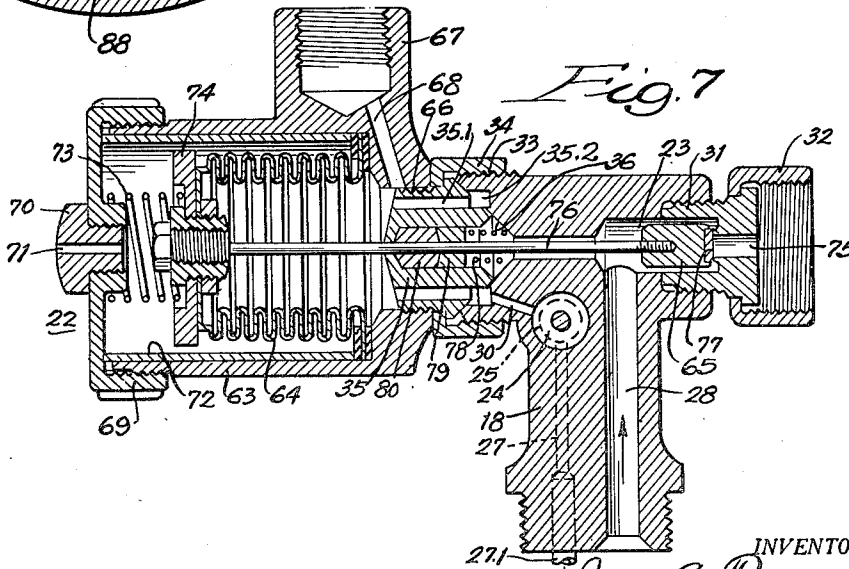
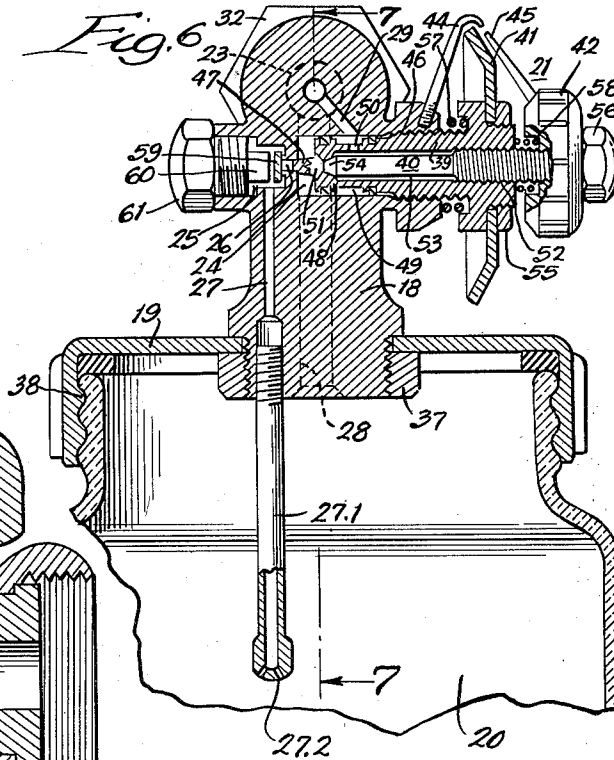
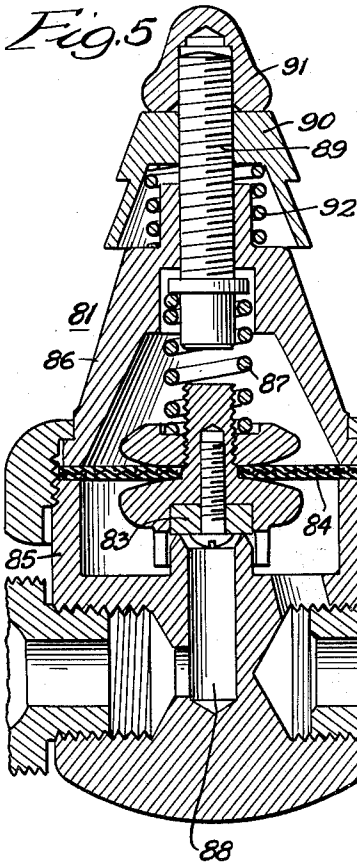
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POWDER COATING ASSEMBLY

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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

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POWDER COATING ASSEMBLY

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Application August 18, 1949, Serial No. 110,955

9 Claims. (Cl. 302—21)

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In the stacking, or otherwise superimposing, of printed sheets, one of the problems has been to prevent the "offset" of the freshly applied ink from one sheet to the next superimposed surface. For years it has been the practice to prevent this "offsetting" by treating the printed sheet as it leaves the press or after it has come to rest on a stacking platform with a substance so finely atomized as to provide a layer between the sheets sufficient to prevent contact of the wet ink with the face of a subsequently superimposed sheet, and which substance has a tendency to improve the appearance of the printed sheet.

Powder has been used recently for such treatment. Its use has presented the problem of how to so arrange the powder supply and powder atomizer and control the delivery of powder from the supply to the atomizer as to get the most efficient results.

The main objects of this invention, therefore, are to provide an improved assembly for spraying finely atomized powder on freshly printed sheets so as to prevent "offset" of fresh ink from one sheet to the next superimposed surface; to provide a "no-offset" powder assembly of this kind having an improved relative arrangement of the powder supply and a powder atomizer so that the container is sufficiently remote from the area of powder atomization as to eliminate the possibility of powder accumulating on the outer surfaces of the container and thereby reduce to a minimum the collecting of any powder on a printed sheet other than that from the valve-controlled powder stream delivered to the powder atomizer; to provide an improved form and arrangement of valve mechanism for controlling the relative flow of air and powder to the powder atomizer; and to provide an improved powder-atomizing device of this kind which is simple in construction and efficient in operation.

In the accompanying drawings:

Fig. 1 is a perspective view of a powder assembly constructed in accordance with this invention;

Fig. 2 is a similar view of the same mounted on a standard and connected to a timing mechanism by means of which the powder assembly may be so associated with a printing press that the atomization of the powder is synchronized with the operation of the press;

Fig. 3 is an enlarged front elevation of the dual valves which control the powder flow to the atomizer;

Fig. 4 is an enlarged cross-sectional detail of the valve mechanism which regulates the maximum air pressure effective during the atomiz-

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ing of the powder. The view is taken on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged cross-sectional view of the valve mechanism which regulates the minimum air pressure constantly maintained in the air line to the atomizer. The view is taken on the line 5—5 of Fig. 2;

Fig. 6 is an enlarged cross-sectional detail of the fitting which supports the powder container and wherewith is associated the valve mechanism which controls the airstreams that effect the powder flow to the powder atomizer. The view is taken on the line 6—6 of Fig. 2; and

Fig. 7 is an enlarged cross-sectional detail of the bellows-actuated valve mechanism which controls the powder flow to the powder atomizer.

Fig. 8 is a side elevation of one form of atomizing head.

Fig. 9 is a bottom plan view of the atomizing head shown in Fig. 8.

Fig. 10 is a bottom plan view of another form of atomizing head.

The embodiment of this invention herein shown comprises an arm 10 mounting a valve-controlled powder supply 11 on one end and a powder atomizing head 12 on the other end, in association with air pressure regulators 13. The remoteness of the source of powder supply 11 from the area of powder atomization practically precludes the possibility of powder accumulating on the powder container. This makes not only for cleaner equipment but avoids having powder collect on the sheet other than that discharged from the atomizer. The arm 10 is adjustably arranged on a standard 14 positionable on or adjacent to a printing press to permit the powder-atomizing action to be synchronized by a timing mechanism 15 with the operation of the printing press.

The arm 10 comprises a conduit or tube 16 telescopically supported in a sleeve 17. The sleeve 17 is attached to the standard 14 and is provided with an eccentric clamp 18, whereby the tube 16 may be locked in any desired position to locate the atomizing head 12 in proper position over the printed sheets to be treated.

The valve-controlled powder supply 11 comprises a fitting 18 mounting a cap 19 for the support of a powder container 20 from which the powder flow is controlled by valve mechanism 21 and admitted to the atomizing head 12 by a bellows-actuated valve mechanism 22.

The fitting 18 is T-shaped and provided with a bore 23 through the transverse or head part, with a pair of chambers 24 and 25 offset from the bore 23 and interconnected by an orifice 26,

and with channels 27 and 28 in the stem of the T providing communication between the interior of the container 20 and the chamber 25 and the bore 23, respectively. Orifices 29 and 30 respectively connect the chamber 24 with the bore 23 and with a source of air pressure, as will be pointed out more fully hereinafter. A tube 27.1, with a perforated nob 27.2, is screwed into the stem part of the fitting 18 axially of the channel 27 and extends said channel down about a third of the way into the container 20.

The transverse or head part of the T-shaped fitting 18 is threaded at one end to receive a nipple 31 with which is associated a hexagon nut 32 for attaching the fitting 18 to the pipe 16. At the other end the transverse or head part of the T-shaped fitting 18 is formed with an exterior thread 33 receiving a hexagon nut 34 whereby a bushing 35 is clamped against a conical seat 36. The bushing 35 provides support for the bellows-actuated valve mechanism 22 and is formed with several axial orifices 35.1 communicating with an annular recess 35.2 from which the orifice 30 leads to the chamber 24.

The cap 19 is secured by a nut 37 to the lower end of the stem part of the T-shaped fitting 18. The annular flange on the cap 19 is formed with a thread 38 conforming with the conventional thread on a mason jar 20. This arrangement makes very simple the removal of the jar 20 for replenishing with a supply of powder.

The valve mechanism 21, for controlling the powder flow to and through the bore 23, and ultimately to the atomizing nozzle 12, comprises two concentrically arranged valve members 39 and 40. These valve members respectively regulate the flow of air from the chamber 24 to the container 20, through the channel 27, and to the bore 23, through the orifice 29.

Associated with the valve members 39 and 40 are operating nob 41 and 42 on the former of which is formed a dial 43 wherewith pointers 44 and 45 register for indicating the relative degree of communication afforded between the chamber 24 and the container 20 and the bore 23, respectively.

The valve member 39 is referred to in practice as the "powder feed" valve, since it determines how much air is admitted to the container 20 and consequently the volume of powder that is delivered to the bore 23. This valve member 39 is threaded at 46 into the side of the T-shaped fitting 18 axially of the chambers 24 and 25. The inner end of the valve member 39 is tapered at 47 to seat on the fitting 18 to control the opening and closing of the orifice 26 connecting the chambers 24 and 25. Inwardly of, but adjacent to, the tapered end 47, the valve member 39 is formed with a piston 48 fitting within the chamber 24 and dividing it into two non-communicable sections. Rearwardly of the piston 48 the valve member 39 is annularly recessed at 49 and apertured at 50 and 51 so as to provide communication around the piston 48 between the section of the chamber 24 in advance of the piston 48 and the orifice 29 leading to the bore 23, as is most clearly shown in Fig. 6.

The valve member 40 is referred to in practice as the "atomizing" valve since it determines how much air is admitted to the bore 23 from the chamber 24 and consequently the air pressure available to discharge powder from the atomizing head 12. This valve member 40 is threaded at 52 into the valve member 39 and has the end inwardly of the thread 52 reduced in diameter so as to provide an annular cavity 53 between the

valve members communicating with the orifices 50 and 51. The outer end of the valve 52 is tapered at 54 to seat on the inner end of the valve member 39 to control the orifice 51 leading from the chamber 24 to the annular cavity 53.

The operating nob 41, for the valve member 39, is in the form of a disk secured on the member 39 by a nut 55. Its peripheral portion is bent to form an angularly-disposed flange on which is inscribed the figures and markings for the dial 43.

The operating nob 42 is in the form of a knurled nut screwed onto the thread 52 and secured in place by a lock nut 56.

Springs 57 and 58 are interposed between the valve member 39 and the T-shaped fitting 18 and between the operating nob 42 and the valve member 39, respectively. These serve to yieldingly hold the valve members 39 and 40 in their relatively set positions. The pointer 44, as will be most clearly apparent from Fig. 6, is in the form of a tapered pin screwed into the fitting 18 at an angle with the outer end thereof bent over in registration with the dial 43. The pointer 45 is likewise in the form of a tapered pin screwed into the nob 42 so as to position its axis practically parallel with the face of the dial 43.

In order to prevent a back flow of air pressure from the container 20 into the chamber 24, a check valve 59, in the form of a floating disk, is arranged in the chamber 25 between the partition wall wherein is formed the orifice 26 and the stem 60 of a hexagonal-headed stud 61. The stud 61 is screwed into the fitting 18 axially of the chamber 25 so as to space the end of the stem 60 a slight distance away from the partition between the chambers 24 and 25 to allow the desired room for the floating movement of the check valve 59, as determined by the opening and closing of the orifice 47 by the valve member 39.

The bellows-actuated valve mechanism 22 comprises a housing 63 wherein is mounted a spring-pressed bellows 64 connected to operate a valve member 65.

The housing 63 is interiorly threaded at 66 to screw onto the bushing 35. A transverse hub 67 is threaded to receive a connection from the air regulators 13. From the hub 67 a channel 68 leads to the interior of the bellows 64. The opposite end of the housing 63 is threaded to receive a cap 69 wherein is fitted a plug 70 apertured at 71 to provide communication between the atmosphere and the interior of the housing rearwardly of the bellows 64.

The bellows 64 is secured in sealed relation with the inner end of the housing chamber by a cylinder 72 which abuts against and is held in place by the cap 69. A spring 73, interposed between the bellows head 74 and the housing cap 69, normally urges the bellows to seat the valve 65 to close the opening 75, through the fitting 31, connecting the bore 23 with the tube 16.

The valve 65 is connected to the bellows by a stem 76. A composition disk 77 provides a seal for the valve on the nipple 31.

A spring 78 urges a packing gland 79 to seat a packing ring 80 so as to seal the valve stem 76 in the bushing 35.

The atomizing head 12 may be formed with either a slit 62, as shown in Figs. 8 and 9, or with small apertures 62.1, as shown in Fig. 10. As a rule, the slit is provided so as to produce a powder spray transversely of the printed sheet and coat the same as it leaves the printing press. The aperture atomizing head is generally used where the coating operation is to be effected after the

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printed sheet has been discharged from the printing press and come to rest on the stacking platform. These atomizing heads are made in different sizes so as to accommodate the atomizing action to different sized sheets.

As will be clearly seen in Figs. 8 and 9, the slit 62 gradually increases in width from its center toward its opposite ends so as to prevent most of the powder from being ejected through the center of the slit. This improved construction ensures a uniform pattern of atomized powder on the sheet, whereas if the slit were of uniform width throughout its length, most of the powder would be concentrated in the center of the pattern. For the same reason, in the construction shown in Fig. 10 the apertures at the periphery of the head are larger than the apertures at the center of the head.

The air pressure regulators 13 are in the form of specially-designed valve mechanisms 81 and 82, which serve to respectively control the adjusted minimum and maximum air pressures to the atomizing head.

The valve mechanism 81 is most clearly shown in Fig. 5. A valve member 83 is carried by a diaphragm 84, secured between housing parts 85 and 86, and is normally urged by a spring 87 to close the channel 88 through which the compressed air flows from the compressor (not shown) to the fitting 18 via the housing 63. The tension of the spring 87, and the consequent reaction of the diaphragm 84 to the line air pressure, is adjusted by the axial shifting of a stem 89 as effected by regulating nut 90 locked to the stem 89 by a nut 91 and frictionally positioned relative to the housing member 86, by a spring 92.

The valve mechanism 82 is most clearly illustrated in Fig. 4. Except for a modification in the relative arrangement of the bellows 93 and spring 94, which coact to open and close a valve member 95, the valve mechanism 82 is constructed in accordance with Patent No. 2,398,503. The spring 94 is tensioned by an adjusting nut 94.1 so as to normally open the valve 95 and tension the bellows 93 so that the closing of the valve 95 will occur whenever the line air pressure entering at 96 exceeds a predetermined maximum as determined by the positioning of the nut 94.1. A pressure gauge G is connected to the valve mechanism 82 to indicate the line pressure as determined by this valve.

The supporting standard 14 comprises a pipe 97, whereon is mounted the sleeve 17 and which is telescopically arranged in a sleeve 98. A cam lock 99 clamps the pipe 97 at the desired position in the sleeve 98.

Within the pipe 97 is an air conditioner of acceptable construction which extracts oil, moisture, or foreign particles from the air entering through the compressed air supply tube 100 connected to the cap 101 from which leads of the tube 102 to the timing mechanism 15.

The supporting sleeve 98 may be mounted directly on the printing press or on some portable base which will permit the positioning of the powder assembly in desired relationship to the press.

The air timing means 15 comprises a valve 103 mounted on a bracket 104 which is attachable to the printing press frame so as to position the valve 103 to be actuated by a cam 105. The cam 105 is attached to a suitable moving part of the press so as to synchronize the action of the spraying mechanism with the discharge of the printed sheets from the printing press. The air

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line 102 from the air conditioner in the pipe 87 leads to the valve 103 from which the air line 106 leads to the air regulator 82.

The powder assembly herein shown operates in the following manner:

The tube or conduit 16 is inserted into the sleeve 17 and clamped in position so as to locate the atomizing head 12 in the desired horizontal position over the sheets to be atomized. The height of the atomizing head 12 over the sheets is determined by the clamping of the pipe 97 in the sleeve 98. The sleeve 98 is attached or positioned adjacent to the printing press and the timer 15 is clamped in a position so that the cam 105, connected to an operating part, will actuate the valve 103 so as to synchronize the discharge of powder through the atomizing head 12 with the discharge of the printed sheets from the printing press.

Initially, the container 20 is three-fourths filled with powder.

The air-regulator valve mechanism 82 is set by means of the nut 94.1 so as to maintain a predetermined pressure in the air line between the valve mechanism 103 and the atomizing head 12. This would be slightly less than the air pressure supply. Also, the automatic air check-valve mechanism 81 is set, through an adjustment of the regulating nut 90, so that the air pressure to the atomizing head 12 will be maintained at a certain minimum, so as to ensure quick on-and-off action of the atomizing operation as effected by the timer 15.

The amount of the powder flow and the force with which it is discharged through the head 12 is determined by the set of the valve members 39 and 40. The exact set individually and relatively of these valves will have to be determined experimentally to secure a spraying of the desired amount of powder with the desired force onto the inked sheets discharged from the printing press.

The valve member 39 is turned so as to retract the tapered end 47 from the orifice 26. This will admit the desired amount of air through the chamber 25 and channel 27 to the powder container 20. The valve member 40 likewise is turned so as to retract the tapered end 54 to open the aperture 51 so as to admit air from the chamber 24 into the bore 23 through the aperture 50 and orifice 29. The individual and relative opening of these valve members is indicated by the registration of the pointers 44 and 45 with the dial 43.

Upon the opening of the timing valve mechanism 103, air is admitted through the orifice 68 in the housing 63 exerting a pressure on the bellows 64 sufficient to overcome the force of the spring 73 and effecting an unseating of the valve member 65 to open communication through the orifice 75 between the bore 23 and the conduit or tube 16. Simultaneously, the air entering the orifice 68 passes through the orifices 35.1, recess 35.2, and orifice 30 to the chamber 24. Here the air current divides; one part flows through the orifice 47, chamber 25, channel 27, and the tube 27.1 into the powder container 20; the other part passes through the aperture 51, the cavity 53, aperture 50, and orifice 29 into the bore 23. This current entering the container 20 agitates and stirs up the powder and, carrying the powder in suspension, is discharged through the channel 28 into the bore 23. Here the powder-laden air current is joined by the air current entering the bore through the orifice 29 wherewith it is mixed

and directed through the conduit or tube 16 and discharged through the atomizing head 12.

As the cam 105 recedes, the valve mechanism 103 cuts off the air pressure entering through the orifice 63 to the housing 63. Thereupon, the spring 73 shifts the bellows 64 to seat the valve 65, thus cutting off the powder flow to the atomizing head 12.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting having a bore formed therein for communicating with the atomizer and being channeled to provide dual passages, one to lead directly from a connectable source of air under pressure to said bore and the other indirectly to said bore through the powder container, valve mechanism for regulating the air flow through said channels so as to control the powder flow from said container to said bore, a valve member controlling communication between said bore and the atomizer, a stem on said valve member extending rearwardly therefrom through said bore, a resilient means acting on said stem to normally maintain said valve closed, a bellows connected to said valve stem and open to said connected source of air pressure so as to be actuated to retract said valve member, and means for admitting air to said bellows and to said channels so as to retract said valve member and permit powder to flow through said bore to the atomizer.

2. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting having a bore formed therein for communicating with the atomizer and being channeled to provide dual passages, one to lead directly from a connectable source of air under pressure to said bore and the other indirectly to said bore through the powder container, and a pair of valve members coaxially arranged on said fitting for controlling air flow through said respective channels, said valve members being independently operable to vary said air flow through said respective channels for controlling the powder flow to the atomizer.

3. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting having a bore for communicating with the atomizer and being channeled to provide dual air passages, one to lead directly from a connectable source of air under pressure to the bore and the other indirectly to said bore through said container, a valve member threaded in said fitting and adapted to seat thereon to control air flow through one of said passages, said valve member having an orifice forming a part of said other passage, and a second valve member threaded into said first-mentioned valve member and adapted to control the air flow through said other passage, said valve members coacting to control the powder flow to the atomizer.

4. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting having a bore for communicating with the atomizer and being channeled to provide dual air passages, one to lead directly from a connectable source of air

under pressure to said bore and the other indirectly to said bore through the container, a valve member threaded in said fitting and adapted to seat thereon to control air flow through one of said passages, said valve member having an orifice forming a part of said other passage, a second valve member threaded into said first-mentioned valve member and adapted to control the air flow through said other passage, said valve members coacting to control the powder flow to said atomizer, and a compression spring interposed between the valve members whereby said second valve member is yieldingly retained in rotative relationship with said first-mentioned valve member.

5. A fitting adapted for use in a powder assembly of the class described which includes a powder atomizer and a powder container, said fitting having a bore for communicating with the atomizer and being channeled to provide dual air passages, one to lead directly from a connectable source of air under pressure to said bore and the other indirectly to said bore through the container, a valve member threaded in said fitting and adapted to seat thereon to control air flow through one of said passages, said valve member having an orifice forming a part of said other passage, a second valve member threaded into said first-mentioned valve member and adapted to control the air flow through said other passage, said valve members coacting to control the powder flow to the atomizer, a compression spring interposed between said valve members whereby said second valve member is yieldingly retained in rotative relationship with said first-mentioned valve member, and a second compression spring interposed between said first-mentioned valve and said fitting whereby said first-mentioned valve is yieldingly retained in its shifted position.

6. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting having a bore for communicating with the atomizer and being channeled to provide dual air passages, one to lead directly from a connectable source of air under pressure to said bore and the other indirectly to said bore through the powder container, a valve member threaded in said fitting and adapted to seat thereon to control air flow through one of said passages, said valve member having an orifice forming a part of said other passage, a second valve member threaded into said first-mentioned valve member and adapted to control the air flow through said other passage, said valve members coacting to control the powder flow to the atomizer, a compression spring interposed between said valve members whereby said second valve member is yieldingly retained in rotative relationship with said first-mentioned valve member, a second compression spring interposed between said first-mentioned valve and said fitting whereby said first-mentioned valve is yieldingly retained in its shifted position, a dial on said one valve member, and pointers on said fitting and on said other valve member coacting with said dial for indicating the relative positioning of said valve members.

7. A fitting adapted for use in a powder assembly which includes a powder atomizer and a powder container, said fitting being generally T shaped and having a bore formed in the transverse part thereof for communicating with the atomizer and having a chamber formed therein offset from said bore, said fitting having chan-

nels formed in the stem thereof for providing communication between said chamber and the powder container and between the container and said bore, said fitting also having orifices adapted to connect said chamber with a source of air under pressure and with said bore, respectively, a valve member rotatable in said fitting axially of said chamber, a piston on said valve member dividing said chamber into two noncommunicable sections communicating respectively with the aforesaid orifices, said valve member being channeled to provide communication between said two sections of said chamber around said piston, a stem on said valve member coacting with a seat on said chamber wall to control communication through the first of the aforesaid orifices, and a second valve member rotatably mounted on said first valve member and having a stem coacting with a seat on said first-mentioned valve member to control communication between said chamber sections through said first-mentioned-valve-member channel, said valve members coacting to control the powder flow to the atomizer.

8. A powder assembly of the class described comprising, a rigid conduit, a powder atomizer supported on and communicating with one end of said conduit, a T-shaped fitting supported on the opposite end of said conduit, a powder container supported on said fitting, said fitting having a bore formed in the transverse part thereof communicating with said conduit and having a pair of chambers formed therein offset from said bore and interconnected by an orifice, said fitting having channels formed in the stem thereof providing communication between one of said chambers and said container and between said container and said bore, said fitting also having orifices connecting one of said chambers with a source of air pressure and with said bore, respectively, a valve member rotatable in said fitting axially of said chambers, a piston on said valve member dividing said one chamber into two incommunicable sections communicating respectively with the aforesaid orifices, said valve member being channeled to provide communication between said two sections of said chamber around said piston, a stem on said valve member coacting with a seat on said chamber wall to control communication through the orifice interconnecting said chambers, a second valve member rotatably mounted on said first valve member, a stem

on said second valve member coacting with a seat on said first-mentioned valve member to control communication between said chamber sections through said first-mentioned-valve-member channel, a plug threaded into said other chamber and having a stem opposed to the interconnecting orifice, and a floating disk interposed between said plug stem and said interchamber orifice to act as a check valve for said orifice.

9. A powder assembly of the class described comprising, a rigid conduit, a powder atomizer supported on one end of said conduit and communicating therewith, a T-shaped fitting supported on the other end of said conduit, a powder container supported on the end of the stem part of said fitting, said fitting having a bore formed in the transverse part thereof communicating with said conduit and having a chamber formed therein offset from said bore, said fitting having channels formed in the stem part thereof providing communication between said chamber and said container and between said container and said bore, a housing secured to the opposite end of said transverse part of said T-shaped fitting and channeled for communication with a source of air pressure, a valve member in said bore controlling communication between said bore and said conduit, a bellows in said housing exposed to the air pressure entering said housing channel, a stem connecting said bellows to said valve member, resilient means normally urging said bellows to seat said valve member, said fitting having orifices connecting said chamber with said housing and with said bore, a pair of concentrically-arranged valve members disposed axially in said chamber, and coacting means on said valve members and said fitting for controlling the air flow through said orifices so as to regulate the powder flow through said bore to said atomizer in synchronization with the actuation of said bellows.

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