Oct. 31, 1967 W. W. BUECHNER 3,349,688

TEMPERATURE CONTROLLING PHOTOGRAPHIC BATH

Filed Feb. 3, 1964 4 Sheets-Sheet 1

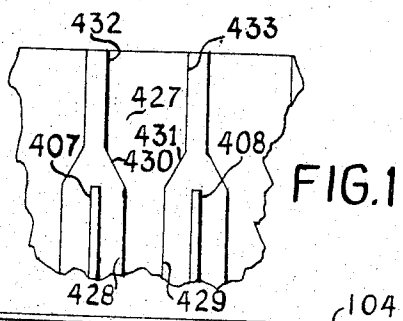


FIG. 1

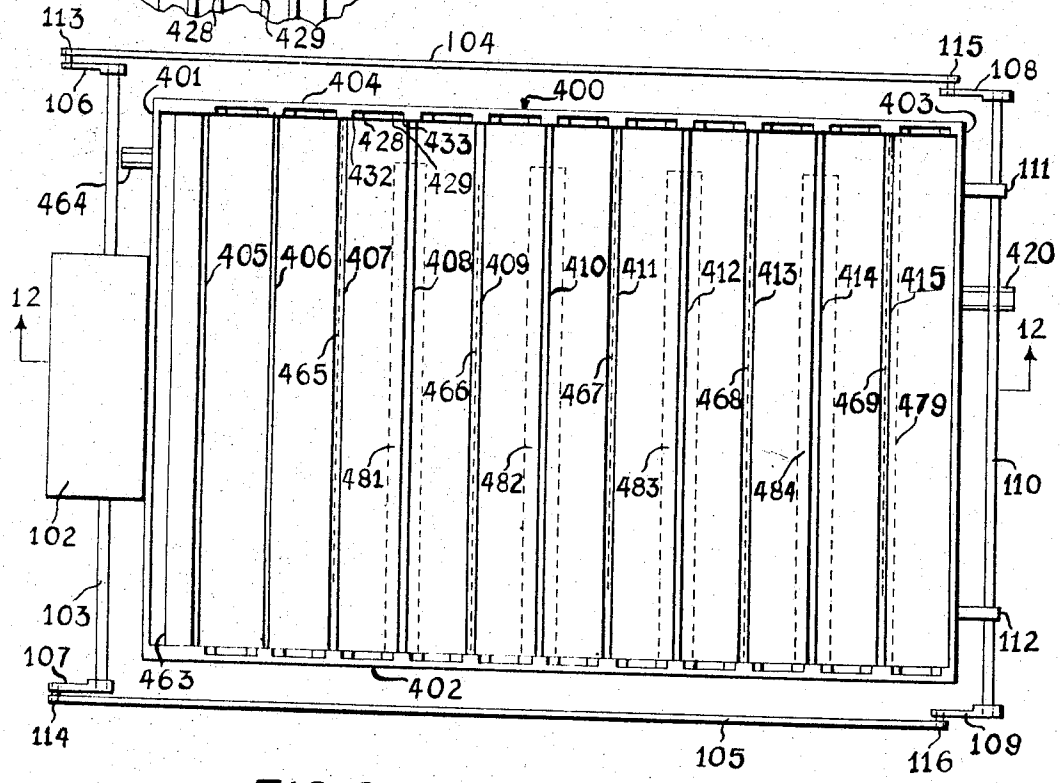


FIG. 2

INVENTOR.

BY Werner W. Buechner

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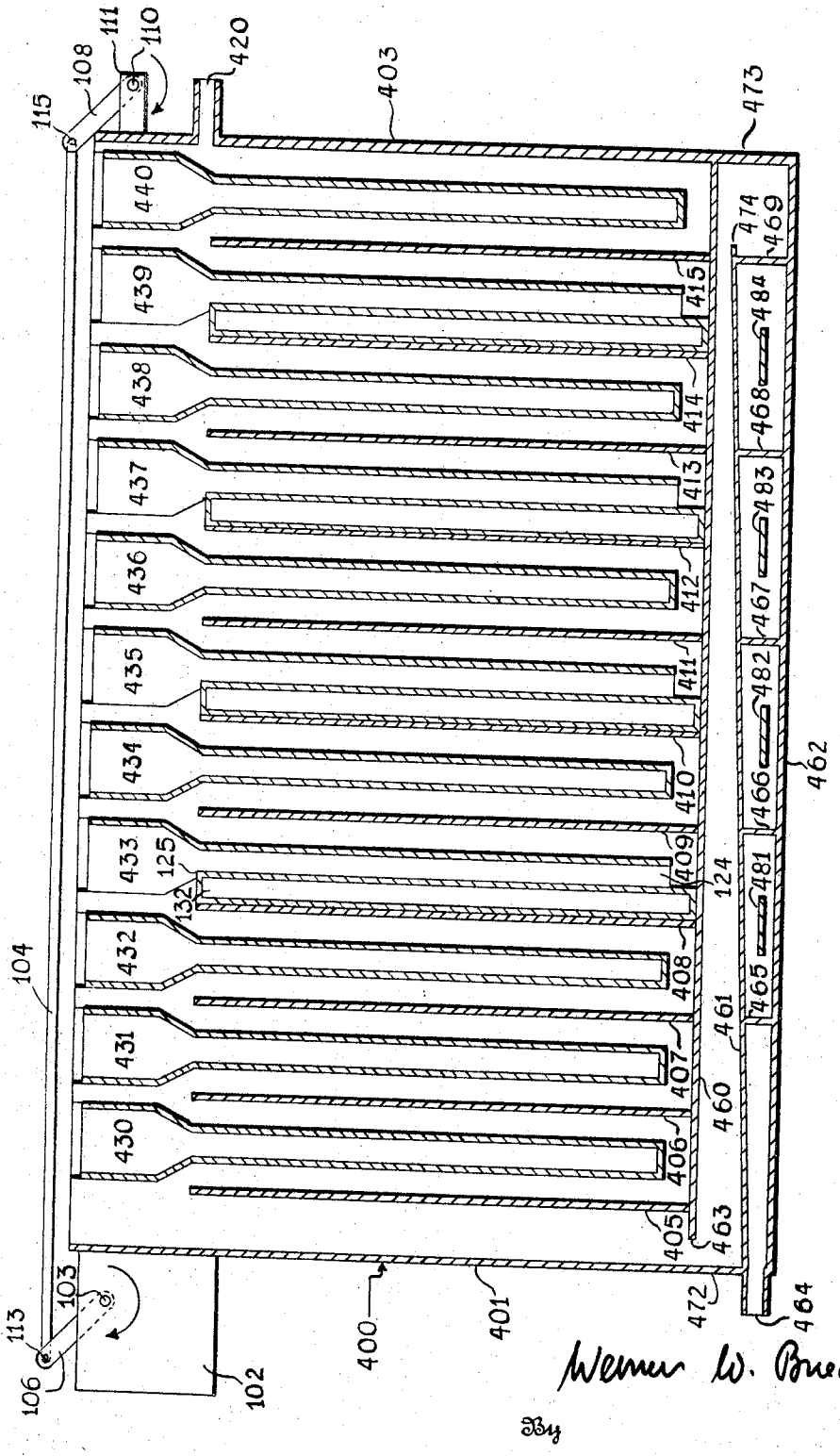


FIG. 3

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TEMPERATURE CONTROLLING PHOTOGRAPHIC BATH

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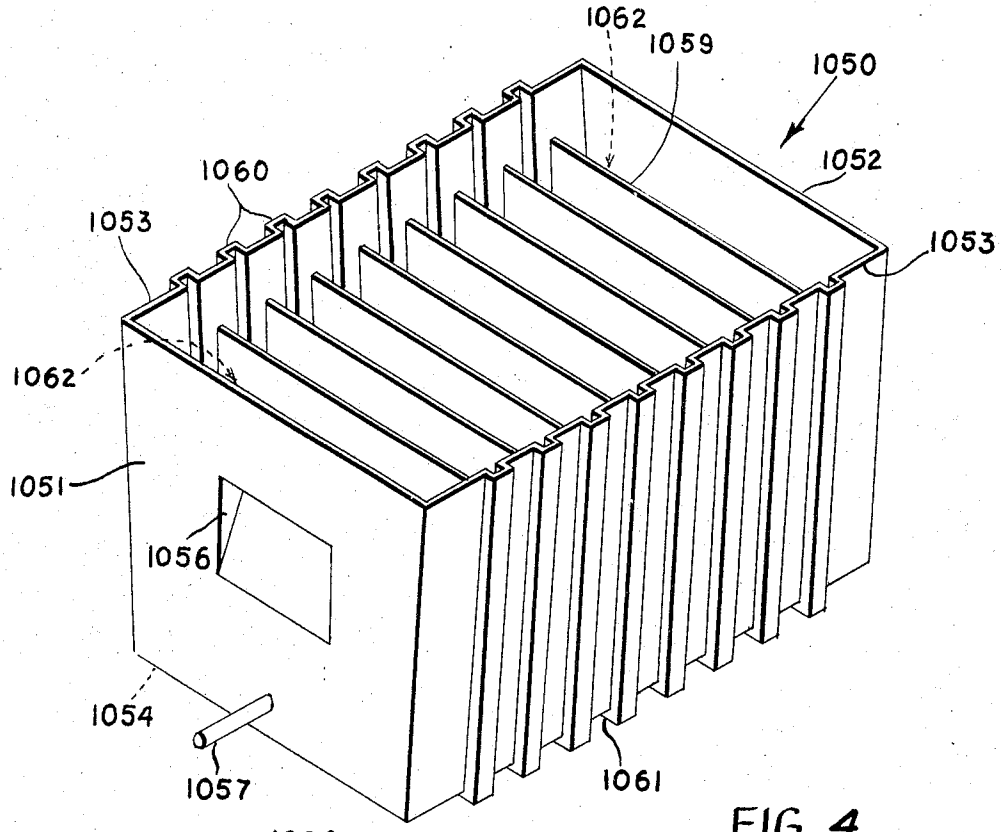


FIG. 4

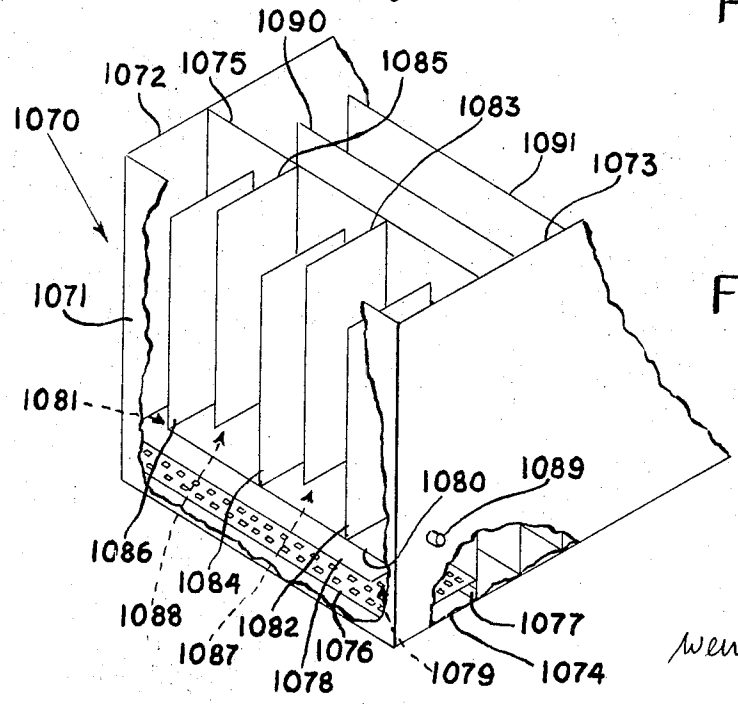


FIG. 5

INVENTOR.

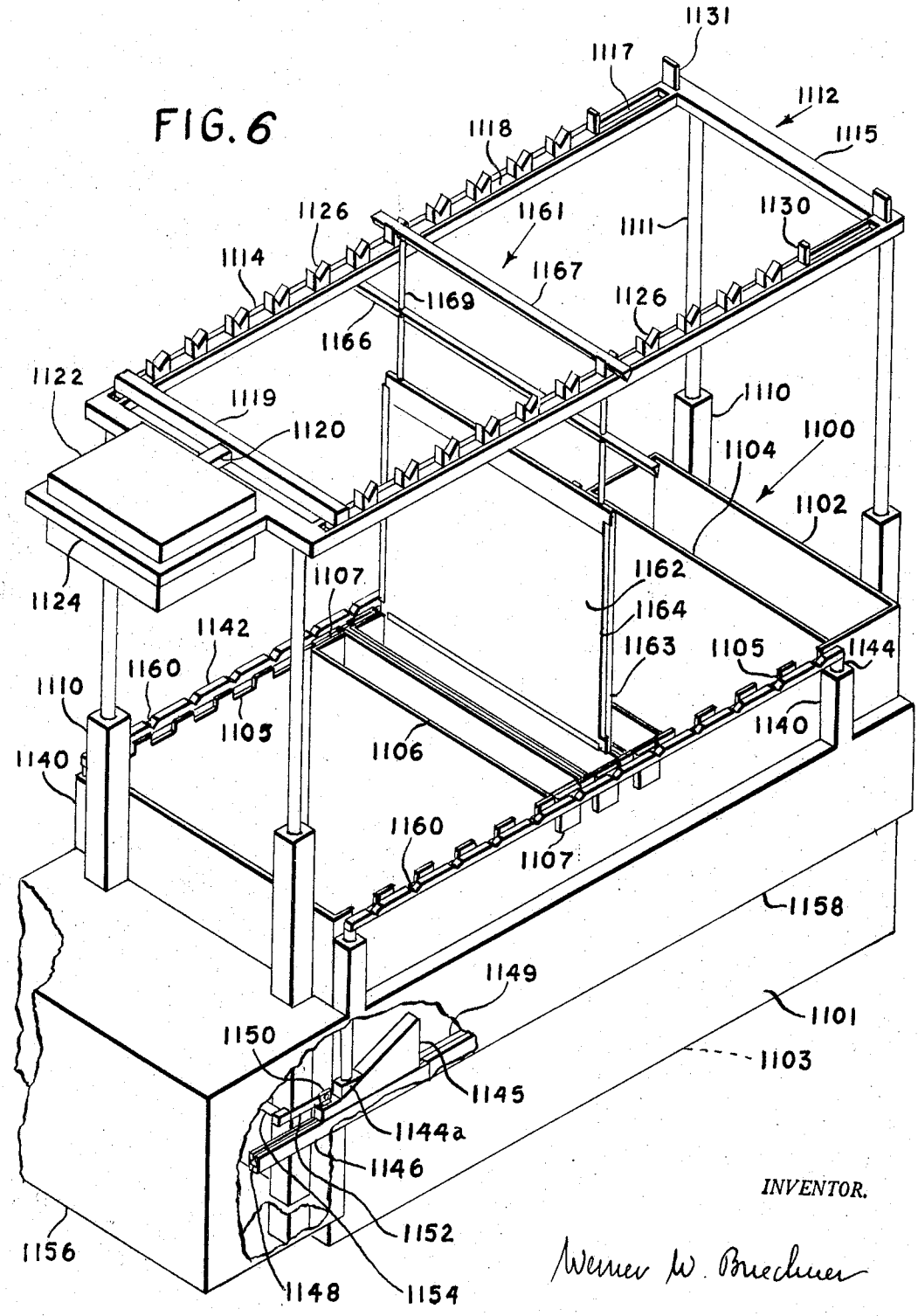
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TEMPERATURE CONTROLLING PHOTOGRAPHIC BATH

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FIG. 6



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United States Patent Office 3,349,688 Patented Oct. 31, 1967

3,349,688

TEMPERATURE CONTROLLING PHOTOGRAPHIC BATH

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Filed Feb. 3, 1964, Ser. No. 342,029
14 Claims. (Cl. 95—96)

This application is a continuation-in-part of my copending applications Ser. No. 52,524, filed Aug. 29, 1960, now Patent No. 3,236,649, and Ser. No. 23,313, filed Apr. 19, 1960, now Patent No. 3,124,051.

The present invention relates to a novel bath for use in photographic treating processes, and more particularly to a compartmented water bath and to a bath having means for the automatic forwarding of the photographic material to be treated.

It is an object of the present invention to provide a photographic bath, which is adapted to receive and hold a multiplicity of upright treating and/or washing vessels side by side in generally parallel relationship.

Another object of the invention is the provision of an improved photographic bath, which permits the maintenance of an essentially constant temperature in photographic treating media-containing receptacles.

It is still another object of the invention to provide a compartmented photographic bath, which permits the establishment of essentially liquid-tight seal between the side walls of the bath or compartment respectively, and the end walls of photographic treating and/or wash vessels when they are inserted therein.

Another object of the invention is the provision of a photographic bath, which provides automatic mechanical agitation for photographic material being treated in the bath or in a receptacle such as an upright treating and/or wash vessel contained in the bath.

Still another object of the invention is the provision of a photographic bath, which is designed to automatically forward photographic material from step to step and from treating receptacle to treating receptacle in a multistep treating process.

Other objects will become apparent, as the description of the invention proceeds.

The objects of the invention are achieved by the provision of a water bath, which comprises a trough-like receptacle having principally two side walls, two end walls and a bottom, which receptacle is subdivided into a multiplicity of compartments by at least one separatory wall, which separatory wall is joined in sealing relationship to the side walls and to the bottom of said receptacle, and which bath is adapted to receive in sealing relationship at least one photographic treating vessel, preferably an upright vessel, e.g., of the type described in my copending applications Ser. No. 342,198, filed Feb. 3, 1964, entitled "Photographic Treating Vessel" and Ser. No. 342,030, filed Feb. 3, 1964, entitled "Photographic Wash Vessel." The upright vessels to be used in the bath may be either treating vessels or wash vessels, or both kinds of vessels may be used at the same time. The bath may comprise only working compartments, or if desired, it may contain in addition one or more adjuvant compartments and/or auxiliary compartments. The photographic treating vessels are generally inserted in the working compartments, preferably not more than one in each working compartment. For the successful operation of the bath not all working compartments need be occupied by treating vessels.

The separatory wall or walls are advantageously integrated with or fixedly joined to the bath. If it is inserted removably, it is preferred to employ sealing means or other suitable means, so as to establish essentially liquid tight seal between the vertical edges of the separatory wall and the adjoining side wall and between the bottom edge of the separatory wall and the bottom section of said receptacle. The number of compartments provided in the bath of the invention may vary in wide limits. In certain specific embodiments of the bath, there may be only one working compartment. Generally, however, the bath of the invention comprises a multiplicity of compartments. Preferred is the bath, which contains a multiplicity of working compartments, advantageously three or more. The benefits of the invention are best realized with the bath, which contains a relatively large number of working compartments viz. more than six and advantageously more than eight up to twelve and for certain applications up to twenty. The bath comprising the larger number of compartments is more readily useful for the carrying out of the complex multistep color and other photographic processes having a very large number of individual steps.

The bath is beneficially provided with means such as an inlet and an outlet, which permit the passage of a unidirectional stream of water or other liquid media through the bath. For efficient operation of the bath the inlet is advantageously provided in one of the end walls of the bath and the outlet is provided in the opposite end wall. The inlet and/or outlet may also be provided in the bottom of the bath or be omitted altogether, if external means are used for each passage of the liquid medium.

If each compartment comprised in the bath is designed to receive a photographic treating vessel, it is desirable to set the water outlet in a high position in the said end wall, so as to keep the compartment adjoining said end wall filled to the intended height. A position of the water outlet approximately at the level of the upper horizontal edges of the separatory walls in the bath is preferred, because this position assures in most instances most efficient and trouble-free operation of the bath. The inlet, which may be located in a high or in a low position, as desired, is advantageously provided with a horizontal distributor, so as to assure even distribution of the flowing stream of water or other liquid medium over the width of the bath. The inlet, with or without the distributor, is advantageously connected into a first adjuvant compartment, which adjoins the end wall carrying the inlet and which precedes the first working compartment in the direction of travel of the stream of liquid medium passing through the bath. Heating means and, if desired, liquid mixing means, adapted to heat the stream of liquid medium to an essentially constant predetermined temperature, may with advantage be provided in said first adjuvant compartment or, if desired, in an additional second adjuvant compartment preceding the first working compartment and, if desired, the said first adjuvant compartment, if such is provided. The heating chamber containing said heating means and, if desired, said mixing means may with advantage be provided beneath the bottom of the water bath with an inlet at one end and its ouet communicatively connecting with the inlet of the bath. In this embodiment of the bath the outlet of the heating chamber and the inlet of the bath may be conveniently integrated and have the form of a horizontal slot provided in the bottom of the said first adjuvant compartment and extending across the bath. The heating chamber may also be provided as an independent external unit to be placed outside the bath or to be inserted in one of the adjuvant compartments.

At the side wall sections of the bath, forming part of the individual compartments, counter sealing means are provided at or in the side walls of each compartment of the bath. The counter sealing means may be male or female, depending on the nature of the cooperating sealing means provided in the photographic vessels to be used in the bath. Female counter sealing means in the compartments of the bath of the invention and male sealing means

in the vessel are generally preferred. The female counter sealing means in the compartments are advantageously provided at the side walls of each compartment along the vertical center line of each side wall of each compartment and may have the form of a groove or recessed channel, or they may be provided in form of suitable channel members on or at the inside of the side walls of each compartment, so as to form essentially vertical channels on both opposing side walls of each compartment. The grooves or channels provided in the bath or compartments, respectively, are advantageously lined with an elastomeric sealing material, if such matter is not provided on the cooperating male sealing means of the upright vessels for which the bath is designed. In order to assure ready exchangeability and the possibility of free rearrangement of the photographic vessels in the compartments of the bath it is preferred that the counter sealing means in all the compartments of a given bath are of identical size, shape and relation position. The term counter sealing means is not intended to encompass the side walls per se.

It is also of advantage, if certain bottom sealing types of wash vessels are to be used, to provide suitable horizontal counter sealing means along the bottom of each compartment such that upon insertion of the wash vessel into the compartment the horizontal sealing means, provided along the bottom side of the upright wash vessel engage with the said horizontal counter sealing means in the compartment, providing essentially liquid tight seal around the sides and bottom of the bath.

The establishment of good seal between the side walls of the compartments and the end walls of the vessels is greatly facilitated by giving the bath a trapezoidal transverse cross section with the base of the trapezoid at the top, which is achieved by slanting the side walls of the bath outwardly toward the top and extending the end walls and separatory walls correspondingly. The trapezoidal embodiment of the bath may incorporate any one or more of the various modifications and features described hereinbefore, particularly also the integral counter sealing means, adjuvant compartments, heating chambers and so forth.

Another embodiment of the bath of the present invention comprises means for automatic mechanical agitation of the photographic material to be treated in the vessels, when they are inserted in the individual compartments of the bath. This is conveniently achieved by the provision of mechanical agitating means comprising at least one, and preferably two horizontal agitator bars and means adapted to give said agitator bars a vertical reciprocating motion. The horizontal agitator bars are conveniently operated by a mechanical power source such as reciprocating linear actuators or an electric motor and associated mechanical means translating the rotational motion of the motor into a vertical reciprocatory motion of a predetermined stroke.

Another embodiment of the bath of the present invention is capable of fully automatic operation by the provision of automatic forwarding means. The preferred modification of the forwarding means comprises means which are adapted to lift the photographic material from any one of the upright vessels i.e. treating or wash-vessels or other receptacles wherein it is contained, thereafter forwarding it to a position above the following vessel and reinserting the material into said following vessel, or in the case of the last step in a treating series, to storage or drying means, respectively. The most preferred embodiment of the forwarding means comprises a base frame, supported by servo-cylinders or equivalent mechanical lifting means, and at least one horizontal forwarding bar or equivalent means, adapted to forward the photographic material between steps horizontally by a distance corresponding to the spacing of the vessels or other receptacles, wherein the treatment is to be carried out. The lifting and forwarding means may be actuated by hand or more conveniently by suitable power source, the operation of which

may be controlled by the operator or more conveniently by a program timer which is programmed for the specific process sequence to be carried out.

The fully automatic embodiment of the bath comprises advantageously also automatic agitating means, if the process to be carried out in the bath requires agitation. Any desired mode of agitation and means therefore, such as gas burst valves, ultrasonic power sources may be combined with the fully automatic embodiment of the bath. The most preferred embodiment of the fully automatic bath, however, comprises in addition to the said forwarding means automatic mechanical agitating means, preferably of the vertically reciprocating type.

As is readily apparent, the compartmented bath comprising counter sealing and/or supporting means for the upright vessels is most preferred for use with the automatic forwarding and/or agitating means and offers the greatest advantages in the automatic operation of the bath, especially also in combination with suitable inlet and outlet means for the unidirectional passage of a temperature conditioned medium. If this embodiment of the bath is controlled by a suitable program timer, the operator need pay virtually no attention to the progress of the treatment he wishes to carry out. The fully automatic bath comprises advantageously also a light tight hood, enclosing the bath and the agitating and forwarding means and permitting the use of light in the darkroom while the treatment proceeds undisturbed in the enclosed bath.

Further embodiments and modifications of the bath of the present invention together with associate devices useful in the bath are described in the following detailed description of the invention and illustrated in the accompanying drawings, wherein:

FIG. 1 is a detailed view of an upper portion of the inside of a side wall of the bath depicted in FIGS. 2 and 3 with female counter sealing means, designed to receive and localize the treating or wash vessel when it is inserted in the water bath.

FIG. 2 is a top plan view of a composite multivessel apparatus, comprising an embodiment of the bath of the present invention and containing upright vessels for the treatment of photographic sheet material in a multistep process.

FIG. 3 is a vertical section of the apparatus and bath of FIG. 2 taken along line 12.

FIG. 4 is an isometric view of another embodiment of the multicompartment bath of the invention.

FIG. 5 depicts a fragmentary isometric view of a modification of the bath comprising a multitude of heating chambers.

FIG. 6 is an isometric view in fully automatic embodiment of a bath comprising the automatic forwarding means of the present invention.

Prefatory to a detailed description of the bath of the invention and of its utility, some of the more important terms used herein will be explained in order to provide a better understanding of the nature of the invention and of its scope.

The term "sealing relationship" is intended to designate the condition that a photographic vessel is inserted in the bath or its compartments in such fashion, that essentially no flowing liquid medium passes between at least a greater portion of the end walls of the vessel or associated means provided at or close to the end walls of the vessel, and the juxtaposed portions of the side walls of the bath or compartments under the conditions normally encountered in the bath. The passage of a small portion of liquid between these components is not necessarily detrimental, and is included in the meaning of the term. Important is, that a barrier is set up, forcing at least the major portion of the flowing liquid medium to find its way underneath the treating vessel or through the wash vessel, as the case may be. Naturally, the better the seal, the more efficient is the operation. Thus, for the more

exacting processes, good seal, permitting less than 20 or 30 percent and preferably less than 10 percent of the streaming medium to pass through or by the interface between the vessels and the side walls of the bath or compartments, is preferred.

The term "working compartment" is intended to designate those compartments in the bath which are designed and adapted to receive at least one vessel or other containers for photographic treating media, such as upright treating and/or wash vessels. The working compartments in a bath are generally numbered in the direction of the flow of the stream of water. The working compartment number one is accordingly the working compartment through which the incoming stream of water passes first. Compartments, which are provided in the bath for functions other than working compartment functions are designated herein as adjuvant compartments. The latter may precede the working compartments, i.e. be located upstream of the working compartments, or they may be interspersed and/or provided downstream of the working compartments as may be desired. The adjuvant compartments are not included in the numbering of the working compartments.

The term "adjuvant compartment" is reserved for those compartments which are not intended to receive a photographic vessel but which are communicatively connected to the working compartments, and which form part of the vertical flow pattern of the stream of liquid medium passing through the bath when it is operated. Compartments which are neither working compartments nor adjuvant compartments by the above definition are called herein "auxiliary compartments."

The term "side walls" is used uniformly and designates with respect to the bath the generally vertical walls which are generally perpendicular to the separatory walls. They are usually the longest generally vertical walls in the bath. The sections of the side walls of the bath forming part of a compartment are likewise called "side walls" even though they are generally the shorter generally vertical walls in the compartment of the bath.

The terms "sealing means," horizontal sealing means," "vertical sealing means" and other terms used herein are explained and defined in my copending patent application Ser. No. 350,612, filed Mar. 9, 1964, to which special reference is made herewith. With respect to the remaining terminology special reference is made to my Patent No. 3,236,649.

A composite apparatus comprising the bath of the invention and utilizing the treating vessels and the corresponding washing vessels, wherein a stream of temperature conditioned water serves the two functions of maintaining the desired temperature in a series of processing vessels and serving also the function of the wash water in one or more washing steps is exemplified in FIGS. 2 and 3 of the accompanying drawings. FIG. 2 is a top plan view of photographic treating apparatus **400** which is designed and adapted to accommodate an eleven step photographic treating process such as Kodak's Ektacolor Positive Paper Printing Process as it is presently recommended by this company. The rectangular bath comprises two shorter vertical end walls **401** and **403** and longer vertical side walls **402** and **404**, which form with the bottom **460** the rectangular water bath. The water bath is subdivided into eleven individual rectangular compartments of equal size, which are defined by the dividing wall sections **405**, **406**, **407**, **408**, **409**, **410**, **411**, **412**, **413**, **414**, **415** and side wall section **403**, respectively, two each of these sections being coordinated with corresponding portions of side walls **402** and **404** and of bottom plate **460**, to which the divider walls are joined. Each of the oblong rectangular cells or compartments is open at the top and comprises principally a pair of longer separatory walls and a pair of shorter vertical side walls and a bottom. The coordinated walls of equal lengths are parallel to each other and join the neighboring wall at a right angle. An additional adjuvant cell or compartment is formed at the left by side wall **401**, divider wall **405** and corresponding portions of the walls **402** and **404**, and a portion of bottom **460**. This compartment is likewise open at the top and communicates with the heating zone below through rectangular slot **463**. All divider sections or separatory walls are of equal height or substantially so and terminate at a level below the upper edge of the water bath. Into each of the working compartments may be removably inserted a treating vessel or a wash vessel to provide any desired arrangement.

In FIG. 3 are shown closed treating vessels **430**, **431**, **432**, **434**, **436**, **438** and **440** of a kind, depicted in FIGS. 1 and 2 of my Patent No. 3,236,649, and wash vessels **433**, **435**, **437** and **439** of a type and kind as shown in FIGS. 3 and 4 of the just mentioned patent. The vessels have been inserted in a number and order to accommodate all the steps of the Kodak Ektacolor Positive Paper Printing Process in the sequence the steps are to be carried out.

To facilitate insertion and removal of the treating and wash vessels into the water bath and to insure proper seal and centering and fixed positioning when inserted, the opposing side wall portions in each cell are provided with a recessed area or indenture, following the contours of the inserted vessel as is shown, for instance, in FIG. 1 and in FIG. 2 of the accompanying drawings. Divider walls **407** and **407** are part of a cell or compartment. The recessed area or indenture is defined by edges **428** and **429**, which are parallel to each other and extend downwardly close to the bottom of the bath and which continue upward in the slanting edges **430** and **431** and parallel edges **432** and **433**. The dimensions, angles and extensions of the recessed area **427** correspond to those of the treating and/or wash vessels to permit their insertion with close fit. As can be seen, either a closed treating vessel or a wash vessel may interchangeably be inserted into each pair of recessions or intentures provided in each cell or compartment. The apparatus thus provides for flexibility in the order in which the two kinds of vessels are arranged in the bath.

As is readily apparent, the provision of a heating chamber under the bottom of the bath does not only assist in the maintenance of an accurate temperature in the bath but provides also the possibility of placing the just described conduit for the drainage of the compartments.

The heating chamber in the bath illustrated in FIGURES 2 and 3 of the accompanying drawings is defined by horizontal bottom **462**, shorter vertical side wall sections **472** and **473**, longer vertical front and rear wall sections (not shown) and the bottom **460** of the bath. The heating chamber thus formed is divided by slanting baffle **461** into two distinct, edge-shaped compartments which are connected with each other by slot-like aperture **474**. The lower compartment has at the left-hand side inlet **464** and is subdivided by baffles **465**, **466**, **467**, **468** and **469** into six distinct cells, which are interconnected by rectangular openings provided in alternating fashion between the front and rear wall sections respectively and the free ends of each of the baffles. The baffles, being shorter than the wall sections **472** and **473** are alternatingly joined to the longer rear wall sections and to the front wall sections, respectively, as is indicated by broken lines **465**, **466**, **467** and **468** and **469** in FIGURE 2. This arrangement of baffles and correlating openings converts the lower compartment into a passageway following a zig-zag pattern. Each of the central four cells, making up the central portion of said passageway contains one of the heating elements **481**, **482**, **483** and **484**. The upper wedge-shaped compartment of the heating chamber has on the left-hand side an outlet formed by rectangular aperture **463** in the bottom **460** of the water bath.

The stream of water, entering through the inlet **464** at the left, passes over the heating elements **481**, **482**, **483** and **484** in this order, as it flows along the passageway making up the lower compartment. It is thereby heated to the desired temperature as has been described in detail hereinbefore. Leaving the lower compartment through rectangular aperture **474** at the right, the water reverses its general direction of flow and passes through the upper compartment which it leaves through slot-like aperture **463** to serve as the temperature conditioning medium in the water bath. This design and arrangement of the composite apparatus provides a streaming layer of temperature conditioned water underneath the bottom of the water bath, thus assisting in the maintenance of an accurate, even temperature in the water bath.

The stream of temperature conditioned water coming from the heating chamber below the water bath and entering the left rectangular compartment through aperture or inlet **463**, rises in this compartment to the level determined by the upper edge of divider section **406** into the compartment containing vessel **430**, which it underflows, rising on the right side of the vessel, flowing over divider **406** into the next compartment containing vessel **431**, and from there into the cell containing vessel **432**. Thereafter, the water stream flows over box-like body **132** and edge **125** of the wash vessel **433**, which it leaves through bottom opening **124** to rise upward in the right open section of the compartment, which it leaves by flowing over the upper edge of divider section **409** and so forth until it has passed all compartments, leaving the water bath through outlet **420**.

As has been pointed out, the water bath may also be designed without the integral heating chamber shown in FIGS. 2 and 3, and the temperature conditioned water may be taken from any desired source including a separate heating chamber, water mixing valve and so forth.

If desired, the actuation of the carrier means for the photographic material may be made automatic for instance, by the utilization of a motor in combination with mechanical means, known per se, which means translate the rotational motion of the motor into a reciprocating vertical motion. In either the manual or the automatic actuation, a stroke of one centimeter or less to 10 cm. or more, depending on the size of the sheet, the dimensions of the vessel and the nature of the treatment, will generally be satisfactory. A stroke in the range from about 2 cm. to 6 cm. was found in most cases to give, in combination with the stirring action caused by the special design of the carrier, most satisfactory turbulence to produce excellent, reproducible results.

An embodiment of the automatic actuation, which was found to be particularly beneficial in the multistep treatment in a multiplicity of upright vessels is shown in FIGURES 2 and 3. Motor **102** provided at the upper left wall of the apparatus drives shaft **103** to the ends of which are fixedly joined cranks **106** and **107**. One end each of bars **104** and **105** is rotatably connected to the free ends of the cranks over crank pins **1113** and **114**. The ends of bars **104** and **105** on the right and are movably connected to the free end of cranks **108** and **109**.

Operation of the motor and actuation device as described hereinbefore with respect to the composite apparatus provides automatic reciprocation of the support within each of the treating or wash vessels wherein it is contained. In carrying out any multistep treating process it is thus only necessary for the operator to forward the support with the sheet secured thereon from vessel to vessel at predetermined time intervals. Thus, the expedient of providing automatic actuation, as described hereinbefore, does not only simplify the processing of the photographic sheet material but provides also the utmost in reproducibility from sheet to sheet and from day to day, eliminating a source of inconsistency which is always present in the uncontrolled tray method.

Instead of having the carrier or support, containing the photographic sheet or sheets to be treated, forwarded by the operator by hand one may provide automatic forwarding means as will be described hereinafter in more detail. The device incorporating these principles may be controlled and actuated by the multistep timer such as that described in detail in my copending application Ser. No. 302,902 filed Aug. 19, 1963.

The operation of the composite apparatus comprising the bath of the present invention comes readily to mind from the foregoing description of the apparatus and the various auxiliary devices and means, and is described in detail in my Patent No. 3,236,649.

The simplicity of the arrangement, utilizing the bath of the invention, reduces the complex eleven step color positive printing process to a semi-automatic easy procedure, enabling even the little experienced or the unexperienced amateur to attempt the heretofore difficult color developing processes with satisfactory results.

The water bath described hereinbefore has a rectangular vertical cross section, taken parallel to the end walls. In a more preferred embodiment of the bath of the invention, the vertical cross section represents a reversed trapezoid with its base or longer parallel side on top. This embodiment of the bath is particularly adapted to be used with the trapezoidal type of upright vessels or with upright vessels, having slanting sealing means, forming together with the vessel also a reversed trapezoid, as they are described and claimed in my copending application Ser. No. 342,198 filed Feb. 3, 1964.

As is readily apparent, the trapezoidal water bath has the additional advantage that perfect seal may be more readily achieved between the side walls of the bath or compartment and the end walls of the upright treating and wash vessels when they are inserted and counter sealing means are provided in or at the bath walls. If the said cooperating counter sealing means are used, satisfactory seal may be readily achieved, even if close tolerances are not observed in the manufacture of the bath and of the vessels. This permits the use of less costly construction materials and methods, permitting the production of the trapezoidal water bath by economical mass production methods.

Referring to FIG. 4 trapezoidal bath **1050** comprises trapezoidal end walls **1051** and **1052**, side walls **1053** and bottom **1054**. In end walls **1051** and **1052** are provided indentures **1056**, which serve as handles for lifting the bath. Close to the bottom edge of end wall **1051** is tubular inlet **1057**. In end wall **1052** is provided tubular outlet (not shown) at a position close to the bottom of the bath. The bath is subdivided into a multiplicity of compartments by vertical transverse, separately walls **1059**, each of which is joined to the bottom **1054** and to the side walls **1053** of the bath. At both ends of the bath are adjuvant compartments and interposed there between eight working compartments. Along the center of the side walls of each working compartment, thus formed, are provided in generally vertical orientation grooves **1060**, which serve as the counter sealing means for the insertion of an upright treating or wash vessel, having suitably shaped and dimensioned cooperating sealing means at their end walls, so as to provide essentially liquid tight seal between the ends of the vessel and the sides of the bath or compartment, respectively. Along the bottom of each working compartment are centrally provided horizontal grooves **1061** which serve as the horizontal sealing means provided at the bottom end of some of the wash vessels, which may be used with the bath of the present invention and which are described and claimed in my copending application Ser. No. 342,030 filed Feb. 3, 1964.

As is readily apparent, the provision of the closely

spaced grooves in the side walls and bottom of the vessel in itself provides greater dimensional stability to the bath, permitting the use of more economical construction materials which derive their impact strength from a certain degree of flexibility. If the separatory walls are permanently joined rather than removably, the structural strength and rigidity of the bath is still better and may be excellent even with the most inexpensive construction materials such as polyethylene or polypropylene.

The adjuvant compartments **1062** comprising the end walls **1051** and **1052**, respectively, of the bath and the vicinary separatory walls **1062**, are narrower than the working compartments and are not adapted to receive an upright treating or wash vessel. It is to be noted that the separatory walls **1059** terminate at a height substantially below the top edge of the water bath. The adjuvant compartments contain indentures **1056** and serve as conduit for the incoming and outgoing stream of treating medium. When treating vessels are inserted in the working compartments, a stream of liquid medium, such as water or temperature conditioned water entering through inlet **1057** rises up in the adjuvant compartment at the left, overflows the first separatory wall, flows downwardly in the first working compartment, underflows the first treating vessel, flows upwardly on the far side of the treating vessel, overflows the next separatory wall to flow downwardly in the next working compartment, underflowing the next vessel and so forth, until it overflows the last separatory wall and through the adjuvant compartment at the right, where it leaves the bath through the outlet. If any one or more of the treating vessels are substituted by wash vessels, the flow pattern, which is an essentially vertical flow pattern, is still maintained except that either the down stream or the up stream in each working compartment containing a wash vessel, passes through the wash vessel itself.

In a further modification of the bath of the invention, the bottom edge of the outlet in end wall **1052** is advantageously set at least about one eighth of an inch higher than the top edge of the separatory walls, so that the level of the water or other liquid medium in the bath, when it flows through inlet **1057** and passes through the bath, stands in the bath by at least one eighth of an inch above the top edge of each of the separatory walls. This expedient assures, with the treating and wash vessels inserted, that the water or other liquid medium is flowing over the whole width of the separatory walls, even if the bath is not exactly level, preventing the formation of dead spots or pockets, which could result in less than perfect temperature control or washing action, respectively. The same beneficial effect may also be achieved by extending the height of the last separatory wall, adjoining the downstream adjuvant compartment, slightly, so that its upper horizontal edge lies somewhat higher than those of the other separatory walls in the bath. Independently thereof, it is desirable that the water bath of the invention is placed as level as is possible. This is facilitated by the provision of horizontal lines or other marks at the inside of the walls of the bath or compartments, respectively, indicating the proper water level. If the water level stands above one of the lines or marks on one side of the bath and below the correlated line on the other side of the bath, the position of the bath may simply be changed until the water level coincides essentially with the marks or lines on both sides of the bath.

The grooves in the individual compartments of the just described embodiment of the water bath may have any other desired shape. Their cross section may be round, oval, wedge-shaped or have any other irregular configuration. They may also be tapering off toward the bottom of the compartment or they may be slightly curved in the direction toward the interior of the compartment. Advantageously, the grooves or other female counter sealing means terminate at a level somewhat above the bottom of the compartment, so as to form at the lower end a seat for the vessel or its sealing means in order to hold the vessel at least slightly above the bottom of the compartment, providing the required underflow passage for the flowing stream of water. However, this requirement applies only, if the bath or the vessel itself does not have spacers or other means, assuring the positioning of the bottom of the treating vessels at the proper height. Such spacers may be provided in form of an extension of the male sealing means at both sides of the vessel to a position, slightly below the bottom of the vessel by a distance equalling that of the desired height of the underflow. Depending on the stiffness and design of the sealing means, such additional spacing or sealing means may in many instances not be needed at all, since the trapezoidal design of the bath in itself controls the depth of insertion of the vessels.

The female counter sealing means, such as grooves or channels, provided in the side walls of the compartment, may be lined with a profiled elastomeric sealing material adapted to receive the cooperating sealing means provided at the treating or wash vessel. Alternatively, male counter sealing means, such as vertical ribs, may be substituted for the grooves or channels, if the bath is to be used with vessels, having cooperating female sealing means such as grooves or channels, adapted to cooperate with the male or rib-like counter sealing means in the bath.

It was found that still better performance of the water bath of the invention can be achieved, if the water enters the first adjuvant compartment through a suitable distributor instead through the simple inlet tube **1057**. The use of the distributor produces more even spread of the flow pattern and avoids the formation of dead pockets in the bath or in any of the compartments, respectively.

Any desired distributor, which serves this purpose may be used. A simple embodiment thereof comprises a flat trough, extending across the end wall at a level high enough such that its upper edge is above the normal water or liquid level in the bath. The inlet is communicatingly connected to the interior of said trough. When the water or liquid medium enters and fills the trough, it overflows over the edge, preferably directly into the first working compartment producing an even stream of liquid medium, such as temperature conditioned water, spread over essentially the whole width of the bath.

Another embodiment of the distributor comprises a perforated tube, which is closed at both ends and which extends horizontally across the bath, preferably parallel to the end wall. The inlet is communicatingly connected to the distributor tube, preferably somewhere in its center. Though the tube may be placed in any desired height at the end wall, it is advantageously located close to the bottom of the first adjuvant compartment, or at or close to the top of the first working compartment, if no adjuvant compartment is used. The perforations are advantageously arranged in a single or double row. For still better distribution, the size of the perforations such as holes, may be varied with the smallest perforations or holes in the center of the inlet connection and the largest at the outer ends of the tube, and with the area of the perforations or holes increasing proportionately as the water pressure decreases at the respective locations. Any other distributor serving the purpose may be used with equal advantage. The adjuvant compartments may, as stated, also be omitted in some modifications of the bath of the invention. This applies particularly to the terminal adjuvant compartment, i.e. the one having the water outlet. By proper design and positioning of the water outlet equally good performance may be achieved, if no terminal adjuvant compartment is used.

The water inlet and outlet may have any other desired form. The outlet may, for instance, have the form of a horizontal slot provided in the end wall **1052**, emptying if desired, into a horizontal conduit, joined to the outside of end wall **1052**. The inlet may be omitted if desired, if the stream of flowing medium is directly introduced into

the first adjuvant or first working compartment e.g. by tubing or other conduit coming in from overhead.

Instead of providing the heating chamber at the bottom of the bath, as shown for example, in FIGS. 2 and 3 of the accompanying drawings, the heating chamber may also be provided directly in the bath, conveniently in an adjuvant compartment. Depending on the design, size and number of the heating elements, the adjuvant compartment may directly serve as the heating chamber into which the heating elements are simply inserted. Or more beneficially, the adjuvant compartment is subdivided, so as to form a heating chamber, comprising a multiplicity of communicatively interconnecting cells and containing one or more heating elements.

An embodiment of the bath of the invention, containing a heating chamber arrangement in the first adjuvant compartment, is illustrated in FIG. 5. Water bath **1070** comprises end walls **1071**, side walls **1072** and **1073** and bottom **1074**. The first adjuvant compartment, formed by end wall **1071**, vertical divider wall **1075** and sections of the side walls **1072** and **1073** and of the bottom **1074**, is subdivided into a number of vertical and horizontal cells. The lowermost horizontal cell is formed by perforated horizontal separator **1076**, which extends between and is joined to the vertical end wall **1071**, divider wall **1075** and the adjoining sections of side walls **1072** and **1073**. The narrow horizontal cell, thus formed, communicates with the neighboring adjuvant compartment number two by a narrow horizontal slot **1077**, said slot extending between the side walls **1072** and **1073** close to the bottom **1074** of the bath. The perforations in separator **1076** increase in size, as they are further removed from side wall **1073** and from passageway **1079**, so as to equalize the passage of water through the perforations over the whole length of the separatory wall in accordance with the pressure drop.

Another horizontal cell is formed above the just described horizontal cell by horizontal separator **1078**, which is joined to end wall **1071**, divider wall **1075** and a section of side wall **1072**, leaving horizontal passageway **1079** at the right next to side wall **1073**.

The next horizontal cell is formed by separator **1080**, which extends between and is joined to side wall **1073**, end wall **1071** and vertical divider wall **1075**, leaving horizontal passageway **1081** at the left next to side wall **1072**. The upper portion of the compartment situated above the just described horizontal cells is subdivided into vertical cells by vertical separators **1082**, **1084** and **1086**, which extend between and are joined to end wall **1071**, divider wall **1075** and to horizontal separator **1080**, and which terminate at a height substantially below the top edges of the said first adjuvant compartment, in which they are contained, so as to provide an overflow or upper passageway for the flowing stream of water. The vertical cells are further formed by vertical separators **1083** and **1085**, which are interposed between the said three vertical separators and which extend between and are joined to end wall **1071** and divider wall **1075**. The latter group of separator walls is positioned with their upper edges at a height about the same as the top edges of the said first adjuvant compartment and terminating with their bottom ends at a level above the horizontal separator **1080**, so as to leave passageway **1087** and **1088** between their lower edges and separator **1080**. The cell at the left, located next to side wall **1072** has no bottom and opens directly into the underlying horizontal cell by passageway **1081**. Inlet **1089** is set in side wall **1073**, so as to communicate with the vertical cell located on the right next to side wall **1073**. The said vertical cells are dimensioned so as to accommodate suitable heating means, such as electric immersion heaters.

For the operation of this embodiment of the water bath an electric submersion heater, controlled by suitable switching means or heat exchange tubing or other suitable heating means, is inserted into at least one or preferably into each of the vertical cells, The inlet **1089** is connected to a source of tap water, having a constant temperature lower than that desired for the photographic treatment, to be carried out in the vessels to be inserted into the water bath. The stream of water enters the first vertical cell at the far right, flows upwardly over the upper edge of separatory wall **1082**, down in the next cell, underflowing separatory wall **1083** through passageway **1087**, up in the next cell overflowing separatory wall **1084** and so forth, until it enters through passage **1081** the uppermost horizontal cell, from where it flows through passageway **1079** into the underlying horizontal cell, and from there through the perforations into the lowermost horizontal cell, and from there through slot **1077** into the second adjuvant compartment, where it flows upwardly, overflowing vertical separatory wall **1090** into the first working compartment, formed by separatory walls **1090** and **1091**, sections of side walls **1072** and **1073** and bottom **1074**. On its way through the said vertical cells, the water takes up the heat energy provided by the heating means contained therein, so as to reach the desired temperature. The change of direction serves to further mix the water, so that it flows in form of a layer of uniformly temperature conditioned medium through slot **1077** and through the compartments containing the treating and washing vessels.

The number, arrangement, shape and size of the cells, making up the first compartment, may be modified so as to establish any other desired flow pattern of the stream of water, as long as these modifications serve the objective of producing a stream of uniformly temperature conditioned water flowing evenly over the whole width of the bath. The method, principles and means for the provision of a temperature conditioned stream of water or other liquid medium is described and claimed in my copending application Ser. No. 342,197 filed Feb. 3, 1964. The concepts and principles explained therein may be employed with advantage in the operation of the bath of the present invention.

A preferred embodiment of the fully automatic bath of the invention, comprising means for automatic agitation of the photographic material to be treated and means for automatic forwarding of the photographic material from step to step through the treating and wash vessels contained in the bath, is illustrated in FIG. 6 of the accompanying drawings. Water bath **1100** comprises a receptacle comprising principally side walls **1101**, end walls **1102**, bottom **1103** and vertical divider wall **1104**. Divider wall **1104** divides the receptacle into a working compartment, adapted to receive upright treating vessels, and an auxiliary compartment at the far end which is usually smaller than the working compartment, and which may serve for the storage of the treated photographic material. The side walls **1101** of the working compartment are provided along their upper edges with depressions **1105** of equal size and shape and even spacing. Three upright treating vessels **1106** are shown inserted in the working compartment side by side. The vessels **1106** carry at the upper ends of their end walls clasps **1107**, which are adapted to slideably fit into said depressions **1105**, with their vertical section extending downwardly along the outside of the side walls **1101** of the bath, when the vessels are inserted in the working compartment. The just described arrangement of evenly spaced depressions in the top edges of the side walls of the working compartment and the cooperating clasps at the treating vessels assures that the vessels are securely held in place and located in a predetermined relative position in the working compartment. This is, as will be explained hereinafter, of paramount importance for the operation of the fully automatic bath of the present invention.

To the end walls **1102** of the bath are vertically joined servo-cylinders **1110** with retractable plungers **1111**. The servo-cylinders have a stroke somewhat larger than the depth of insertion of the carrier means for the photo-

graphic sheet, measured from the top edge of the vessel to the bottom edge of the said carrier, when it is inserted in the vessel in the deepest position. The servo-cylinders are connected to hydraulic means (not shown) which provide the hydraulic pressure for all four cylinders, so as to simultaneously and evenly operate all four cylinders at the same time.

The free top ends of the plungers **1111** are joined to the corner sections of rectangular base frame **1112**, comprising side members **1114** and end members **1115**. Each side member **1114** has in its top portion a groove-like depression **1117**, extending nearly over the full length of said side members **1114**. In depressions **1117** are slideably mounted horizontal forwarding bars **1118**, having a length substantially less than said depressions **1117**, so that they are held in said depression and are capable of being horizontally reciprocated in the said depressions by a stroke length corresponding at least to the lengthwise spacing, measured from center to center of the treating vessels, when they are inserted in the bath, or of the depressions **1105** in the top edge of the side walls **1101** of the working compartment, respectively. The ends of forwarding bars **1118** at the left, are joined to cross bar **1119**, which rigidly connects the two forwarding bars to form a forwarding unit. Cross bar **119** is joined to stroke rod **1120** of linear actuator **1122**, which is mounted at the left and member **1115** of base frame **1112** by frame extensions **1124**. The stroke of linear actuator **1122** equals exactly the spacing of the vessels, measured from center to center.

To the top side of forwarding bars **1118** are mounted prismatic forward seats **1026**, each seat having at its top a triangular or wedge-shaped indenture, running in a direction perpendicularly to the side walls of the bath and essentially parallel to the cross bar **1119**. Forwarding seats **1026** are arranged in pairs, one each on each forwarding bar, and evenly spaced on their respective forwarding bars by a distance equalling the distance measured from center to center of the treating vessels when they are inserted. Forwarding seats **1126** are furthermore mounted such, that when stroke rod **1120** and thus forwarding bars **1118** are in the fully retracted position i.e. in the starting position as shown, each pair of forwarding seats is located above one of the vessels with the apex of the wedge-like indenture located exactly over the center lines of the coordinated vessels. Thus, the first pair of forwarding seats at the far left is in the retracted position of the forwarding unit located exactly above vessel number one, i.e., the vessel to be inserted at the left end of the working compartment (not shown). The second pair of seats is located exactly above vessel number two and so forth. The only exception as to location and spacing is found from this rule in the pair of prisms **1130**, mounted at the far ends of the forwarding bars **1118** and coordinated to the last vessel at the far right (not shown). Prisms **1130** are mounted on the respective forwarding bars somewhat off-set to the left, so that the far vertical side of the prism is located somewhat to the left of the extended vertical center plane of the number twelve vessel. Close to the far ends of the side members **1118** of base frame **1112** are mounted prismatic stops **1131**.

The automatic bath illustrated in FIG. 6 comprises furthermore a preferred embodiment of the vertically actuated automatic mechanical agitating means. Sleeves **1140** comprising a longitudinal central bore are vertically joined to the outside of the side walls **1101**, so that they are located opposite the four corners of the working compartments. Horizontal agitator bars **1142**, extending over the whole length of the working compartments, are slideably set in sleeves **1140**. To the lower ends of rods **1144** are joined wedge-like shoes **1144***a*, which rest with their slated bottom side on the slanted top side of sliding wedges **1145**. The angles of slant or of the slope of shoe **1144***a* and of wedge **1145** are essentially identical. Wedges **1145** are slideably set into guide rails **1146**, which in turn are joined to the side walls of the bath. The wedges **1145** are slideably held on guide rail **1146** by a reversed T-shaped bottom section, which is slideably set in reversed T-groove **1148**. The pair of wedges **1145** located at each of the side walls **1101** is connected by rods **1149**, so as to form a unit. The wedges **1145** at the left end of the bath are movably interconnected over joint **1150**, horizontal lever **1152** and horizontal rod **1154**. Horizontal rod **1154** joined to the levers **1152** on both sides of the bath are connected to a reciprocating power source (not shown) and contained in housing **1156**, so as to give levers **1152** and wedges **1145** a reciprocating motion when the power source is actuated. The wedge arrangements on both sides of the bath are enclosed in housings **1158**.

Agitator bars **1142** are provided at their top sides with wedge-like, triangular indentures **1160**, which are arranged in pairs, one each on each bar **1142** and which correspond in number and spacing exactly to those of the vessels, when they are inserted in the bath, such that the apex of each pair of coordinated triangular indentures **1160** is located exactly in the vertical center plane of each of the vessels, when they are inserted in the bath.

On the number seven pair of forwarding seats **1126** is shown suspended a carrier **1161** with a photographic sheet **1162** contained thereon. The carrier **1161** comprises backrest **1163** and channel members **1164** on both vertical edges and at the bottom edge of backrest **1163**, forming grooves in which the corresponding edges of sheet **1162** are supported. The carrier **1161** comprises furthermore trinagular bar-like agitating support **1166** and forwarding support **1167**, which are joined to the backrest over vertical rods **1169**. The spacing of the agitating and forwarding supports from each other is such, that the vertical distance between the lower edges of the forwarding and agitating bars is essentially larger than the distance between the apex of the indentures **1160** in the agitator bars **1142**, when they are in their lowermost position, and the apex of seats **1126** on forwarding bars **1118**, when the base frame **1114** is lowered to its lowest resting position. By this expedient the forwarding support **1167** is free from forwarding seats **1126** when agitating support **1166** rests on the agitator bar **1142** as the result of the lowering of base frame **1114** to its low rest position, permitting the free horizontal movement of the forwarding bar **1118**, regardless of the position of the agitator bars **1142**.

For the operation of the automatic forwarding means, the electrical control of the central source of hydraulic pressure is conductively connected, advantageously over a relay, to the electric circuit of a program timer, adapted to control the process to be carried out in the bath. A suitable program timer has been described and claimed in my copending application Ser. No. 302,902 filed Aug. 19, 1963. The electrical control of the linear actuator is connected to a delayed time switch (not shown), which is actuated, when the base frame arrangement, with the carrier suspended thereon, has reached its highest position, and which energizes the linear actuator after a predetermined time period, the delay being that desired for the drainage of the carrier and photographic material. To start the operation, the operator inserts into the bath the vessels containing the treating liquids required for the process to be carried out, arranged in the order as they are required by the sequence of the multistep process to be carried out. He then sets the forwarding means in the starting position i.e. with base frame **1114** in the fully raised position. The carrier **1161**, loaded with the photographic material, is then suspended by forwarding support **1167** on the number one pair of forwarding seats **1126** at the left and directly above the number one vessel (not shown). With the agitator mechanism running the timer is thereafter started to initiate the treatment of the first step by lowering of the

base frame **1114** to its low position, resting the frame **1114** on the top edges of the servo-cylinders **1110**. This results in submersion of the photographic material contained on the carrier in the treating medium contained in the number one vessel. As the carrier is lowered, it comes to rest on the vertically reciprocating agitator bars **1142**, by agitating support **1166**, the apex of which slides into triangular indentures **1160**, assuring that the carrier is during reciprocation kept from contacting the walls of the vessel and from sliding off-center, as the treatment and mechanical agitation proceeds.

When the photographic material has been treated in the number one vessel for the predetermined length of time, the program timer actuates the relay, which in turn energizes the source of hydraulic pressure. This results in raising of the base frame **1114** to its elevated position with the carrier and sheet suspended thereon. When the frame structure has reached its highest position the coordinated time switch, after the preset time delay (e.g. 20 seconds in some processes for drainage), energizes the linear actuator which in turn pushes the forwarding bars **1118** toward the right by a stroke length, which equals the distance of the vessels from center to center. This results in the shifting of the carrier to the right, so that it is now suspended over the next vessel. The next pulse in the program timer or, if desired, another time delay switch (not shown) actuates the relay which deenergizes the source of hydraulic pressure, resulting in the lowering of the frame structure, with the photographic material contained on the carrier, being inserted in the treating medium contained in the next vessel for the treatment in the second step. When the carrier has been inserted in the next vessel and the base frame **1112** has been lowered to its fully retracted position, the switch controlling the linear actuator is energized to start the retraction of the stroke rod of the actuator and of forwarding bars **1118** connected thereto into their starting position. When the sheet has been treated in the next vessel for the predetermined time, the program timer starts the next cycle, as described hereinbefore, raising, forwarding and inserting the photographic material in the treating medium contained in the next vessel and so forth, until the sheet has passed through all the steps at exactly the predetermined time schedule, including also the desired or required drainage times.

When the carrier has been immersed and treated in the last (the number twelve) vessel, and the base frame has been raised to its elevated position, the stroke of the forwarding bars **1118** pushes the carrier by prism **1130** toward the end of the base frame. The operator may now start the treatment of a new batch of material without removing the carrier from the base frame or he may first remove the carrier. Upon each lowering of the base frame, the carrier contained on the storage portion of the base frame will be lowered into the auxiliary compartment, which may be filled with water or other liquid medium for subsequent washing or other after treatment of the photographic material, if desired. Alternatively, no liquid is filled into the auxiliary compartment, so as to permit complete drainage and predrying of the treated photographic material, while the treatment of the next batch proceeds.

The above mentioned delay and drainage time may be provided either by a delay in the actuation of the forwarding switch or it may be controlled by a separate pulse given by the program timer. Many modifications may be made in the automatic forwarding means as may be desired. The forwarding bars **1118** may, for instance, be provided with grooves or indentures instead of the forwarding seats **1126**, so that the forwarding support **1167** of the carrier is held in the grooves or indentures during the forwarding cycle in a manner as shown in the agitator bars. Mechanical lifting means may be substituted for the hydraulic servo-cylinders and other suitable device may be substituted for the linear actuator to produce the stroke of the forwarding bar arrangement.

If the fully automatic bath is to be used with the raised wall vessels i.e. vessels in which the downstream major side wall is raised to a level higher than the upstream wall, such as in the upright raised wall vessels described in my patent application Ser. No. 342,798, a further function of the controls is advantageously introduced. In this modification of the fully automatic treating process and apparatus the stroke of the servo-cylinders is made large enough to raise the bottom edge of the carrier above the level of the upper raised edge of the downstream major side wall of the vessel. When the base frame has been raised to this high position, the lower edge of the carrier clears the top edge of the downstream major side wall, when it is forwarded downstream toward the next vessel.

At a position of the moving forwarding bars, at which the carrier has passed by the downstream major side wall, but before the forwarding bars have reached their fully advanced position, the servo-cylinders are lowered to an intermediate position, which is somewhat lower than the fully raised position, but high enonugh to clear the bottom edge of the carrier over the upper edge of the upstream major side wall of the vessel. In this manner, when the carrier is forwarded to its fully advanced position over the next vessel, it passes freely over the lower upstream major side wall, but is prevented from overshooting the raised downstream side wall of the vessel. This assures, that the carrier is safely inserted in the vessel, eliminating the risk of spillng or overshootng. As is readily apparent, this modification of the fully automatic process and appartus is used with particular benefit, where the very thin upright treating and/or wash vessels are used in the bath, particularly also with the vessels, having a trough-like reservoir superimposed on an extremely narrow upright vessel.

A particular advantage of the agitator means of this embodiment of the bath is to be seen in the fact, that the agitator bars **1142** reciprocate in a true vertical direction. There is thus no horizontal vector in the movement, obviating the use of rollers or other means on the agitating support of the carrier and avoiding friction of the carrier against the walls of the vessel. This makes the vertical agitating means particularly useful also with semi-automatic operation, if no automatic forwarding of the carriers and of the photographic material is desired.

The agitating means may be modified in many ways as will come readily to mind. Instead of using the reciprocating wedge arrangement described hereinbefore as the means for the vertical reciprocation of the agitator bars, one may substitute any other desired means capable of producing the vertical reciprocation, such as rotating excentric rollers, verticallly reciprocating actuators and so forth. Instead of providing wedge-shaped indentures in the agitator bars as the means for the localization of the carrier, one may employ with equal benefit notched seats, as shown on the forwarding bars in FIG. 6 of the drawings or pairs of vertical pins and the like, arranged in pairs at the top edge of the agitator bars, so as to form a barrier on both sides of that section of the agitating support, which rests on the agitator bars. The carrier may also be suspended on the agitator bars, by the use of hooks on the carrier and/or agitator bars.

Instead of using two agitator bars, one on each side of the bath, one may employ a single agitator bar preferably centrally located along the length axis of the bath.

The fully automatic embodiment of the bath of the present invention has been described and illustrated as a stationary bath. The concept of the fully automatic operation of the bath is, as is readily apparent, even more beneficially employed in the compartmented bath of the invention, permitting the passage of a temperature conditioned liquid medium, such as water, by and around the treating vessels in a predominantly vertical

flow pattern, so as to permit readily good temperature control of the treating media contained in the treating vessels. The combination of the automatic forwarding means and mechanical agitating means with the concept of the compartmented bath offers the further advantage of permitting the carrying out of intermediary washing steps in a flowing washing medium in the oder, as they occur in the treating sequence of the multistep process to be carried out in the bath, so that a constantly renewed supply of washing medium is available in the washing vessels. The fully automatic compartmented bath of the present invention is thus most beneficial and most preferred embodiment of the bath of the invention.

If it is desired to drain the compartmented bath of the invention, after completion of its operation without lifting the bath and pouring the liquid medium remaining in the bath, it is necessary to provide a separate drain with suitable removable closures, valves and the like in each compartment of the bath. More conveniently, the drains provided in the various compartments may be communicatingly connected to a common conduit such as tubing or pipes or the like with suitable closure means including flexible tubing with its opening located in a position higher than the water level when the bath is in operation. Opening of the closure in the common conduit or the lowering of the opening of the flexible tubing to a level below the bottom of the bath permits complete drainage of the bath. The said common conduit and the drainage openings in each compartment may be made integral with the bath e.g. by providing said conduit in or under the bottom or in the low portion of at least one side wall of the bath with a communicating opening to each compartment. Closing means need thus be provided only at one end of said conduit, the other end being closed or serving as the drainage opening to the last compartment. Thus, for instance, one single stop cock valve or plug will be sufficient in this preferred embodiment of the self draining embodiment of the bath to drain all compartments as desired.

As is readily apparent, the various features illustrated hereinbefore with specific embodiments of the bath of the invention may be recombined to form a multitude of new combinations and new embodiments of the bath of the present invention. Such modifications are, on the basis of the principles and inventive concepts taught hereinbefore, within the skill of the artisan and fall within the ambit and scope of the present invention.

The form of the bath, the number, size and shape of the compartments and the nature and arrangement of the sealing means may be readily modified and adjusted to form new embodiments of the bath of the invention too numerous to be illustrated.

The compartments in the bath described hereinbefore were shown to be arranged side-by-side in one row. The invention comprises also embodiments of the bath in which the compartments are arranged in more than one row, separated by a divisional vertical wall. Also other arrangements such as circular or off-set arrangements of the compartments may be readily derived from the bath described hereinbefore by adaptation of the principles and by suitable rearrangement of the features and components described hereinbefore.

In these embodiments of the bath, particularly in the double row and in the circular compartmented bath modified forwarding means, which are adapted to forward the photographic material in a zig-zag pattern or in a circular pattern, respectively from vessel to vessel, may be employed with particular benefit. Such forwarding means are described and claimed in my copending application Ser. No. 342,459 filed Feb. 4, 1964. The principles and features described with respect to the bath in that application may be applied with benefit also in the bath of the present invention and are herewith made also part of the present application.

Besides resistance to the corrosive action of treating liquids, other considerations may play an important part in the selection of construction materials for the bath of the invention. Among the preferred materials are metals and plastics such as polyolefins, high impact styrene polymers and copolymers, acrylate polymers or copolymers and many other synthetic polymers well known in the art, including the heat settable resins. These materials are sufficiently form stable at the temperatures encountered in photographic treating processes and possess the chemical indifference to withstand the corrosive action of most of the treating solutions used in most photographic treating processes.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is understood, that the invention is not limited to the specific embodiments thereof, except as defined in the appended claims.

I claim:

1. A photographic bath, comprising a receptacle which is subdivided into a multiplicity of water tight compartments by at least one separatory wall and which comprises wide overflow passages between neighboring compartments at the top end of said separatory walls, at least some of said compartments being working compartments, each working compartment being adapted to removably receive a photographic treating vessel in sealing relationship by the provision of generally vertical counter sealing means along the generally vertical side walls of said working compartments, such that essentially liquid tight seal is established between the end walls of a treating vessel and the side walls of a compartment, when a treating vessel is inserted therein.

2. The bath of claim **1**, in which the separatory walls are removable.

3. The bath of claim **1**, which comprises means for the passage of a unidirectional stream of a liquid medium through the bath.

4. The bath of claim **1**, in which are provided vertical counter sealing means along the side walls and horizontal counter sealing means along the bottom of each compartment.

5. The bath of claim **1**, which has a reversed trapezoidal cross section, with the base of the trapezoid at the open top of the bath.

6. The bath of claim **1**, which comprises at least one adjuvant compartment.

7. The bath of claim **6**, in which is provided a heating chamber in one of the said adjuvant compartments.

8. The bath of claim **1** comprising in addition mechanical agitating means.

9. The bath of claim **8**, in which the mechanical agitating means comprises at least one agitator bar and means adapted to vertically reciprocate said agitator bar.

10. The bath of claim **1**, which comprises in addition automatic forwarding means.

11. The bath of claim **10** which comprises in addition automatic forwarding means.

12. The bath of claim **11**, in which the said forwarding means comprise a base frame joined to the stroke rods of lifting means and at least one horizontal forwarding bar, which is adapted to forward the photographic material unidirectionally and horizontally by a distance corresponding to the spacing of photographic treating vessels contained in said bath in side by side relationship.

13. The bath of claim **12**, in which said lifting means and forwarding bar are actuated by independent power sources and controlled by a program timer in accordance with the time schedule required by the process to be carried out.

14. The bath of claim **13**, which is enclosed in a light tight housing so as to permit the treatment of light sensitive photographic material contained in the bath in a lighted room.

(References on following page)

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