Oct. 4, 1966 L. S. FLORSHEIM, JR., ET AL 3,276,312

MOVABLE VACUUM BACK FOR PHOTOGRAPHIC APPARATUS

Filed April 8, 1964 4 Sheets-Sheet 1

FIG. 1

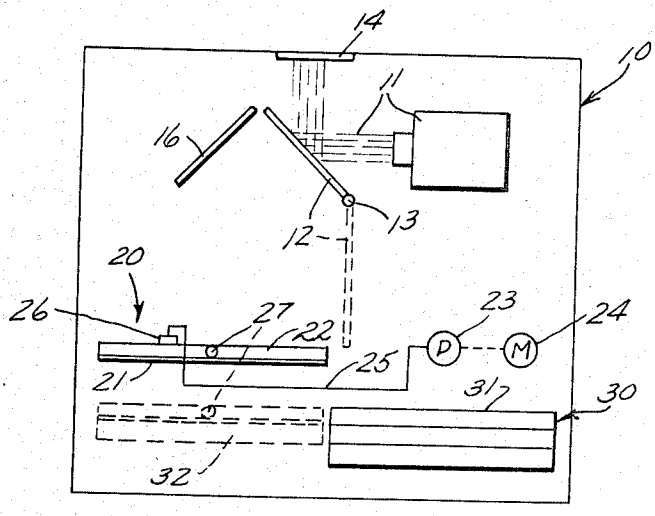

FIG. 2

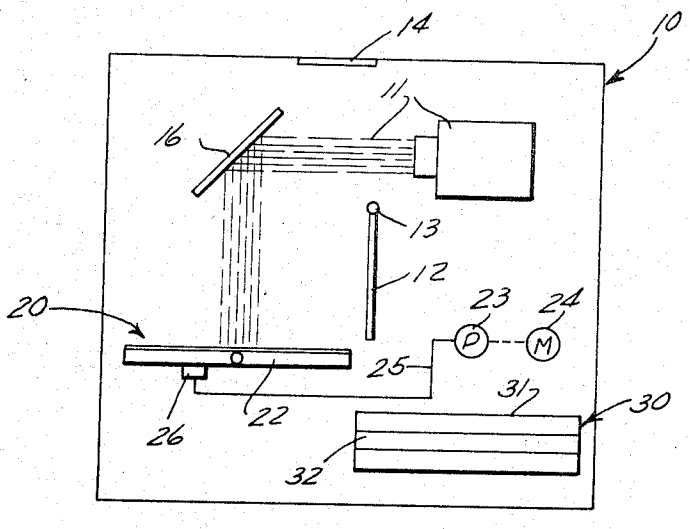

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FIG. 3

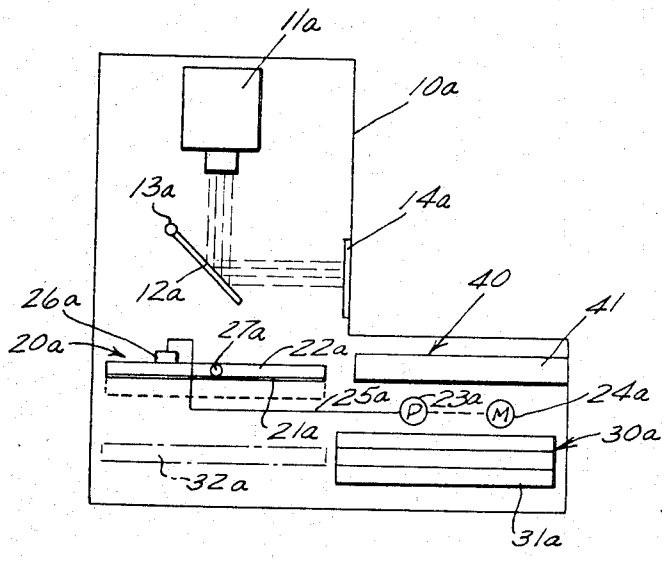

FIG. 4

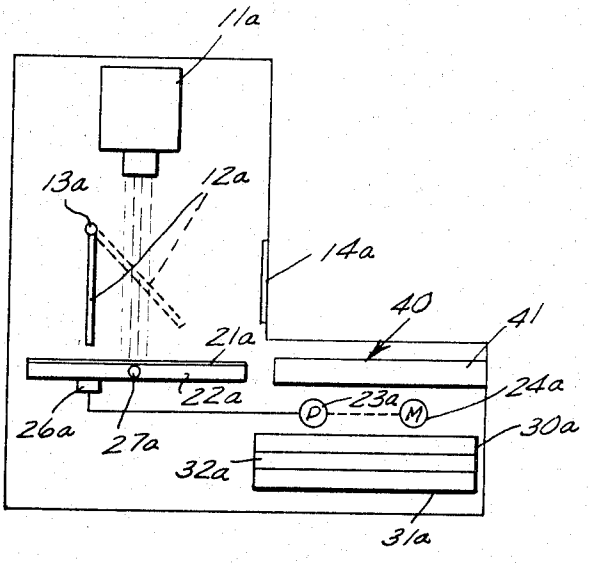

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FIG. 5

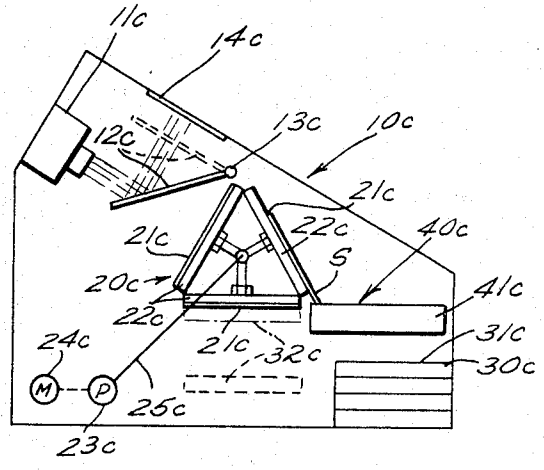
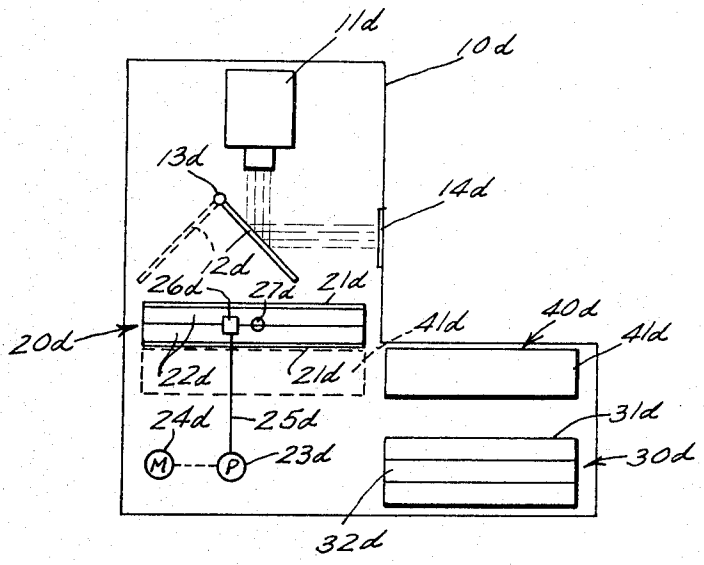


FIG. 6



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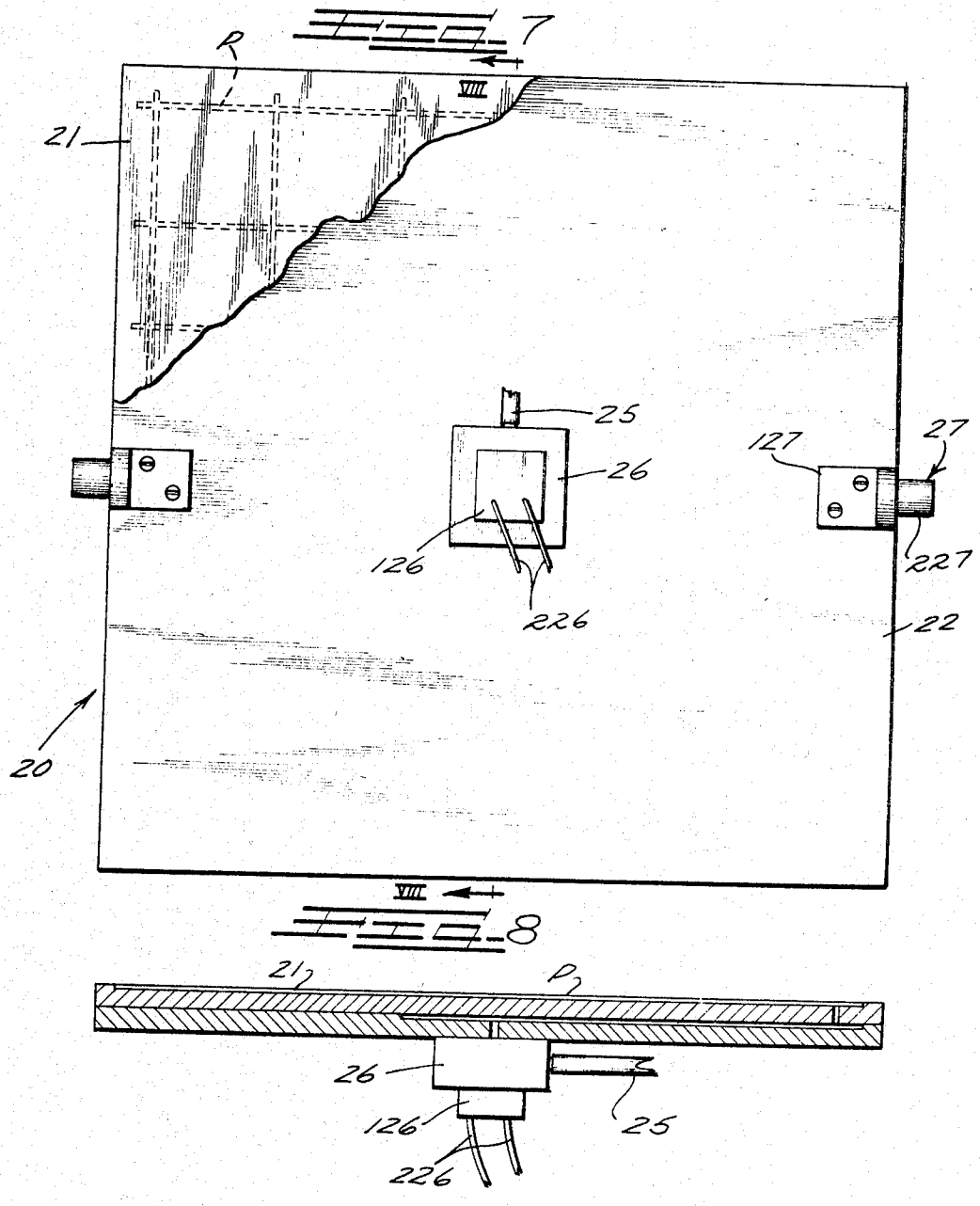

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United States Patent Office 3,276,312 Patented Oct. 4, 1966

3,276,312

MOVABLE VACUUM BACK FOR PHOTOGRAPHIC APPARATUS

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Filed Apr. 8, 1964, Ser. No. 358,168
9 Claims. (Cl. 88—24)

This invention relates generally to photomechanical apparatus and more specifically relates to a vacuum back means comprising a platen forming a flat working surface characterized by a zone pattern of passages for receiving a vacuum bias wherein the vacuum back means is carried by a support means for angularly shiftable movement between multiple positions so that a sheet storage means adjacent the support means will engage a sheet member against the working surface at one of the multiple positions and an image projection means including an optical track will project an image against the sheet member at another of the multiple positions.

The vacuum back has been advantageously utilized in the graphic arts industry for the purpose of holding film and other sheet form members against a flat working surface during various processing steps. In such installations, the vacuum back remains absolutely stationary and in one form of equipment, the vacuum back is moved on tracks between successive stations, including a storage station, an exposure station and a subsequent sheet removal station.

In accordance with the principles of the present invention, it is contemplated that a vacuum back be mounted in such a manner as to be angularly shiftable, thereby permitting any one or more working surfaces to be consecutively and successively shifted between multiple positions, including a first storage pick-up position and then subsequent exposure and developing positions.

For example, in one form of the invention, the vacuum back is pivotally carried for 180° inversion, thereby permitting a sheet form member to be loaded on the vacuum back in one position and when angularly shifted into inverted position, the sheet form member carried by the vacuum back is ready for exposure to an image properly projected into the focal plane which is made to correspond with the plane of the sheet member on the vacuum back at the second position.

It is also contemplated by the present invention that plural platen surfaces may be provided so that the vacuum back means mounted for angularly shiftable movement will afford the capability of operation through a sequence of separate operational steps.

It is an object of the present invention, therefore, to provide an improved movable vacuum back means for use in photomechanical equipment.

Yet another object of the present invention is to provide a movable vacuum back means characterized by a support which carries the device for angularly shiftable movement between multiple positions.

Still another object of the present invention is to provide a movable vacuum back which is angularly shiftable between multiple positions and which further includes multiple working surfaces so that the sheet member may be carried between multiple stations for multiple procedures.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheets of drawings in which a preferred structural embodiment of the present invention is shown by way of illustrative example.

On the drawings:

FIGURES 1 and 2 are somewhat schematic views showing a pivotally mounted vacuum back associated with a film casette wherein FIGURE 1 depicts the parts schematically and diagrammatically in one position corresponding to a film loading position and FIGURE 2 depicts the same apparatus but with the parts arranged in an exposure position;

FIGURES 3 and 4 show an alternative arrangement of the same type of structure as shown in FIGURES 1 and 2, but wherein processing equipment is incorporated in the mechanism;

FIGURE 5 is a somewhat schematic view depicting another form of the invention wherein the vacuum back means has multiple platen surfaces;

FIGURE 6 is a view similar to FIGURES 3 and 4 but showing an alternative form of platen construction wherein double platen working surfaces are provided;

FIGURE 7 is a partially broken elevational view of a vacuum back provided in accordance with the principles of the present invention; and

FIGURE 8 is a cross-sectional view taken generally on line VIII—VIII of FIGURE 7.

As shown on the drawings:

In FIGURE 1 there is shown a graphic arts apparatus indicated generally at **10** and comprising a projection means **11** including an optical track for projecting an image as indicated in dashed lines at **11**.

A first mirror as shown at **12** is pivotally mounted as at **13** for movement between a full line position wherein the image is reflected to a viewing screen **14** and a dotted line position wherein the image is projected against a stationary mirror **16** angularly disposed to reflect the image in an offset direction towards a vacuum back as provided in accordance with the principles of the present invention and which is shown generally at **20**.

In this form of the invention, the vacuum back has a front side **21** and a rear side **22**. The front side comprises a platen providing a front face which is characterized by a zoned pattern of air passages formed therein. For example, the front face **21** may have a zoned pattern of air passages provided by plural perforations, or by a pattern of grooves. The front side of the platen could also be formed by using a porous material, thereby providing a surface through which a vacuum bias may be exerted. Means for supplying a vacuum bias to the zoned pattern of air passages or its porous surface takes the form of a pump **23** driven by a motor **24** and the vacuum bias is conducted from the pump to the platen **21** by a conduit **25** connected to a manifold **26** communicating with the back of the platen and hence the zoned passages or recesses, or the porous surface.

The vacuum back shown generally at **20** is particularly characterized by a support means including a pivot pin **27** by means of which the vacuum back **20** is pivotally supported for movement between first and second positions including the loading position of FIGURE 1 and the exposure position of FIGURE 2. It will be noted that in FIGURE 2 the vacuum back **20** is inverted through 180° of angular shifting. Accordingly, in FIGURE 1 the working surface provided by the platen **21** faces downwardly and is located in register with a film casette shown generally at **30** and which comprises a light-tight box **31** having a slidable drawer **32** for containing a supply of light sensitive sheets. In FIGURE 1, the drawer **32** is shown shifted laterally in register with the vacuum back **20** and means are provided for effecting relative movement between the drawer **32** and the vacuum back **20** so that the vacuum back will operate to pick up a single sheet at the loading position of FIGURE 1 and upon inversion of the vacuum back **20**, the sheet securely held on

the working surface of the platen **21** will be ready for exposure to the image reflected by the mirror **16**.

It will be understood in connection with the arrangement of FIGURES 1 and 2, that the photomechanical structure **10** includes a light-tight enclosure so that the drawer **32** can be removed from the casette **31** without exposing the light-sensitive emulsion on the sheet until it is properly positioned at the focal plane required to receive the projected image.

By moving the projector head or mirror projector combination, or the vacuum back, the size of the image may be selectively varied.

In the arrangement of FIGURES 3 and 4, a generally similar arrangement is disclosed in connection with a combined exposure and processing machine. Accordingly, like reference numerals will be used to designate like parts but the suffix *a* is attached to the numbers for the sake of clarity. The machine is shown generally at **10***a* and includes image projection means **11***a* for projecting images of selected size and which preferably include an optical track having a lens means so the image is projected against a mirror **12***a* pivotally carried as at **13***a* so it can be swung out of the way from the full line position of FIGURE 3 to the full line position of FIGURE 4. When positioned, as shown in FIGURE 3, the image is reflected from the mirror **12***a* onto a viewing screen **14***a* carried in a front wall of the apparatus **10***a*.

The vacuum back is again shown at **20***a* and includes a front platen **21***a* characterized by a porous surface or a zoned pattern of recesses or apertures. A rear portion **22***a* provides the necessary closure and passages by means of which a vacuum bias is conducted from a pump **23***a* driven by a motor **24***a*. A conduit **25***a* connects the pump **23***a* with a manifold **26***a*.

The vacuum back **20** is pivotally supported as at **27***a* and is movable through a 180° inversion from the position shown in FIGURE 3 which is a loading position to the position shown in FIGURE 4 which is an exposure position.

A casette **30***a* includes an enclosure **31***a* for a removable drawer **32***a* and contains a supply of sheets having the requisite photographic properties. After the sheet is exposed in the exposure position illustrated in FIGURE 4, the sheet is developed or otherwise processed by removing the same from the platen **21***a* and placing the sheet in the developing means shown generally at **40** and more specifically identified as including the processing tray **41**.

In the form of the invention shown in FIGURE 5, there is a photomechanical apparatus **10***c* having projecting means **11***c* for projecting an image against a mirror **12***c* pivotally mounted as at **13***c* for movement between a full line position and a dotted line position. When in full line position, an image of prescribed size is projected to a viewing screen **14***c*. When in dotted line position, the image is projected towards a vacuum back shown generally at **20***c* and comprising plural platens each shown at **21***c* and each characterized by having a porous surface or zoned patterns of apertures or recesses receiving a vacuum bias from a pump **23***c* driven by a motor **24***c* and conducting the vacuum bias via a conduit **25***c*. A rear side **22***c* on each respective platen completes each respective unit of the vacuum back. It will be noted the respective units are disposed to provide a triangular configuration so that each vacuum back unit constitutes one leg of an equilateral triangle.

Adjacent one of the legs of the triangle is a loading station so that a drawer **32***c* removable from a casette **30***c* having an enclosure **31***c* may be moved relative to the vacuum back, thereby to engage a sheet against the vacuum back. Upon rotation of the vacuum back structure, the sheet will be carried into the exposure station shown in alignment with the projector means **11***c*. Following exposure, the vacuum back **20***c* is again rotated, whereupon the exposed sheet is carried to a removal station from which a sheet, indicated at S, is being removed from

the vacuum back and into a processing tray **41***c* of a development apparatus shown generally at **40***c*.

In the form of the invention shown in FIGURE 6, the apparatus is shown at **10***d* and includes a projecting means **11***d* for projecting an image of selected size against a mirror **12***d* pivoted as at **13***d* for movement between a full line position and a dotted line position, the full line position corresponding to an arrangement whereby the image is projected onto a viewing screen **14***d* in a front wall of the apparatus **10***d*. In the dotted line position, the image is projected onto a focal plane constituted by the working surface formed by a platen **21***d* of a vacuum back means shown generally at **20***d*. In this form of the invention, the vacuum platen **20***d* constitutes two vacuum back units which are placed back-to-back. Thus, a second platen providing a second working surface **21***d* is in spaced parallel relation to the first working surface **21***d* and both units have a rear cover portion **22***d* connected together.

Vacuum bias is conducted to the working surfaces **21***d*, **21***d* by means of a manifold **26***d* serviced by a pump **23***d* connected to the manifold **26***d* by a conduit **25***d*. The pump **23***d* is driven by a motor **24***d*.

As in the previous embodiments, a casette **30***d* having an enclosure **31***d* houses a drawer **32***d* for containing a supply of sheets. There is also provided a development apparatus shown generally at **40***d* and including a processing tray **41***d* by means of which the exposed sheet may be developed.

The vacuum back **20***d* is pivotally supported as at **27***d* and is angularly shiftable through a full circle and is generally horizontally positionable in two positions relatively inverted 180° so the surfaces **21***d*, **21***d* will alternately be in a loading or discharge position and in an exposure position. In the loading and discharge position, the platen and working surface **21***d* will be engaged against a sheet to pick up and hold the sheet. In that position, the processing tray **41***d* will be shifted to the right, as viewed in the orientation of FIGURE 6. The vacuum back **20***d* is then angularly shifted to place the sheet in the exposure position and the mirror **12***d* is pivoted, thereby permititng the sheet to be exposed. The drawer **32***d* is placed back in the casette **30***d* during exposure and the film previously exposed on the working surface **21***d* is discharged into the processing tray. The processing tray is then moved again to the right and a new sheet is loaded onto the working surface **21***d*. Accordingly, a continuous operation can be effected.

In FIGURES 7 and 8, a typical vacuum back **20** is shown including the front platen **21** characterized by the zoned passages designated by the letter P. The rear portion of the vacuum back **20** is indicated at **22** and the pivot mounting is shown generally at **27** and includes brackets shown at **127** having projecting pivot pins **227** by means of which the vacuum back may be pivotally carried in accordance with the principles of the present invention, The manifold is shown at **26** connected to a conduit **25** and there is provided a valving mechanism **126** which may be automated by a suitable electric control motor powered through a usual source of electrical energy via conductor wires identified at **226**.

With respect to the developing apparatus, a suitable form of developing apparatus such as that provided for processing photo-direct material may be utilized and the apparatus shown generally at **40** may correspond generally with the structure as disclosed in the copending application of Wanielista and Sippel, Jr., Serial No. 293,694, filed July 9, 1963. With respect to all of the embodiments disclosed, it will be understood that the casette, storage processor and drive motor can be located and positioned in three other directions relative to the micro-film head.

Although various 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:

1. In combination a vacuum back having front and rear sides including

a platen on the front side of the vacuum back forming a working surface,

said platen having a zoned pattern of air passages formed therein,

means for supplying a vacuum bias to said zoned pattern of air passages,

thereby to hold a sheet member on said working surface,

support means carrying said vacuum back for pivotal movement between first and second positions wherein said vacuum back is inverted 180° from said first to said second position,

sheet storage means on one side of said vacuum back for engaging said working surface against a sheet,

and an optical track having means for projecting an image onto said sheet when said vacuum back is turned to said second position.

2. In the combination defined in claim 1, two of said vacuum backs being provided and means joining said two vacuum backs together to provide platens facing in opposite directions,

whereby one platen can be loaded with a sheet member while the other platen is being exposed.

3. In combination, a movable vacuum back comprising,

vacuum back means

having a platen

forming a flat working surface characterized by a zone pattern of passages being formed therein,

means for supplying a vacuum bias to said passages to pick up and retain a sheet member on said working surface,

support means carrying said vacuum back means for angularly shiftable movement between multiple positions,

sheet storage means adjacent said support means and arranged to engage a sheet member against said working surface at one of said multiple positions,

and an optical track having means for projecting an image against said sheet member when said vacuum back is angularly shifted to another of said multiple positions relatively inverted with respect to said one position.

4. A movable vacuum back comprising, vacuum back means

having a platen forming a flat working surface characterized by a zoned pattern of passages being formed therein,

means for supplying a vacuum bias to said passages to pick up and retain a sheet member on said working surface,

support means carrying said vacuum back means for angularly shiftable movement between multiple positions,

sheet storage means adjacent said support means and arranged to engage a sheet member against said working surface at one of said multiple positions, and

image projection means including an optical track for projecting an image against said sheet member at another of said multiple positions,

said vacuum back means having front and rear sides with said working surface being disposed on one of said sides,

said support means comprising a pivot support carrying said vacuum back means for pivotal movement between fist and second positions inverted by 180° from one another.

5. A movable vacuum back comprising, vacuum back means

having a platen forming a flat working surface characterized by a zoned pattern of passages being formed therein,

means for supplying a vacuum bias to said passages to pick up and retain a sheet member on said working surface,

support means carrying said vacuum back means for angularly shiftable movement between multiple positions,

sheet storage means adjacent said support means and arranged to engage a sheet member against said working surface at one of said multiple positions, and

image projection means including an optical track for projecting an image against said sheet member at another of said multiple positions,

said vacuum back means comprising two separate vacuum back units providing separate platens disposed in spaced parallel planes and facing in 180° opposed direction.

6. A movable vacuum back comprising, vacuum back means

having a platen forming a flat working surface characterized by a zoned pattern of pasages being formed therein,

means for supplying a vacuum bias to said passages to pick up and retain a sheet member on said working surface,

support means carrying said vacuum back means for angularly shiftable movement between multiple positions,

sheet storage means adjacent said support means and arranged to engage a sheet member against said working surface at one of said multiple positions, and

image projection means including an optical track for projecting an image against said sheet member at another of said multiple positions,

said vacuum back means comprising a bracket forming said support means and having a plurality of platens, whereby loading and exposure can occur simultaneously at two corresponding stations.

7. A movable vacuum back as defined in claim 6,

wherein said bracket supports three platens in the disposition of legs of an equilateral triangle,

said sheet storage means being disposed adjacent one leg of said triangle,

said projection means being disposed to project an image at the platen on another leg of said triangle,

and developing means adjacent the third leg,

whereby the vacuum back means may be moved through sequential steps of (1) loading, (2) exposure and (3) development.

8. In a graphic arts reproducing machine having an optical system for projecting an image on a focal plane,

means for holding a sheet form copy media throughout various steps of an operational cycle including an exposure step and comprising pivotal support means,

said pivotal support means including means for angularly shifting said sheet form copy media through at least a 180° inversion,

thereby to provide an exposure station and a loading station,

a member for carrying said sheet form copy media,

said pivotal means positioning said copy media in the focal plane of the optical system at the exposure station, and positioning said member to receive a new sheet form copy media at a loading station,

said member for carrying said sheet form copy media comprising a vacuum back means and a source of vacuum bias connected to said vacuum back means,

thereby to hold the sheet form copy media thereon.

9. In a graphic arts reproducing machine as defined in claim **8**,

said vacuum back means comprising two separate vacuum back units and means joining said two units together to provide platens facing in opposite directions,

whereby one platen can be loaded with a sheet form form copy media while the other is being exposed.

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