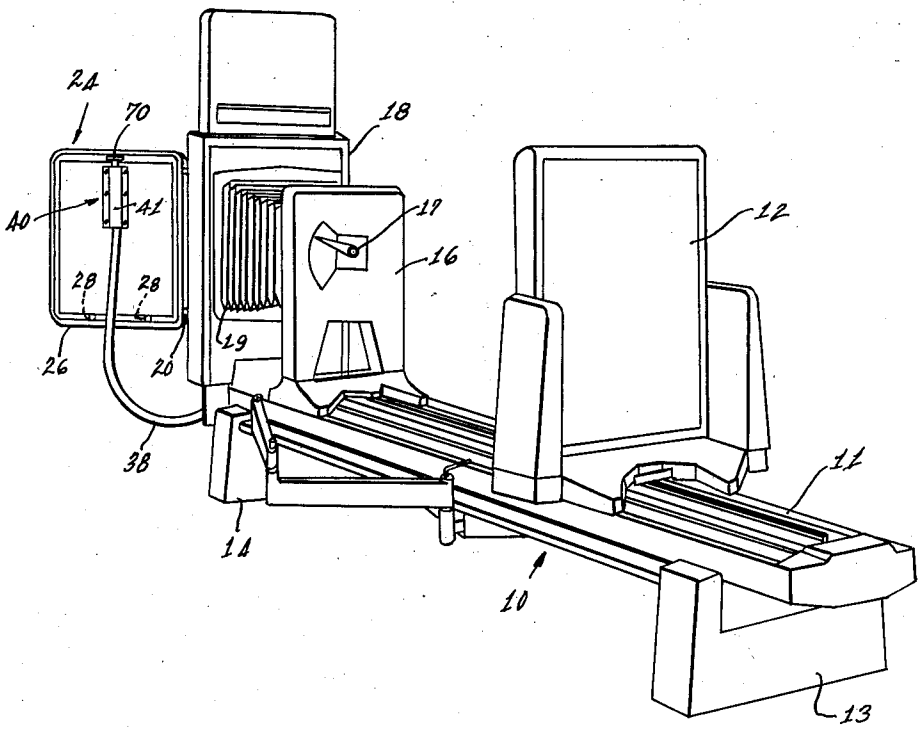
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VALVE CONTROL MEANS FOR A VACUUM BACK

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Fig. 1



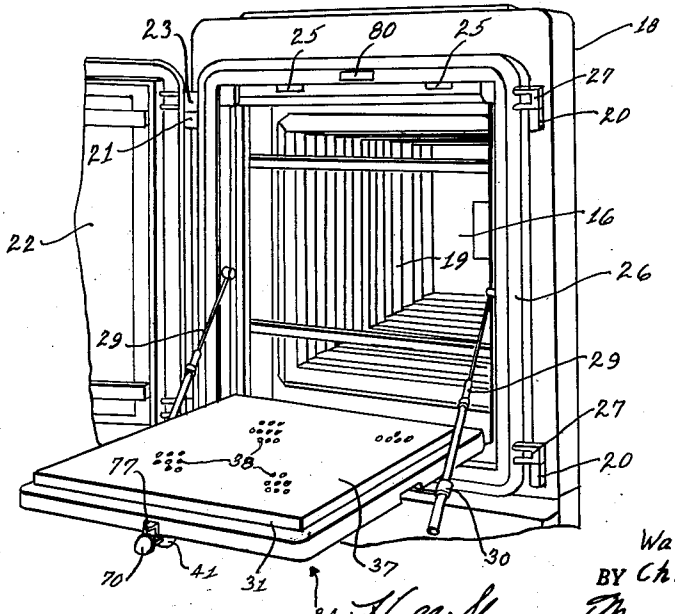


Fig. 2

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VALVE CONTROL MEANS FOR A VACUUM BACK

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Fig. 3

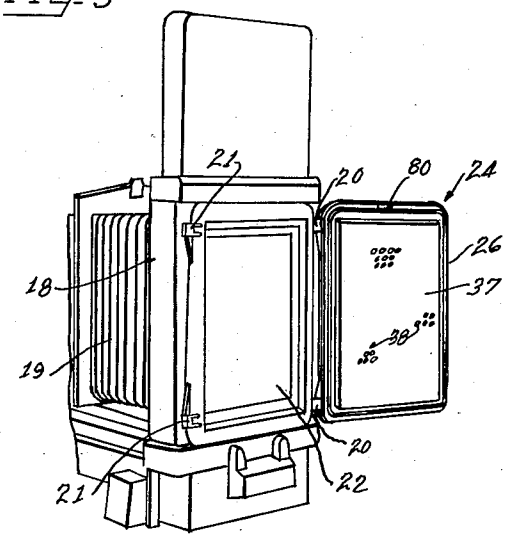


Fig. 6

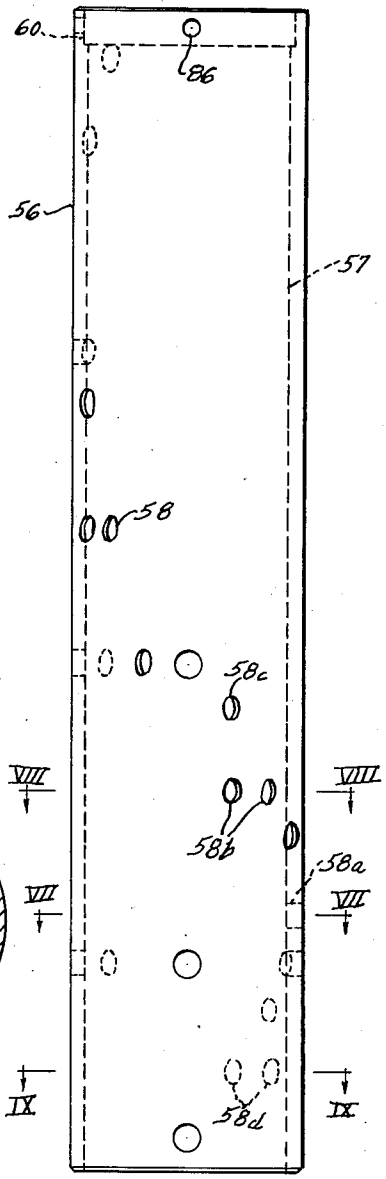


Fig. 7

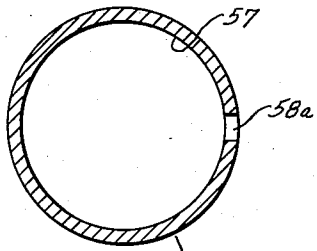
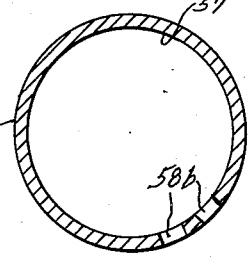


Fig. 8



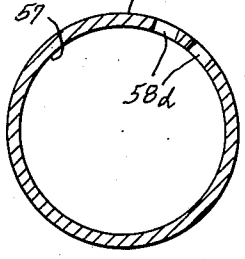


Fig. 9

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Fig. 4

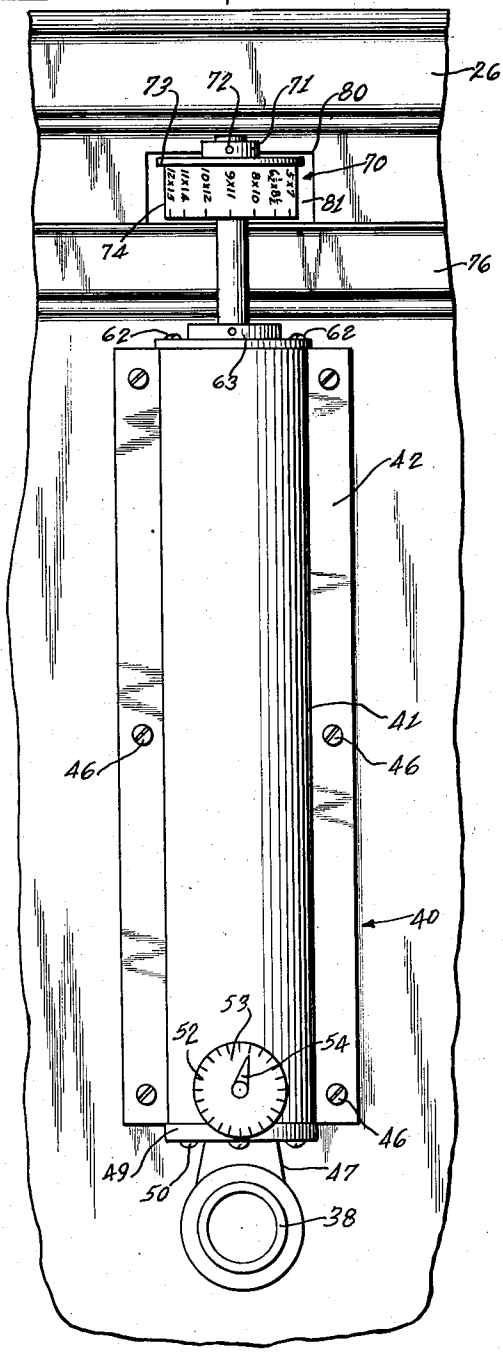
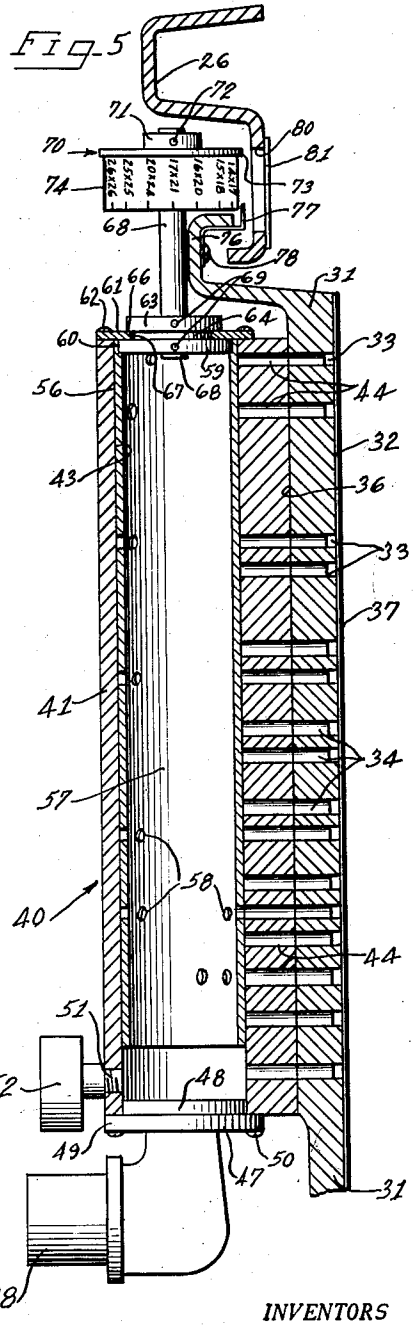


Fig. 5



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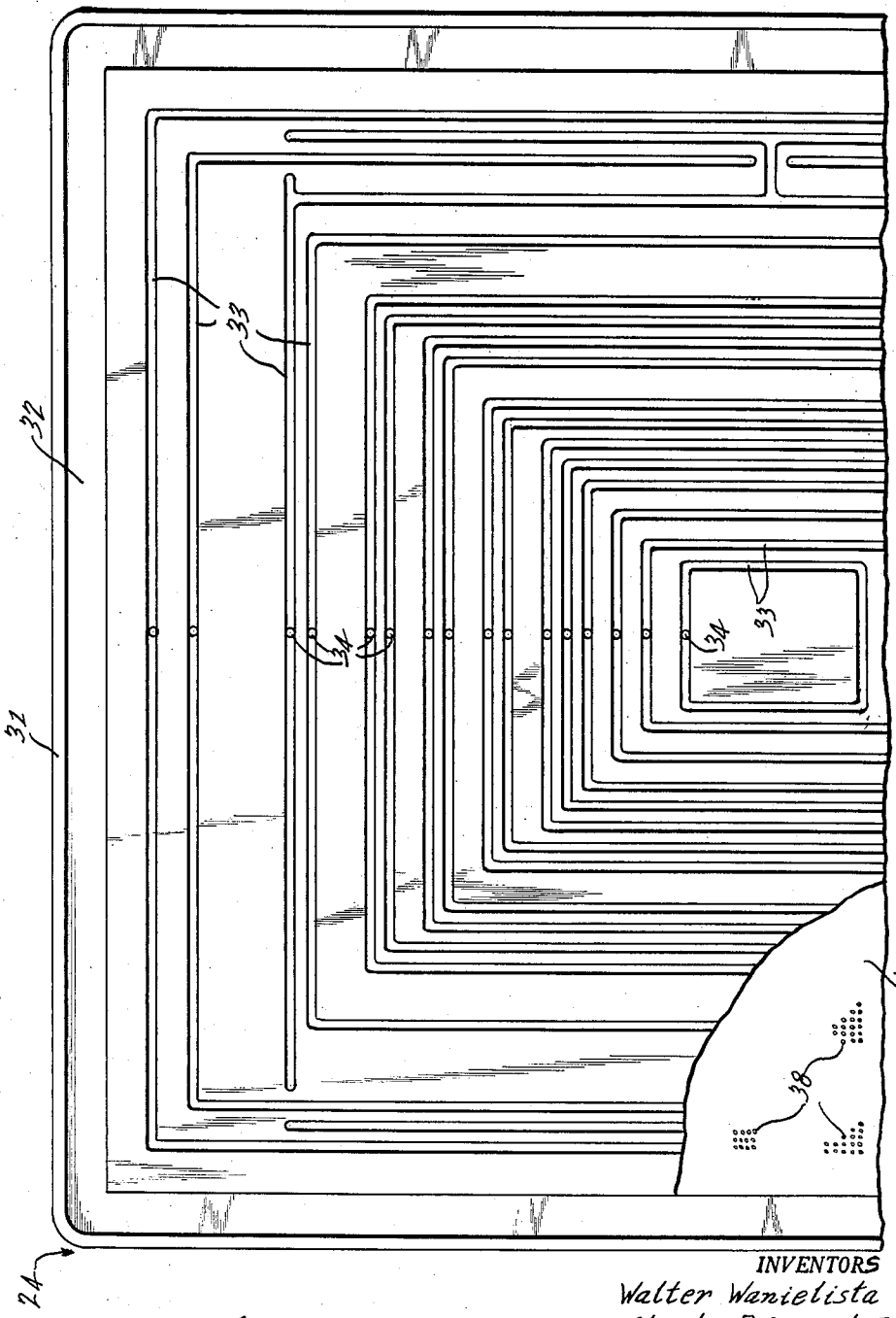


FIG-10

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3,077,141

VALVE CONTROL MEANS FOR A VACUUM BACK

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Filed Sept. 27, 1960, Ser. No. 58,809
1 Claim. (Cl. 88—24)

This invention relates generally to graphic arts apparatus and more particularly to an improved apparatus for regulating the application of a vacuum biasing effect to a vacuum film holder, for example, the vacuum film holder of a process camera wherein both vertical and horizontal loading is contemplated.

A process camera including overhead types or track mounted cameras is frequently required to develop multiple functions. For example, a graphic arts camera may be capable of precision color separation and registration, large volume black and white production and may also be capable of producing reproductions demanded in industrial applications.

With that type of camera, a precision machined vacuum film holder is mounted on its own swinging door hinged to one side of the rear case of the camera. A heavy duty pump and motor draw air quickly through a grooved pattern in the working surface of the vacuum plate, thereby holding the film and contact screen perfectly flat. For separation work, however, the vacuum film holder must be equipped with a horizontal loading facility. Accordingly, to effect that end, the vacuum film holder is bottom hinged on its door and may be swung out of vertical loading position into a horizontal loading position.

Heretofore, zone selection means have been provided to compensate or to apply the vacuum to a selected area on the working surface of the vacuum film holder required to be used for the specific operation. However, such vacuum selection means have ordinarily been positioned on the rear side of the vacuum film holder and, accordingly, such selector means are completely inaccessible when the vacuum film holder is in the horizontal loading position. Moreover, such selector means as have been provided heretofore usually involve the provision of a valve incorporating a movable element which must be operated against a pressure differential. Further, because of the limitations of valve constructions, zone selectivity has been extremely limited.

In accordance with the principles of the present invention, a rotatable core valve is provided for connection to a source of vacuum bias and to the groove pattern on the vacuum film holder. The rotatable core valve is extremely easy to operate because it is not necessary to actuate the movable element thereof against an air bias.

The rotatable core valve is also extremely advantageous because of the wide selectivity pattern which can be effected through provision of appropriate control apertures in the core. Thus, the use of a rotatable core valve, as contemplated by the present invention permits selective multiple or pattern zoning to a greatly improved degree over what has been heretofore available.

It is yet another object of the present invention to provide a valve mechanism for controlling the application of vacuum bias to a vacuum film holder which is characterized by a cylindrical valve element having actuating means extending out to the upper margin of the vacuum film holder when the vacuum film holder is in a vertical loading position. Further, the actuating means includes a calibrated dial which lies in register with a suitable window formed in the door frame. Thus, the calibrated dial is not only rendered visible in all positions of the vacuum film holder whether the door is moved in or out of position, or whether the vacuum film holder is in the vertical loading position or the horizontal loading position, but the operator can also readily grasp the dial for speedy adjustment of the valve mechanism at any such position of the vacuum film holder, thereby facilitating changing of the zone pattern at any stage of operation.

Many other features, advantages and additional objects of the present invitation will become manifest from the following detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIGURE 1 is an isometric view of a graphic arts camera incorporating the vacuum film holder and the vacuum bias regulating means of the present invention;

FIGURE 2 is a fragmentary view of the rear case of the camera of FIGURE 1 and particularly illustrates the vacuum film holder mounted in its own swinging door hinged to the right of the rear case and shown in FIGURE 2 in a horizontal loading position;

FIGURE 3 is a fragmentary view of the rear case showing the vacuum film holder in its own swinging door but with the door moved to an open position and with a ground glass door hinged on the left side of the rear case moved into the focal plane of the camera;

FIGURE 4 is a fragmentary elevational view showing the valve regulating mechanism of the present invention;

FIGURE 5 is a cross-sectional view taken generally on line V—V of FIGURE 4;

FIGURE 6 is an elevational view of the rotatable valve member embodied in the valve mechanism of FIGURES 4 and 5;

FIGURE 7 is a cross-sectional view taken generally on line VII—VII of FIGURE 6;

FIGURE 8 is a cross-sectional view taken generally on line VIII—VIII of FIGURE 6;

FIGURE 9 is a cross-sectional view taken generally on line IX—IX of FIGURE 6; and

FIGURE 10 is a fragmentary view with parts broken away showing an exemplary groove pattern which may be utilized on the working surface of a vacuum film holder in accordance with the principles of the present invention.

As shown on the drawings:

It will be understood that the principles of the present invention are applicable to any vacuum base utilizing the vacuum regulating means herein disclosed and would be particularly suited to any vacuum base required to have both a vertical and a horizontal loading position. In order to adequately illustrate the principles of the present invention, however, there is disclosed in this application a process camera which is generally identified in FIGURE 1 at **10** and which includes a track **11** movably mounting a copyboard **12** and supported on a pair of pedestals **13** and **14**, which are spaced longitudinally of the track **11**.

The camera **10** further includes a movable lens board **16** carrying the camera lens **17**. At the end of the track **11** there is provided a rear case **18**. A bellows construction **19** interconnects the rear case **18** and the front case which houses the lens board **16**.

Referring now more specifically to FIGURES 1, 2 and 3, it will be noted that the rear case **18** includes a peripheral frame having on the right side thereof a hinge means **20** and on the left side thereof a hinge means **21**. In the particular form of camera herein disclosed, a ground glass door mechanism shown generally at **22** is pivotally mounted on the hinge means **21** as at **23** and may be moved into position on the rear case **18** to dispose a ground glass at the focal plane of the camera.

In accordance with the principles of the present invention, there is pivotally mounted on the hinge means **20** a

vacuum film holder which is shown generally at 24. The vacuum film holder 24 is a precision machined plate structure mounted in its own swinging door 26 having hinge means 27 pivotally engaging the hinge means 20, thereby facilitating a swinging action away from position on the rear case 18 to the position illustrated in FIGURES 1 and 3.

As shown in FIGURE 1, there is provided between the lower portions of the door frame 26 and the vacuum film holder 24, hinge means 28 which permit the vacuum film holder 24 to be swung downwardly from its normal vertical loading position (FIGURES 1 and 3) to a horizontal loading position as shown in FIGURE 2. The vacuum film holder is normally retained in vertical position by a latch means 25.

To further assist in providing a horizontal loading facility on the camera, the door frame 26 has attached thereto at one end and on opposite sides of the opening a telescoping mechanism as shown at 29. The telescoping mechanism 29 includes a bracket 30 connected to the vacuum film holder 24. Springs inside of the telescoping mechanism 29 provide a counterbalancing effect and means may be provided in association with the telescoping mechanism 29 to insure horizontal positioning of the vacuum film holder 24.

Referring now to FIGURES 5 and 10, the vacuum film holder 24 is shown as comprising a plate structure 31 having a plane surface 32 on one side thereof provided with sets of grooves 33 defining substantially concentric rectangular areas on the plane surface 32 which constitute vacuum zones or endless cavity means of progressively increasing size from the center of the surface 32 towards the outside borders thereof. The illustrative embodiment herein described contemplates an inner zone of approximately 4 x 5, while the outermost zone will be approximately 26 x 26.

In order to apply a suction effect or a vacuum bias to each of the respective concentrically spaced zones, the plate structure 31 is formed with a passage for each groove or vacuum zone 33, which passages are indicated at 34. All of the passages 34 are disposed in a longitudinal row and are preferably arranged in accordance with the principles of the present invention in the upper half of the vacuum film holder 24 on a vertical center line when the vacuum film holder is in the vertical loading position.

Each of the passages 34 intersects a back surface 36 of the plate structure 31. Superimposed over the surface 32 is a foraminous plate 37 having a large number of spaced openings 38 therein and providing a flat even surface for holding film and contact screens perfectly flat.

In order to supply a source of vacuum bias to produce a suction effect in the grooves or vacuum zones 33, the usual heavy duty pump and motor is provided and such pump is connected to a conduit 38 (FIGURE 1) leading to the regulator mechanism of the present invention shown generally at 40.

Referring now more specifically to FIGURES 4–9, it will be noted the regulator mechanism 40 comprises a valve body 41 flanged as at 42 to provide a mounting pad for assembly on the surface 36 of the plate structure 31. The valve body is characterized by an elongated cylindrical bore 43 which is intersected by a longitudinal row of passages 44 each disposed to register with a corresponding passage 34 in the plate structure 31. The flanged portion 42 of the valve body 41 is suitably apertured and a plurality of fasteners 46 secure the valve body 41 in firm assembly with the plate structure 31.

A coupling member 47 has a pilot portion 48 received in the bottom end of the cylindrical bore 43 and is flanged as at 49 so that a plurality of fasteners 50 may be passed therethrough and engaged with the valve body 41 to place the coupling member 47 in firm assembly with the valve body 41 and in position to close the end of the cylindrical bore 43. The conduit 38 is connected to the coupling 47 and introduces the vacuum bias into the end of the cylindrical bore 43.

The lower end of the valve body 41 is provided with an aperture 51 receiving in assembled relationship therewith a vacuum gauge 52 having an indicator face 53 and an indicator 54 so the quantitative amount of vacuum bias will at all times be indicated.

Rotatably disposed within the cylindrical bore 43 is a rotary valve element 56. In the form of the invention disclosed, the rotary valve element 56 takes the form of a cylindrical sleeve and which is, in effect, a hollow core since the sleeve is provided with a through bore 57 so that the vacuum bias is freely communicated throughout the entire interior of the valve element 56.

The valve element 56 is provided with a plurality of apertures 58 which are spaced longitudinally and spaced circumferentially to selectively apply a vacuum bias to the passages 44, 34 and hence to the vacuum zones or grooves 33 upon rotation of the sleeve or valve element 56 within the cylindrical bore 43 of the valve body 41.

At the upper end of the sleeve there is provided an actuating means including a first cylindrical disk 59 received in corotatable assembly with the sleeve at a notched portion 60. A cover 61 overlies the end of the valve body 41 and is fastened thereto by a plurality of fasteners 62.

The disk-like portion 59 is actually the lower portion of an integral hub member having an upper disk-like portion 63 and a centrally reduced portion 64 which forms an annular recess receiving the edges 66 of an opening 67 formed in the cover 61. The hub member is locked to a stem 68 by means of suitable set screws 69 and the stem 68 thereby provides an actuating means which extends outwardly of the valve body 41 towards the upper margin of the plate structure 31.

A valve dial 70 includes a hub 71 which is suitably apertured to receive the stem 68 and a set screw 72 may be utilized to lock the hub 71 in corotatable assembly with the stem 68.

The valve dial 70 has a knurled flange 73 to facilitate manual rotation and actuation of the valve and depending from the knurled flange 73 is a calibrated scale 74 upon which appears suitable indicia identifying the corresponding sizes of the vacuum grooves or vacuum zones on the surface 32 for each corresponding angular adjustment of the valve dial 70.

To establish a fixed reference point for the calibrated index, the plate structure 31 has formed on the upper margin thereof an offset flange 76 to which is fastened a pointer 77 by means of a fastener 78. The pointer 77 is positioned immediately concentrically outwardly of the valve dial 70 adjacent the calibrated index, thereby pointing to the selected zone.

As will be clearly shown in FIGURE 5, the door frame 26 in which the vacuum file holder 24 is mounted, has formed therein a window 80 in register with the valve dial 70 and through which the pointer 77 and the calibrated index 74 may be observed, for example, through a piece of red glass 81.

It will be noted that by virtue of the arrangement provided, the valve dial 70 is positioned in a manually accessible location where it may not only be viewed in reference to the indexing pointer 77, but may be readily manipulated whether the vacuum film holder 24 is positioned in the horizontal loading position of FIGURE 2, or in the vertical loading position of FIGURE 3.

This is particularly desirable in the practice of photographic processes, for example, in the production of color half-tones the operator may desire to make that is colloquially referred to as a "bump" shot, while the vacuum film holder 24 is in the horizontal loading position of FIGURE 2. Such a "bump" shot may be made and the operator can adjust for multiple or pattern zoning without returning the vacuum film holder to the vertical position. Adjustment of the sleeve type valve element is effected by positioning the valve dial 70.

Exemplary details of the sleeve-type valve element **56** are shown in FIGURES 6–9. At the notched portion **60** near the upper end of the valve element **56**, there are provided one or more apertures **86** which may be effectively utilized to lock the hub **59, 63, 64** in corotatable assembly with the sleeve **56**.

As shown in FIGURE 7 and in FIGURE 6, the spaced apertures **58** may include an aperture **58***a* which is used to communicate vacuum bias from the interior of the sleeve **56** as at **57** to one of the zones or grooves **33**, for example, a zone prescribing a biasing area of 9 x 11 inches. The rotational adjustability of the sleeve **56** makes the valve of the present invention particularly advantageous because the sleeve **56** freely rotates without encountering any substantial vacuum biasing effect. Further, not only can the sleeve **56** be provided with a single aperture such as the aperture **58***a* for a single zone, but it is possible to control with great effectiveness selective zoning patterns, for example, by multiple or pattern zoning. Thus, the apertures shown in FIGURE 8 at **58***b* are two in number and both are disposed on the same longitudinal spacing dimension of the sleeve **56**. It will be understood that only one of the apertures **58***b* is in register with a corresponding passage **44** at any one time and when such registry occurs, a zoning area such as 11 x 14 will have a suction effect applied thereto. However, note that one of the apertures **58***b* is in axial alignment with another aperture shown at **58***c*. Accordingly, by virtue of the structure of the present invention multiple zones may be vacuum-energized simultaneously, thereby to effect multiple or pattern zoning.

The same would be true in connection with the apertures shown at **58***d* in FIGURE 9 and in FIGURE 6, which apertures are associated with a zoning area, for example, 5 x 7, but which zoning area could be vacuum-energized simultaneously with some other zone in order to provide multiple or pattern zoning.

Although minor modifications might be suggested by

those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

In a process camera,

a side hinged generally rectangular door frame pivotable between open and closed positions,

a plural zone vacuum film holder bottom-hinged mounted on said door frame for pivotal movement between a vertical loading position and a horizontal loading position,

said plural zone vacuum film holder being disposed inwardly of said door frame,

and valve control means on the outside back wall of said vacuum film holder for selectively applying vacuum bias to the plural zones of the vacuum film holder,

said control means comprising a rotatable valve having a stem,

and a calibrated dial on said stem and positioned by said stem at a location which is readily accessible at any position of the vacuum film holder,

an upper margin of said door frame having formed therein a window outwardly of said vacuum film holder and in register with said calibrated dial,

whereby the valve control means is rendered visible whether said door and said vacuum film holder is in a vertical loading position or a horizontal loading position.

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