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VACUUM FRAME AND IMPROVEMENTS FOR VACUUM FRAMES

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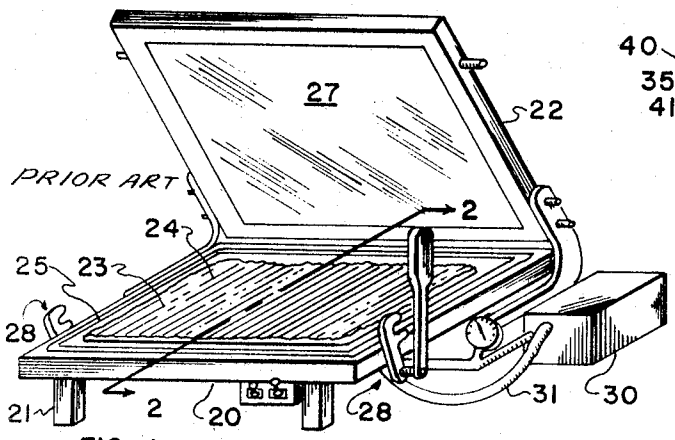


FIG-1

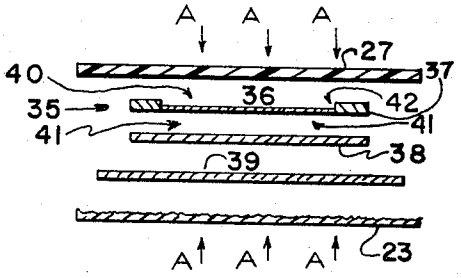


FIG-2
PRIOR ART

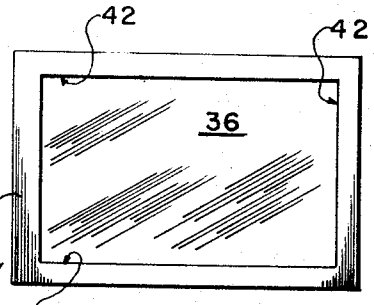


FIG-3

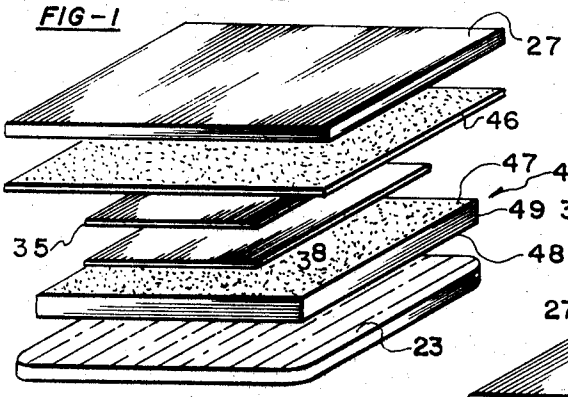


FIG-4

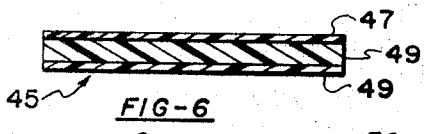


FIG-6

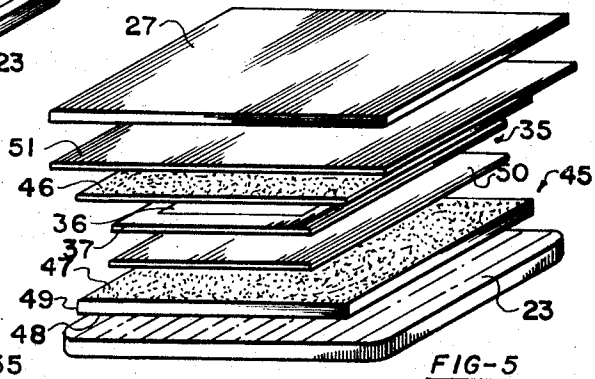


FIG-5

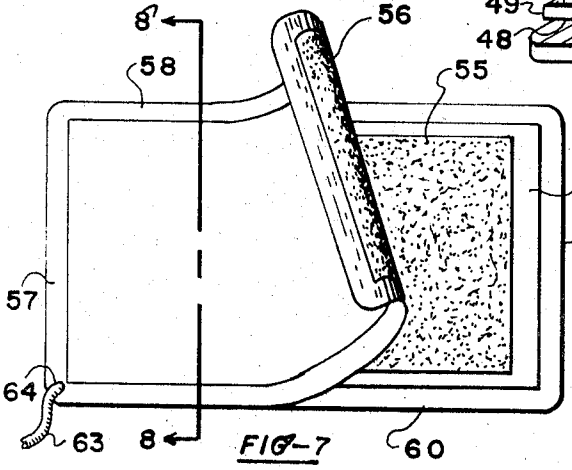


FIG-7

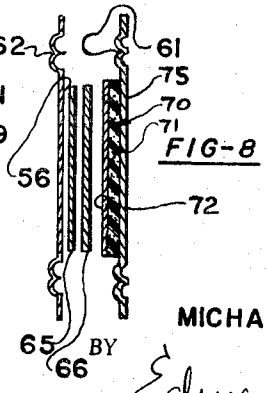


FIG-8

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VACUUM FRAME AND IMPROVEMENTS FOR VACUUM FRAMES

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Continuation of application Ser. No. 255,404, Jan. 31, 1963. This application Sept. 20, 1965, Ser. No. 488,372
U.S. Cl. 355—91 1 Claim
Int. Cl. G03b 27/00

This is a continuation application of application Ser. No. 255,404 filed Jan. 31, 1963.

This invention relates to improvements for the vacuum frames, and to a novel vacuum frame of the type used in the graphic arts in printing processes where light is passed through a negative to a positive, and the said negatives and positives must be held in exact contacting registration.

In particular, this invention provides new types of elements such as plastic sheets having abraded surfaces adapted to hold the said negatives and positives between the said abraded surfaces.

In FIG. 1 of the drawings, a type of vacuum frame well known in the art is illustrated. It comprises a pair of hinged frame members which may be opened to introduce the negative and positive material, a sealing ring between the members, a top element such as a glass, and a bottom element such as a rubber mat. When the frame is closed, all of the air is exhausted, and the rubber mat is forced by outside atmospheric pressure up against the glass. In theory, this presses the negative and positive together for best contact and registration.

In the usual device known to the art, the rubber mat is provided with a series of ridges or other spacing elements to provide air passage between the mat and the positive material so that all of the air can be exhausted without leaving bubbles or islands of air to disturb the contacting relationship. This feature, while necessary, has the disadvantage that the ridges or other spacing elements in and of themselves create an unequal pressure on various parts of the films or plates with sometimes undesirable results in achieving proper contact.

The technician may, therefore, improvise by placing a piece of cardboard or heavy paper between the rubber mat and the positive. If this produces a satisfactory result, well and good. If not, it is then necessary to piece and patch the negative and positive together involving many steps and operations which are both time consuming and costly.

In other words, for some applications the vacuum frame will not work properly. This is especially true in the case where a negative is made up of material which may be a combination of film and non-film elements having differences in thickness throughout the negative material. In such case, it is virtually impossible to exhaust the air properly and to press the negative and positive together without forming undesirable air spaces between the negative and the positive.

It is, therefore, an object of this invention to provide a new vacuum frame and improvements for existing vacuum frames which will enable the technician to get desirable contact between the negative and the positive, and which will eliminate undesirable non-contact areas.

Throughout the specification, reference will be made to negatives and positives. It is to be understood that these terms are used to mean elements commonly referred to as negative from which a positive print is obtained, and a positive which is commonly obtained from a negative. It is sometimes the practice to take what is commonly referred to as a positive and use it as a negative to obtain an opposite or negative type print. In order to avoid any misunderstanding, the use of the terms "negative" and "positive" in this specification are as follows:

The term "negative" covers any material through which light is passed to obtain a print, and the term "positive" covers any material out of which a print is made from a negative material. This is true whether or not the printed material or the material from which it is printed is commonly called a negative or positive or vice versa, and includes films, plates, mechanical make-ups, engineering drawings, translucent drawings, tracings, or any other material from which a print could be made.

It is a further object of this invention to provide an improved type of vacuum frame which eliminates undesirable Newton rings.

It is a further object of this invention to provide simple adapting elements which will convert existing vacuum frames to vacuum frames in accordance with this invention.

It is also an object of this invention to provide a new vacuum frame eliminating the glass and rubber mat of the prior art, and another object of this invention is to provide, in another form of the invention, a vacuum frame requiring no fixed solid frame elements and which may be made in sizes much larger than those presently available in existing vacuum frames.

Further objects and advantages will appear in the specification hereinbelow. These objects are achieved with the device and improvements as illustrated in the accompanying drawings in which:

FIG. 1 is a perspective view of a vacuum frame already existing in the art;

FIG. 2 is an exploded sectional view of elements as they might appear along the lines **2—2** in FIG. 1 with the frame closed and in position for printing;

FIG. 3 is a top plan view of the negative element shown in FIG. 2;

FIG. 4 is an exploded perspective view of certain elements of prior art devices incorporating the improvements of this invention;

FIG. 5 is a view similar to FIG. 4 including an extra optional element of the invention;

FIG. 6 is a sectional view of the matte bed of the invention;

FIG. 7 is a top plan view of a vacuum frame made in accordance with the invention with the top portion of the frame lifted away in perspective; and

FIG. 8 is an exploded sectional view along the lines **8—8** in FIG. 7, with a matte bed added.

Similar numerals refer to similar parts throughout the several views.

In the old vacuum frame well known to the art as illustrated in FIG. 1 of the drawings, there is a base frame **20** resting on legs **21**, a cover frame **22** which is hinged to the base frame **20**, a rubber mat **23** having spacing elements **24**, all being held within the base frame **20**, a sealing ring **25**, a glass element **27** held within the cover frame **22**, and clamping elements **28** to clamp the frames **20** and **22** together. There is also suction means **30** comprising a motor and a pump (not shown) connected to the frame by means of a conduit or tube **31** through which the air is exhausted from the frame.

Reference to FIG. 2 of the drawings will show arrows A which represent the air pressure outside of the frame which forces glass element **27** and rubber element **23** toward each other, and which will force any material between these elements into close contact.

In FIG. 2 of the drawings, a negative **35** made partly of film **36** and other material, such as masking material **37**, which may be paper, plastic chemical or other material, and wherein the film **36** plus the other material **37**, is of greater thickness than the film **36**, alone.

There is also a sheet of positive material **38**. Reference numeral **39** designates a cardboard which may be improvised by the technician for the purpose of obtaining more exact contact as set forth hereinabove. This is the old art.

There are at least two areas where good contact may not be achieved in the system set forth in FIG. 2. The first area is designated by reference numeral **40** which denotes the area between the film portion **36** of the negative **35**, and the glass **27** of the frame. The second area, designated by the arrow and reference numeral **41**, would be the area between the film portion **36** and the positive **38**.

Air pockets or islands would be formed in these areas, and in particular, a perimeter of air would usually remain at the points designated by reference numeral **42** immediately within the rectangle, circle or other area formed by the unequal thicknesses of negative **36** and masking or other material **37** with the film **36**. Thus, referring again to FIG. 2, which is a drawing in exploded section, if the elements therein were to be visualized as pressed together in extremely close contact by the air pressure designated by arrows A, there might nevertheless be air pockets between the glass **27** and the film **36** and the positive **38**.

I eliminate these air pockets by providing an improvement for the vacuum frame which comprises a matte bed **45** and a top sheet **46**. The matte bed **45** is comprised of a pair of polyester film sheets **47** and **48** between which is contained a thickness of polyurethane foam **49**. The top sheet **46** is comprised of a sheet of polyester film.

The upper surface of sheet **47** as well as the lower surface of sheet **46** are abraded, textured or grained to disrupt the normally smooth surface of the sheet. This is done because a smooth surface contacting a smooth surface may prevent passage of air between the two surfaces. If one of the said surfaces is abraded, textured or grained, this will provide a spacing means for passage of air because the abraded or disrupted surface pressed tightly against the smooth surface will nevertheless provide minute non-discrete pockets or areas from which air can be substantially exhausted throughout the entire area of contact.

Thus, referring to FIG. 4 of the drawings, when I place a matte bed **45** over the rubber mat **23** and a top sheet **46** immediately under the glass **27**, with the work, comprising the negative **35** and the positive **38**, between the said sheets, I have provided upper and lower elements **46** and **45** respectively between which the work may be placed, and which are adapted by reason of abrading, texturing or graining, to permit substantially all of the air to be exhausted. In this instance, top sheet **46** is grained or abraded on both its upper and lower surfaces, or in other words, on both sides of the sheet **46**. Thus, the smooth glass **27** is contacted by an abraded, textured or grained sheet **46** which in turn contacts, by its abraded lower surface, the work, which is in turn contacted by the abraded upper surface of sheet **47** of the matte bed **45**.

When air is exhausted from the vacuum frame including my improvements, air pockets, such as **40**, **41** and **42**, found in prior art devices, do not appear. This is because air passageways have been provided, and the polyurethane foam **49** has been introduced for uniformly applying the air pressure to the work. As a result, maximum contact by the work pieces **35** and **38** are achieved, even though there are differences in thickness of the negative **35**, as aforesaid.

I prefer to use polyester plastic film sheets for the top sheet **46** and the matte bed **45** having a thickness of 0.0075 inch. However, these sheets may be of any thickness so long as they have the necessary strength and so long as they are flexible.

A further problem is presented in the use of vacuum frames for printing when one of the elements, such as the positive element, is in the form of a sensitized metal or glass plate, and the other element is a combination of film or other substances providing different thicknesses. In such case, there is very poor contact indeed between the negative **35** and the positive, or metal plate **50**. To rectify this situation, I provide a sealing sheet **51** of plastic film such as polyester plastic film. This is a thin sheet of 0.002 inch or less, and is made of clear plastic material. This thickness is relative to the qualities of the plastic sheet being used. It must have the quality of being ductile enough to be sucked or pulled into minute areas.

The thin sealing sheet **51** is placed immediately over the work as shown in FIG. 5 of the drawings. When the air is exhausted, the thin sheet will adapt itself to the upper surface of the film portion **36** and contact said upper surface and force all of the air remaining to the perimeter as shown by reference numerals **42** in FIG. 3 of the drawings. Thus, while there will be some air remaining, it will be forced to the very edges of the film portion **36** of the negative **35**, and all of the center portion will be in proper contact and registration.

In FIGS. 7 and 8 of the drawings, I show a new type of vacuum frame made in accordance with this invention. This frame consists essentially of an upper and lower sheet of polyester plastic film. The lower sheet or frame bed **55** has an upper abraded surface and the upper sheet or frame top **56** has a lower abraded surface. The sheets are held together around the perimeter of the edges **57**, **58**, **59** and **60**, a sealing device such as beads **61** and **62** which are provided in the ployester sheets by any means known to the plastic art. They may also be held together at the edges by weights, or pressure sensitive, or chemical adhesives. This closure is non-permanent, and only used when air is to be exhausted.

A tube **63** is attached to an opening or exit port **64**, and the tube **63** leads to an air exhausting mechanism similar to the suction means **30**. When it is desired to exhaust the air between sheets **55** and **56**, the beads **61** and **62**, or other sealing means, will form a closure seal permitting a substantial vacuum to be formed between the said closure seal and the sheets **55** and **56**. Thus, negative and positive material, such as designated by reference numerals **65** and **66**, will be held within the frame in close contact.

The type of frame shown in FIGS. 7 and 8 can be made of any size within the limitation of the construction of the plastic sheets **55** and **56**. It may be laid on a flat surface, or it may be curled or curved since the negative and positive material will be in close contact regardless of whether the frame of material is in a plane or curved spacial relationship.

In FIG. 8 of the drawings, I show a matte bed **70** comprising spongy material such as a thickness or layer of polyurethane foam **71**, a top cover **72** comprising flexible sheet material such as polyester film, and a secondary bottom cover **75** for the spongy material **70**. Sheet **75** could be a separate sheet in addition to and held within frame bed sheet **55**, or as in FIG. 8, sheet **75** alone would serve as both the lower part of the frame bed and as a lower or bottom cover for the matte bed **70**. Thus, I have provided an alternate form of vacuum frame by adding a matte bed **70** since the lower frame may be made with a matte bed **70**, as in FIG. 8, or without the matte bed **70** as in FIG. 7, as preferred. The preferred form would be as described and shown in FIG. 8 of the drawings. It is understood that in the form shown in FIG. 8, the upper surface of sheet **72** would be abraded, grained or textured in at least a portion thereof, and that sheet **75** need not have an abraded portion.

At various places hereinabove in the specification, I have mentioned graining, texturing and abrading for the plastic sheets. Certain methods of graining, texturing and abrading are well known in the art, and need no further description. In addition, there are various types of machines for graining and abrading such as one disclosed in my co-pending application for Abrading Device, filed

Feb. 1, 1962, Ser. No. 170,334, issued as U.S. Letters Patent No. 3,217,447.

While I have described my invention in its preferred forms, there are other forms which it may take without departing from the spirit and scope of the invention. For example, while I mention polyester film sheets and polyurethane foam plastic, any other plastic type material may be used having the qualities called for in the specification and I, therefore, desire to be protected for all forms coming within the claim hereinbelow.

Wherefore I claim:

1. A vacuum frame comprising a rigid transparent member and a flexible member in facing relationship and means for substantially exhausting the air between said rigid and flexible members, said rigid and flexible members having positioned between them a matte bed comprising spongy material and flexible sheet material and further in combination with separate flexible sheet material means in facing relationship to the said first mentioned flexible sheet material of the said matte bed, said frame being adapted to hold printing material in it between the said first and second mentioned sheet materials with at least a portion of the facing surfaces of the said mentioned sheet materials, between which the said printing material is held, having minute non-discrete disruptions.

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