

July 15, 1969

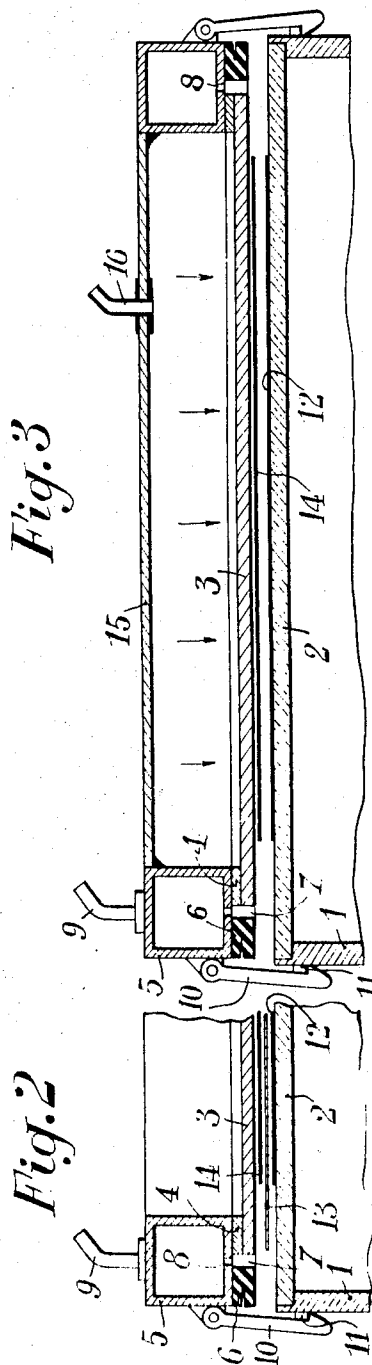
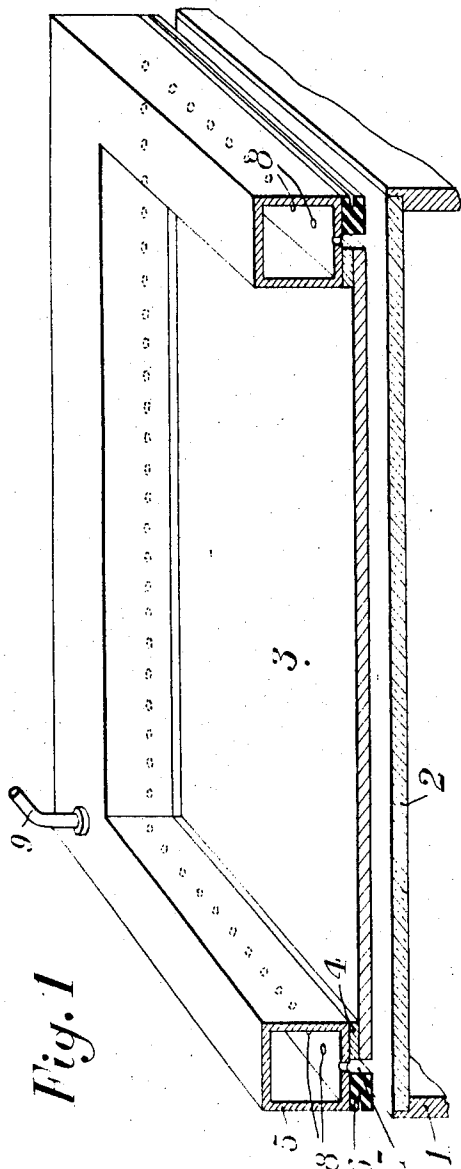
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3,455,634

PNEUMATIC PRINTERS FOR PHOTOMECHANICAL PROCESSES

Filed April 14, 1967

2 Sheets-Sheet 1



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PNEUMATIC PRINTERS FOR PHOTOMECHANICAL PROCESSES

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2 Sheets-Sheet 2

Fig. 4

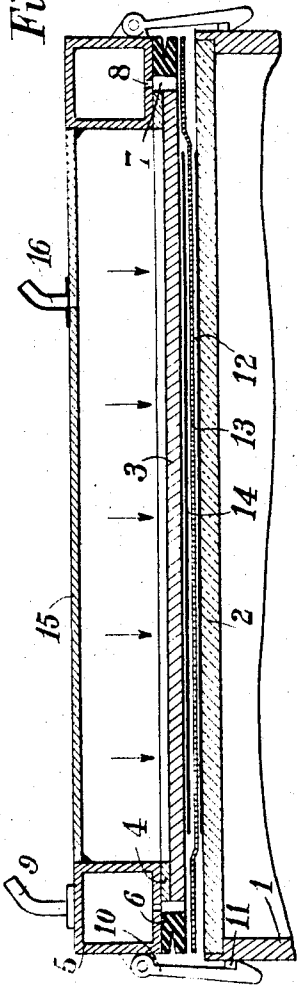


Fig. 6

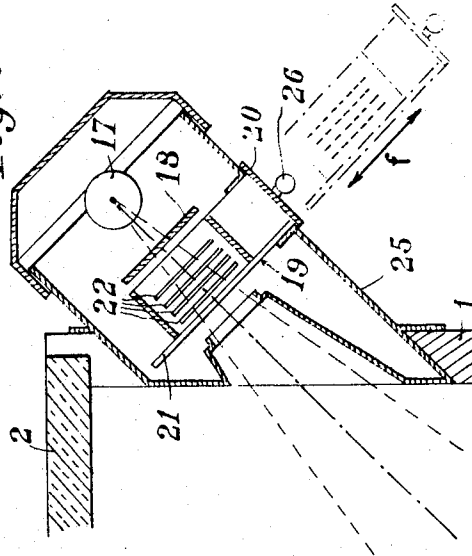
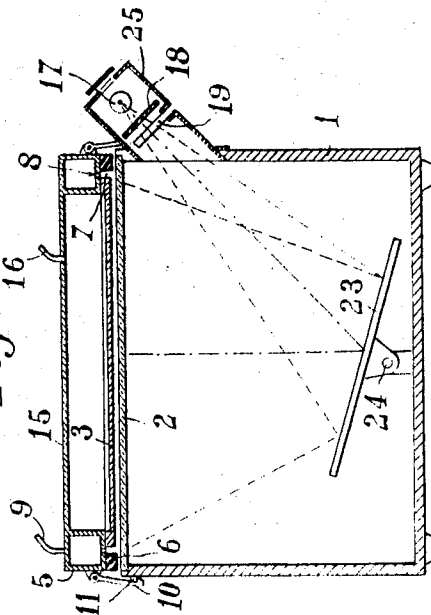


Fig. 5



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PNEUMATIC PRINTERS FOR PHOTO-MECHANICAL PROCESSES

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7 Claims

ABSTRACT OF THE DISCLOSURE

The pneumatic frame of the printer comprises a hollow frame member perforated on its lower face and provided with an air suction outlet through which a vacuum is created between the flexible cloth and the glass plate of the pneumatic frame. The device for illuminating the glass plate is a high- and constant-output lamp mounted externally of the box of the printer and associated with a mirror mounted inside said box and with a slide-type filter magazine placed in front of the lamp.

BACKGROUND OF THE INVENTION

Conventional pneumatic printers as currently used in photomechanical processes for contact copying works comprise as a rule a box closed at its top by a pneumatic printing frame consisting of a glass plate constituting the copying plane and a flexible and air-impervious cloth (of rubber, rubberized fabric or the like), means being provided for creating a vacuum therebetween to ensure a proper contact between the image to be copied and the sensitive film.

As a rule, the cloth has attached to its lower face an air-tight peripheral section or lip made of a suitable elastomer and adapted to constitute a sealing gasket between the cloth and the glass plate, and to its upper face a peripheral and generally metallic frame having hinged mounted to its side faces adequate fasteners for locking the frame to the underlying printing box.

In these conventional printers the air suction produced between the glass plate and the frame cloth takes place through a single orifice provided at one corner of the cloth; an obvious inconvenience of this arrangement is the building up of air pockets trapped between the glass plate and the cloth, which tend to develop zones of different densities in the copy of ruled half-tone images.

Besides, the air-suction orifice formed in the cloth takes some space and reduces inasmuch the useful size of the printer.

The light source of conventional pneumatic printers consists, as a rule of a tungsten-filament point lamp disposed at the bottom, and generally centrally, of the box. To perform the usual colour-selection and half-tone operations the light is filtered by using a limited number of colour filters carried by strips or disks adapted to travel in front of the lamp under the control of suitable linkage means or an electric motor.

The intensity of the light source is adjustable by means of a rheostat.

The inconveniences characterising this lighting system are well known. They are essentially:

A lack of uniformity of the light distribution over the plane of the copy, due to the short distance between the light source and this plane, this inconvenience being particularly detrimental when making half-tone and positive prints according to the photogravure process, due to the resulting irregular density of the print;

The range of exposure times required is abnormally

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wide and therefore inconsistent with the optimum efficiency of photographic emulsions;

The fact that a rheostat is necessary for reducing the intensity of the light source is objectionable because the light composition is altered as a consequence of the reduction in the lamp supply voltage, thus impairing the precision of the copying work and preventing a reliable calculation of the exposure:

Conventional printers are ill-suited for a rapid replacement of the filters or the use of a plurality of superposed filters, due to the poor accessibility of the filter positions.

SUMMARY OF THE INVENTION

It is the essential object of the present invention to avoid these drawbacks by providing to this end an improved printer characterised in that the pneumatic frame comprises a hollow frame member having the same outer dimensions as the glass plate, said frame member having secured to its lower face, on the one hand, along the external marginal portion of said face, an air-tight elastomer section and on the other hand, along the internal marginal portion of said face, the edges of a flexible, air-impervious cloth having smaller dimensions than said glass plate and free of the conventional section constituting the sealing gasket, a free gap being reserved under the lower face of said frame member between said cloth and said elastomer section, said hollow frame member having perforations formed in its lower face which register with said free gap, said perforations being disposed at spaced intervals along the periphery of said frame member, and an air suction outlet being provided at any suitable point along the lateral faces or the upper face of said hollow frame member, and that the device provided for illuminating the copying or printing plane is a lamp having a high and constant output, which is mounted in a particularly accessible manner in a case secured to the lateral wall of the printing box, externally of said box and substantially level with the copying or printing plane disposed at the top of said box, said lamp being associated on the one hand with a mirror inclined to the bottom of said box and adapted to reflect the light from said lamp onto said copying or printing plane, this arrangement permitting of disposing the light source remotely from said plane, and on the other hand with a filter slide disposed in front of said lamp in said box, in order to permit an easy access to said filter slide which on the other hand can receive a plurality of superposed filters replaceable at will.

As in hitherto known pneumatic frames, the aforesaid air-tight elastomer section seals the joint between the glass plate and the cloth carried by the frame member, but as contrasted with the conventional arrangement, in the device according to this invention this elastomer section is attached to the frame member in lieu of the cloth.

Fasteners pivotally mounted on the frame member are also provided for locking this member to the underlying box of the printer.

An essential technical improvement characterising the structure of this invention is that any air present between the glass plate and the cloth is sucked up through the many holes constituting the aforesaid perforations of the lower wall of the hollow metal frame member, which are disposed at spaced intervals along the entire periphery of said frame member. Thus, a uniform vacuum is created in all and any space available between the glass plate and the cloth. Moreover, as the general air suction pipe is mounted not on the cloth but on the hollow frame member, the useful size of the printer corresponds to the whole of the surface area of the cloth which lies inside the frame member. Another advantageous feature of this novel frame structure is of economical order and as fol-

lows: as contrasted with the construction of conventional printers, wherein the lip or section sealing the joint between the cloth and the glass plate is solid with the cloth, in the printer of this invention the section is detached from the cloth so that either the cloth or the section can be replaced separately when necessary.

Another improvement characterising this invention is that the cloth is secured to the frame member by means of an air-tight frame-shaped metallic or plastic distance-piece inserted between the edge of the cloth and the hollow frame member, said distance-piece being bonded in an air-tight manner to one of these elements and of a thickness such that the lower face of the cloth be substantially flush or co-planar with the lower face of said sealing section.

This relative disposal of the cloth and sealing section is made possible by the fact that in the arrangement of this invention they constitute separate elements, whereby the contact between the sensitive film and a film-like ruled half-tone screen disposed between the glass plate and the cloth is obtained without causing any distortion of the marginal portion of said film-like ruled half-tone screen, as the cloth and the section are level with each other.

In copying operations carried out with half-tone or line images, a good contact is required between the image to be reproduced, the half-tone screen and the sensitive film, this contact being produced by sucking up the air between the glass plate and the cloth. On the other hand, when it is desired to copy images having a continuous relief, a contact requiring a lesser pressure is preferred, notably in order to avoid the formation of Newton rings.

To this end, the improved printing device according to this invention is provided accessorially with an air-impervious rigid plate solid with, and tightly connected to, the aforesaid hollow frame member, so as to seal this frame member in the plane of the upper face thereof, this rigid plate being provided with nozzle means permitting the supply compressed air into the air-tight box bounded by said rigid plate, the lateral inner wall of said hollow frame member, the cloth and possibly the distance-piece associated therewith.

Thus, an air-pressure device is obtained wherein the air pressure is adjustable at will and exerted against the upper face of the flexible cloth in order to produce the necessary contact between the sensitive film and the image to be reproduced or copied.

This rigid plate may consist of metal, plastic or the like, and is advantageously ribbed to increase its rigidity and strength. If desired, this rigid plate may be bonded to the frame member in a sealed manner by cementing, welding, or by using an intermediate sealing gasket and fastening screws, etc.

The above-mentioned air-pressure device has a specific purpose as explained hereinafter:

In half-tone works it is advantageous to combine this air-pressure device (which in this case ensures the necessary contact between the negative or image to be half-toned and the half-tone screen) with the air-suction device producing the necessary contact between the half-tone screen and the sensitive film. This combination permits of removing the negative during one fraction of the exposure time, so as to reinforced the finest points of the half-tone pattern. In fact, the negative can be removed momentarily by simply preserving the vacuum between the half-tone screen and the film, and removing the pressure between the negative and the ruled half-tone screen.

The lamp and mirror assembly for illuminating the copying plane is advantageous in that it elongates the light cone and ensures a more homogeneous distribution of the light over the copying plane.

The high-output and constant-output lamp may consist for an example of a halogenincandescent lamp such as an iodine (quartz-iodine) lamp having a compact filament. Preferably, a stabilized voltage is fed to the lamp.

The adjustment rheostat is dispensed with. It is replaced by a series of neutral grey filters that can be disposed at will and very rapidly across the light beam, in front of the lamp, in the filter slide. Thus, the printer can be operated within a relatively narrow range of exposure values. The use of colour filters, in addition to the aforesaid grey natural filters, permits of altering at will the light composition. The accessibility and interchangeability of these filters constitutes a substantial advantage of the printer of this invention.

The mirror associated with the lamp may be flat or shaped.

With the improved printer according to this invention an original method is used for adjusting the illumination of the image to be reproduced. Considering an iodine lamp operated under a constant and maximum voltage, the nature of the neutral grey filters to be associated therewith is determined as follows:

The sensitive film is exposed during a mean time of, say, 30 seconds through a rated range of greys as commercially available, and the film is processed. Then the operator determines by visual comparison the zone of the rated range of greys to which corresponds the desired density, as obtained on the film. The known optical density of the corresponding zone of the grey range represents the total density to be interposed between the lamp and the sensitive film (which is equal to the sum of the densities of the image to be reproduced, as measured with a densitometer, and of the neutral grey filters to be inserted in the filter slide) for obtaining the desired density on the film with the selected exposure. A simple subtraction will give the total density of the neutral grey filters to be associated with the lamp.

This method is advantageous in that it permits of utilizing a nearly constant exposure time, or at least a relatively narrow portion of the exposure time range.

During the film exposure through the range of rated greys the contact half-tone screen and the colour filter or filters adapted to alter the light composition are positioned, provided of course that they are required for the type of reproduction contemplated.

The improvements according to this invention bring several advantages to pneumatic printers.

BRIEF DESCRIPTION OF THE DRAWING

A specific form of embodiment of the pneumatic printer according to this invention will now be described by way of example with reference to the accompanying drawing, in which:

FIGURE 1 is a fragmentary diagrammatic perspective and cross-sectional view showing the improved printer of this invention;

FIGURE 2 is a fragmentary vertical section of the device during its operation;

FIGURE 3 is a fragmentary diagrammatic vertical section illustrating a modified form of embodiment of the device;

FIGURE 4 is a view similar to FIGURE 3 but showing the operation of the device for half-tone works;

FIGURE 5 is a diagrammatic vertical section of the printer, showing the device for illuminating the copying plane; and

FIGURE 6 is a fragmentary diagrammatic vertical section showing on a larger scale the lighting device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The pneumatic printer illustrated in the drawing comprises a box 1 of substantially parallelepipedic configuration, which is made generally of metal and closed at its top by a pneumatic frame consisting essentially of a glass plate 2 and a flexible cloth 3 of air-impervious material, as a rule rubber (FIGURE 1).

The copying plane of the printer is the top face of the glass plate 2.

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The cloth 3 has smaller dimensions than the glass plate and its marginal portion is secured in an air-tight manner, for example by cementing, to the lower face of a frame-like member constituting a distance-piece 4. This distance-piece 4 is secured in turn in an air-tight manner to the lower face of a hollow frame member 5, against the inner marginal portion of this lower face.

A sealing strip or section 6 of air-impervious and if desired cellular material is also secured to the lower face of the hollow frame member 5, on the external marginal portion of this face.

A free space or gap 7 is left under the hollow frame member 5 between the section 6 and the assembly comprising cloth 3 and distance-piece 4, and in this zone the inner face of said hollow frame member 5 is perforated at spaced intervals as shown at 8; besides, an air suction pipe 9 is connected at any suitable point of the top or lateral faces of the hollow frame member 5.

Fasteners 10 adapted to engage catches 11 rigid with the underlying box 1 are provided for pressing the hollow frame member 5 carrying the cloth 3 against the glass plate 2, the section 6 acting as a sealing gasket (see FIGURE 2).

The thickness of the distance-piece 4 is calculated to cause the lower face of cloth 3 to be co-planar with the lower face of section 6, as shown in the drawing.

FIGURE 2 illustrates the operation of this improved pneumatic printing frame. Between the glass plate 2 constituting the copying plane of the device and the cloth 3, an image 12 to be reproduced is inserted, together with a half-tone screen 13 and a sensitive film 14. The hollow frame member 5 of the assembly is then locked relative to the main box 1 of the printer by means of the fasteners 10, and the space left between the cloth and the glass plate is vacuumized by connecting the air outlet 9 and the air suction holes 8 of the frame member 5 to a suitable vacuum source.

FIGURE 3 illustrates a modified form of embodiment of the printer according to this invention, wherein a rigid plate 15, for example of metal and formed with stiffening ribs, seals the interior of the hollow frame member 5, in the plane of the top face thereof, and is bonded in an airtight manner to this frame member so as to constitute, with the inner lateral wall thereof and with the distance-piece 4 and cloth 3, an-tight box communicating with the outside only through a pipe 16 carried by said plate 15.

This arrangement is designed for introducing air under pressure into the box through said pipe 16 and thus exert a pressure adjustable at will against the cloth 3, in the direction of the arrows (FIGURE 3). More particularly, this arrangement permits of exerting against an image 12 and a sensitive film 14 disposed between the glass plate 2 and the cloth 3, a pressure lower than that obtaining by producing a vacuum or suction between the glass plate and the cloth by means of the frame member. As already explained hereinabove, this arrangement is advantageous when it is desired to copy images having a continuous relief pattern.

Moreover, as already explained in the forgoing the above-described air-pressure device and the air-suction device described before may be used simultaneously in the half-tone reproduction process.

Referring to FIGURE 4 it will be seen that with the device of this invention; wherein the lower faces of cloth 3 and section 6 are level or co-planar, the marginal portion of the half-tone screen 13 is not subjected to appreciable distortion in those applications where the half-tone screen must have the same external dimensions as the frame member 5.

Referring now to FIGURES 5 and 6 it will be seen that the light source of the printer is a lamp 17 having a high and constant output, such as an iodine lamp, to which a stabilized voltage is applied; this lamp is mounted in a case 25 secured externally and obliquely to a lat-

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eral wall of box 1, approximately at the level of the copy plane. Across the light beam of this lamp are disposed a heat-protection glass filter 18 and, within the case 19, a filter magazine 20 comprising a slide 21 adapted to receive a plurality of superposed filters 2 which can be changed at will; the filter magazine provided with an external gripping member 26 is adapted to slide in the case 19, by means of its slide 21, as shown by the double-headed arrow *f*, whereby it can be extracted from the lamp case 25 and placed as shown in chain-dotted lines for positioning and changing the filters. A mirror, in this example, a flat mirror 23, mounted on a pivoted support 24, is provided in an inclined position in the bottom of the box 1. As shown, this mirror 23 reflects the light beam from the lamp 17 towards the glass plate 2, whereby the light cone emitted by the lamp is elongated and therefore widened, and the light thus distributed with greater homogeneity throughout the surface of the glass plate 2.

As the lamp 17 is operated with a maximum and constant candle power, the illumination of the copying or reproduction plane is altered by using neutral grey filters and possibly the light composition itself may be modified by using colour filters, these various filters 22 being inserted at 19 into the filter magazine 20.

Of course, detail modifications may be brought to the pneumatic printer described hereinabove and illustrated in the accompanying drawing, without inasmuch departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. In a pneumatic printer for photo-mechanical process works, which comprises a box closed at its top by a pneumatic frame consisting of a glass plate forming the copying plane and of a flexible and air-impervious cloth, between which a vacuum can be created, the marginal portions of said cloth being secured in an air-tight manner under said frame, said frame having the same external dimensions as said glass plate and being provided with fasteners for interlocking same to said printer box, and comprising means for illuminating said copying plane, the improvements consisting in that said pneumatic frame comprises a hollow frame member having the same external dimensions as said glass plate, said hollow frame member having secured to its lower face on the one hand, along the external marginal portion of said lower face, an elastomer air-impervious section, and on the other hand, along the internal marginal portion of said lower face, the marginal portion of said flexible air-impervious cloth, said cloth having smaller dimensions than said glass plate and being free of the conventional gasket-forming section, a free gap being reserved under the lower face of said hollow frame member between said cloth and said elastomer section, said hollow frame member having perforations formed through its lower face, said perforations registering with said free gap and being disposed at spaced intervals along the entire periphery of said hollow frame member, and an air suction outlet being disposed at any point along the top face or the lateral faces of said hollow frame member, and in that said means for illuminating said copying plane consists of a high- and constant-output lamp mounted in an easily accessible manner in a case secured to the lateral wall and externally of said box, approximately at the level of said copying plane disposed at the top of said box, said lamp being associated on the one hand with a mirror mounted in an inclined position in the bottom of said box and adapted to reflect the light emitted by said lamp into said copying plane, and on the other hand with a slide-type filter-magazine disposed in front of said lamp in said case, said filter-magazine being easily accessible and designed to receive a plurality of superposed filters adapted to be changed at will.

2. A pneumatic printer as set forth in claim 1, wherein said cloth is secured to said hollow frame member through

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the medium of an air-tight, frame-shaped distance-piece interposed between the edge of said cloth and said hollow frame member, said frame-shaped distance-piece being bonded in an air-tight manner to both these elements and having a thickness such that the lower face of the cloth be co-planar with the lower face of said elastomer section.

3. A pneumatic printer as set forth in claim 1, wherein an air-tight rigid plate adheres in an air-tight manner to said hollow frame member, so as to seal said hollow frame member in the plane of the upper face thereof, said plate being provided with nozzle means permitting of introducing air under pressure into the air-tight box bounded by said rigid plate, said cloth and the inner lateral wall of said hollow frame member.

4. A pneumatic printer as set forth in claim 2, wherein an air-tight rigid plate adheres in an air-tight manner to said hollow frame member, whereby it will seal said hollow frame member in the plane of the upper face thereof, said plate being provided with nozzle means permitting of introducing air under pressure into the air-tight box bounded by said rigid plate, said cloth, the inner lateral wall of said hollow frame member and of said frame-shaped distance-piece of said cloth.

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5. A pneumatic printer as set forth in claim 1, wherein said high- and constant-output lamp is a halogen incandescent lamp supplied with a stabilized voltage.

6. A pneumatic printer as set forth in claim 1, wherein said filter-magazine is adapted to receive neutral grey filters and color filters.

7. A pneumatic printer as set forth in claim 4, wherein said high- and constant-output lamp is a halogen incandescent lamp supplied with a stabilized voltage, and said filter-magazine is adapted to receive neutral grey filters and color filters.

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