United States Patent

[11] 3,592,118

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[45] Patented **July 13, 1971**
Continuation of application Ser. No. 677,265, Oct. 23, 1967, now abandoned, which is a continuation-in-part of application Ser. No. 302,902, Aug. 19, 1963, now Patent No. 3,349,685, and a continuation-in-part of 621,382, Jan. 23, 1967, now Patent No. 3,538,270.

[54] PHOTOGRAPHIC PROGRAM TIMER

10 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **95/89,** 200/46, 200/24, 200/33, 340/309.1, 340/309.4
[51] **Int. Cl.** **G03d 3/00**
[50] **Field of Search** ..... 200/46, 38 C, 24, 33, 33.3; 340/309.1—309.4; 95/89; 307/141.8, 141

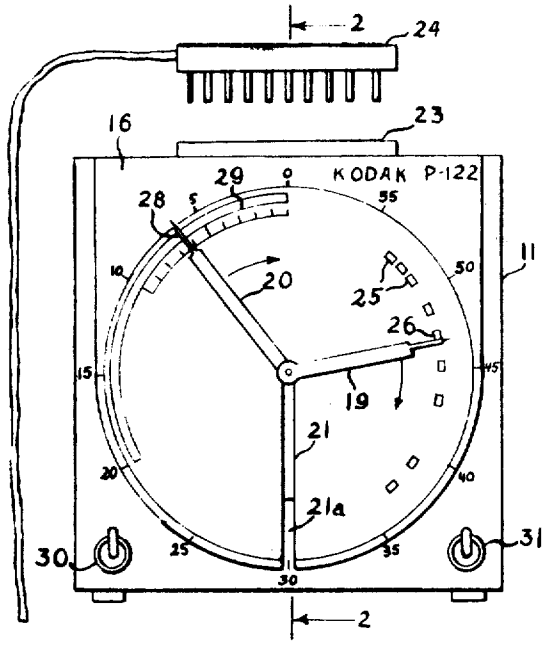
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Primary Examiner—David Smith, Jr.

ABSTRACT: A photographic process timer of the dual-speed type having contacts and cooperating countercontacts and auxiliary contact and cooperating auxiliary countercontact. The contacts have a slightly larger time value than the auxiliary contact, so that the actual timing of the steps of the process is effected by the engagement of the auxiliary contact countercontact pair.



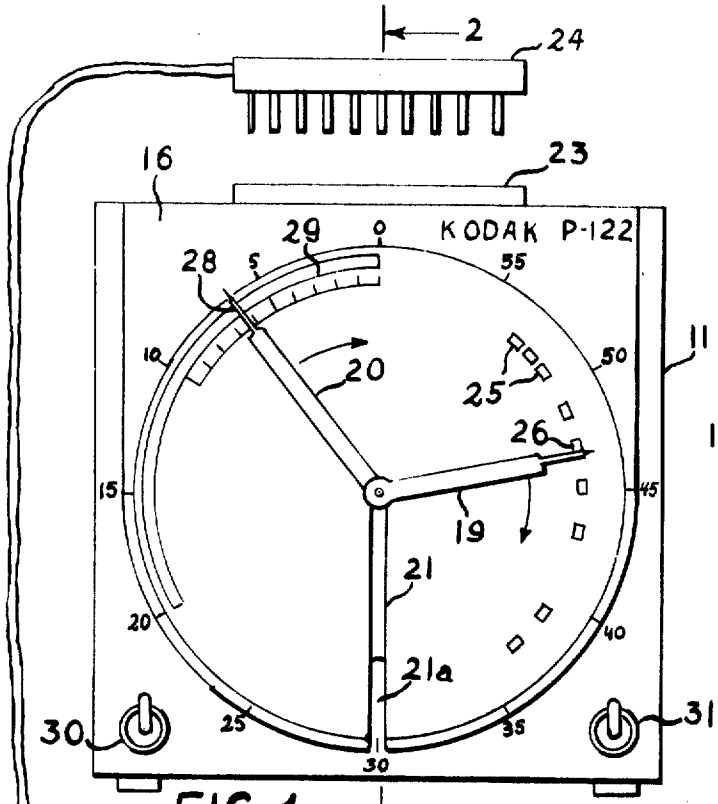


FIG. 1

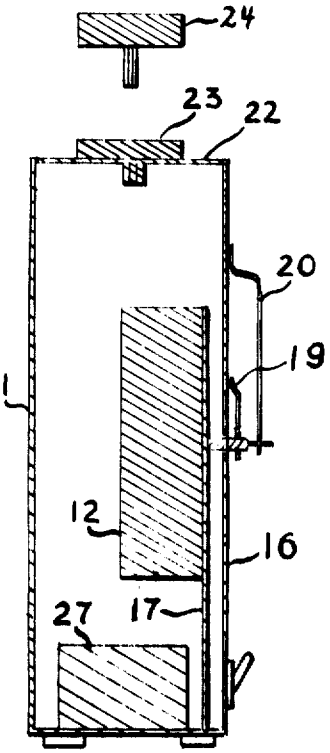


FIG. 2

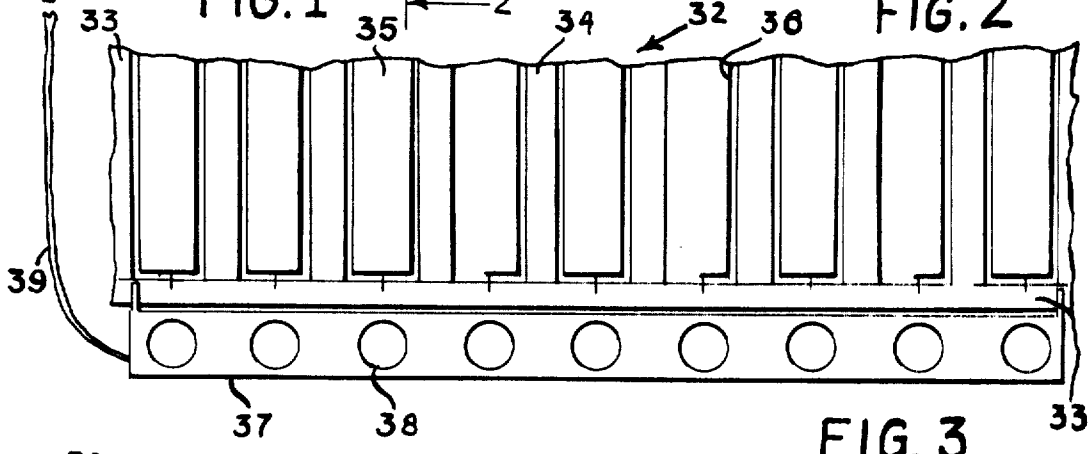


FIG. 3

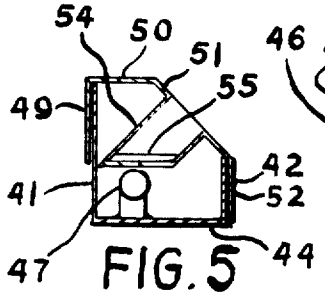


FIG. 5

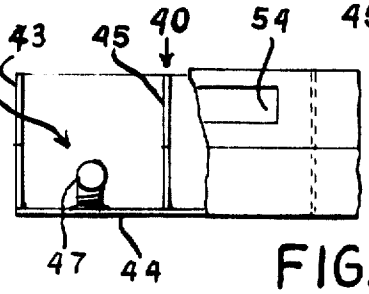
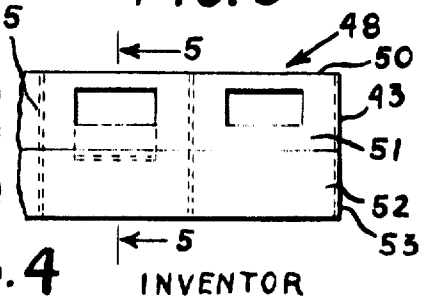


FIG. 4



INVENTOR

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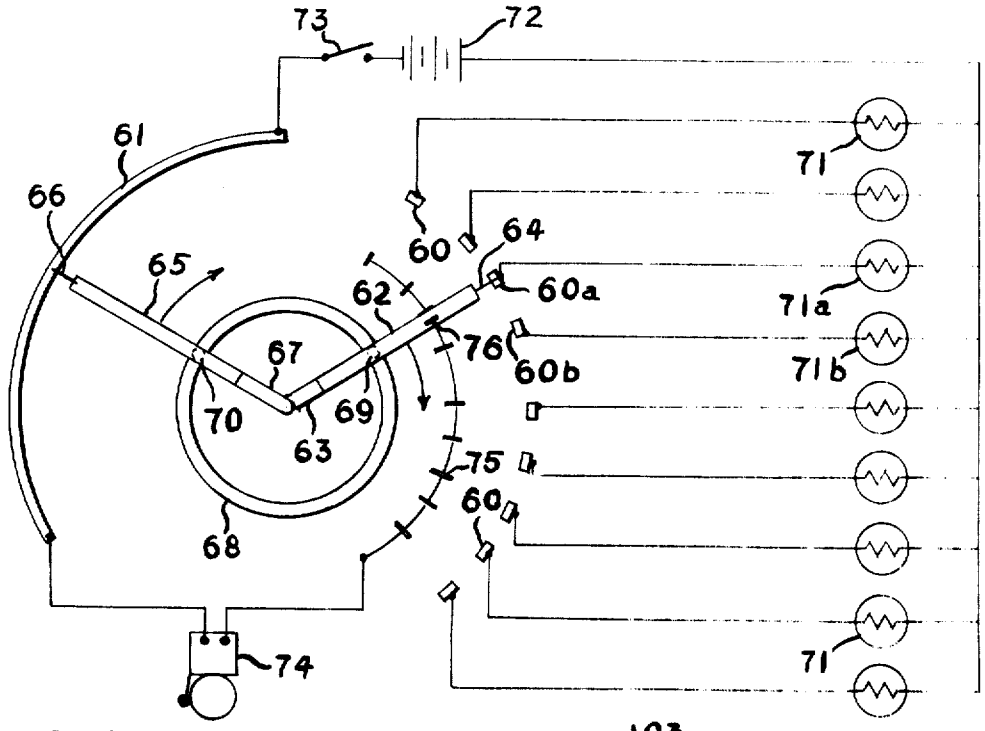


FIG. 6

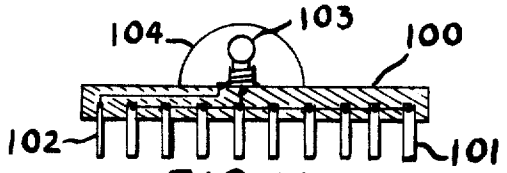


FIG.11

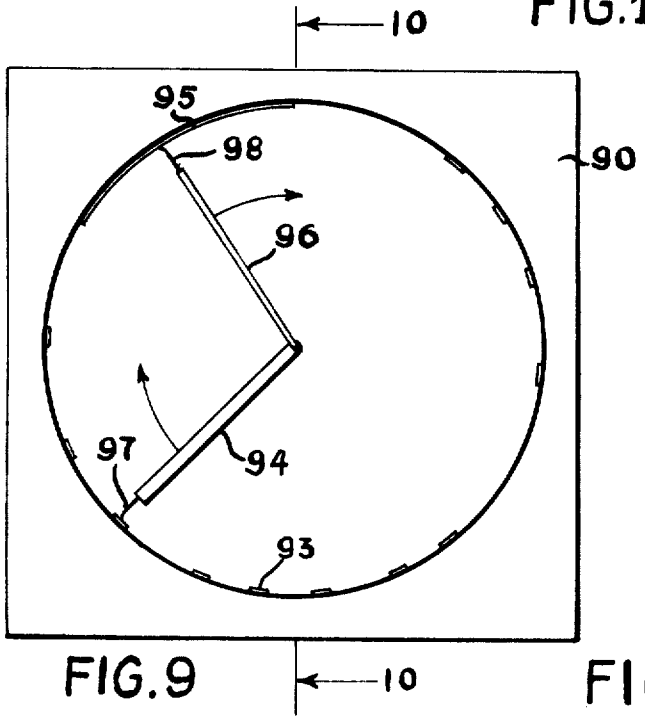


FIG.9

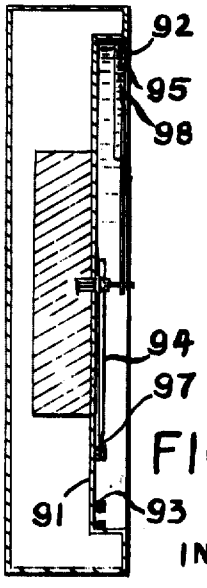


FIG.10

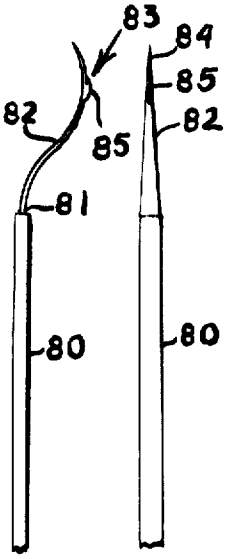


FIG.7 FIG.8

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PHOTOGRAPHIC PROGRAM TIMER

This application is a continuation of my copending application, Ser. No. 677,265, now abandoned, which is a continuation-in-part of my copending application Ser. No. 302,902 filed Aug. 19, 1963 and entitled "PROGRAM TIMER," now U.S. Pat. No. 3,349,685 and of my copending application Ser. No. 621,382, filed Jan. 23, 1967 and entitled "PROGRAM TIMER" now U.S. Pat. No. 3,538,270.

SUMMARY OF THE DISCLOSURE

The present invention relates to an improved timer and a method for the timing of the successive steps of a sequence of photographic wet-treating steps and more particularly of the treating and drainage steps of photographic color-developing processes.

A timer for the timing of each of the treating and drainage steps in a multistep photographic wet-treating sequence in which a signal source is activated and deactivated, respectively, at the begin and end of said treating and drainage steps by the closing and opening, respectively, of a primary electrical circuit, made by a pair of cooperating contact and countercontact, wherein the exact point of opening and closing of the primary circuit is controlled by an auxiliary contact-countercontact pair, moving relative to each other at a higher rate of travel, than the said cooperating contact and countercontact.

In my copending application Ser. No. 302,902 now U.S. Pat. No. 3,349,685 is disclosed and claimed a new timer which times the treating and drainage steps of multistep photographic wet-treating sequences by bringing about closing and opening, respectively, of a primary circuit, by relative motion of at least one contact and at least one countercontact, so that successive engagement and disengagement of the contacts and countercontacts is achieved at time intervals, which correspond to the duration of the individual treating steps and the drainage steps interspersed thereinbetween, for the sequence of which the timer is programmed.

In my copending application Ser. No. 621,382 is described a new timer, in which the engagement and disengagement of the contacts and countercontact is controlled and timed by a track of alternating insulating and noninsulating areas, travelling between said contact and countercontact. This timer may be used for controlling a signal source or a plurality of signal sources, and particularly for controlling the operation of fully automatic photographic color-developing apparatus.

These timers may find wide application in the photographic color-developing field and may serve in a wide variety of applications. There are taught in these applications many embodiments and modifications of the timing mechanism, which make each of these timers particularly useful in one or the other specific situations to be met in the timing of the various photographic developing practices.

It is an object of the present invention, to provide an improved timing mechanism, which provides extremely great accuracy and which can at the same time be massproduced at low cost.

It is another object of the present invention to provide an improved timing mechanism, which is particularly adapted for serving the needs of the photographic amateur in developing the various color materials by the various practical processes and methods available to him. Other objects will become apparent, as the description proceeds.

DRAWINGS

In the attached schematic drawings FIG. **1** is a front elevation and FIG. **2** a vertical section along line **2–2** in FIG. **1** of the preferred embodiment of the timer of the present invention. FIG. **3** illustrates a compartmented bath, containing in compartments treating vessels and washing vessels arranged in the order as the treating and washing steps are to be carried out and coordinated thereto a light bar, comprising a plurality of light signal sources, each of which controls in part the timing of one of the treating steps and the interspersed drainage steps.

FIG. **4** is a fragmentary top elevation, partially broken away, of an improved embodiment of the light bar and FIG. **5** is a vertical section thereof, taken at line **5–5** of FIG. **4**.

FIG. **6** is a schematic representation of an example of the circuit of the timer of the present invention.

FIGS. **7** and **8** represent a portion of a preferred hand, comprising an elastic springlike countercontact, in fragmentary side elevation and in fragmentary top elevation. FIG. **9** is a schematical representation of a front elevation and FIG. **10** of a vertical section taken along line **10–10** in FIG. **9** of another preferred embodiment of the timer of the present invention.

FIG. **11** is a vertical length section of a plug, which serves to convert the light bar embodiment of the timer into a single light source timer.

FIG. **12** is a fragmentary front elevational view and FIG. **13** a side elevational view of part of a dial, comprising pin-type contacts, cooperating with the countercontact provided on the minute hand.

As is apparent from the foregoing, the timer of the present invention operates on the principle, that a primary electrical circuit is preactivated by engagement of a contact *a* and of a countercontact *x*, the latter being conductively connected to an auxiliary countercontact *y*, which in turn is coordinated to and intermittently engaged with an auxiliary contact *b*, and whereby the relative rate of travel between auxiliary contact *b* and auxiliary countercontact *y* is a multiple of the relative rate of travel between contact *a* and coordinated countercontact *x*. Contacts *a* and *x* are dimensioned and correlated such that they engage all during the time that the engagement or disengagement of the auxiliary contact and countercontact takes place.

In this manner, the exact point of making or breaking the primary circuit is determined and controlled by the faster travelling auxiliary countercontact *y*. By this expedient, the accuracy of the timing of the individual steps is increased by a factor, corresponding approximately to the factor by which the rate of travel of counter contact *y* exceeds that of counter contact *x*. In this manner, an increase of the accuracy can be achieved by a factor of 10 to 60 or more by simply adding an auxiliary contact *b* and an auxiliary countercontact *y*, which latter may be coupled to the driving means by simple conventional gearing etc. The high accuracy achieved in this manner would only be available, without this expedient, by employing extreme precision in the construction of the timer or by making the dimensions of the timer correspondingly large. With the employment of the expedient of the present invention, low-cost mass production methods and the most inexpensive construction material may be employed and the timer may be designed compact without detriment to the required accuracy.

Alternatively, the contact *a* and countercontact *x* may be stationary, and their engagement is controlled by drawing between them at a predetermined uniform speed a track of alternating insulator and noninsulator e.g. a track of perforations, contained in a travelling insulator. For achieving the high accuracy in accordance with the invention, a pair of cooperating auxiliary contact and countercontact is added and included in the primary circuit as before. The auxiliary contact and countercontact may operate on the former principle of stationary contact and travelling countercontact, (travelling at high rate) or on the principle, that both the auxiliary contact and countercontact are cooperatively stationary, and the track of alternating insulating and noninsulating areas is drawn between them at a high rate of travel, e.g. by rapidly drawing a travelling belt, carrying a track of perforations in an otherwise insulating belt between the auxiliary contact and countercontact.

Referring to FIGS. **1** and **2**, a preferred embodiment of the timer of the present invention comprises a housing **11** with an exchangeable dial face **16**, removably set into the front part of the housing. Within the housing is provided, mounted on stationary support **17**, electrically driven clockwork **12**, compris-

ing a motor, the necessary gearing and shaft means for driving hand **19** at a relatively slow speed, e.g. at 1 revolution per 30 minutes or 60 minutes or the like, gearing and shaft means for driving hand **20** at a much higher rate, e.g. at 1 revolution per 30 seconds, or 1 revolution per 60 seconds or the like. The clockwork **18** comprises beneficially also ratchet or clutch means, permitting the independent setting by hand of the hands **19** and **20** to any desired starting position. Hands **19** and **20** are in electrically conducting contact, e.g. by help of the shafts on which they are contained, or by separate slideable contact means.

Exchangeable dial face **16** of an insulating material, such as plastic, is slipped into a correspondingly shaped and dimensioned cutout in the front panel of housing **15**, in the manner, illustrated and described in my copending application Ser. No. 302,902. Any other suitable manner of supporting the exchangeable dial face in the front of the housing may also be employed. For facilitating the sliding of the dial face into the front panel, vertical slot **21** is provided in the lower part of the dial face, engaging in tongue **21***a*, extending upwardly from the lower front face of the housing. At the top edge of the dial face **16** is provided horizontal lid portion **22**, which closes off the housing at the top, when dial face **16** is slipped into the housing. On lid portion **22** is provided multicontact socket **23** for the reception of plug **24**. Contacts in the housing and on the face establish automatically connection of the circuit to the battery (not shown) contained in the housing.

Into the dial face **16** are set in a partial circle contacts **25**, dimensioned and spaced in accordance with the time schedule of Process P-122 of the Eastman Kodak Co. for the development of Ektacolor papers. This process requires between the treating steps and washing steps, having in succession the duration set out below, drainage steps of not more than 20 seconds, whereby each drainage step is subtracted from the time of the preceding step.

The time schedule of the P-122 process is therefore as follows:

Step	Time
1. Developer	6 minutes, 40 seconds.
2. Drain	20 seconds.
3. Stop bath	40 seconds.
4. Drain	20 seconds.
5. First hardener fixer	40 seconds.
6. Drain	20 seconds.
7. Wash	1 minute, 40 seconds.
8. Drain	20 seconds.
9. Bleach	1 minute, 40 seconds.
10. Drain	20 seconds.
11. Wash	1 minute, 40 seconds.
12. Drain	20 seconds.
13. Formalin fixer	1 minute, 40 seconds.
14. Drain	20 seconds.
15. Wash	3 minutes, 40 seconds.
16. Drain	20 seconds.
17. Buffer	1 minute, 40 seconds.
18. Drain	20 seconds.

For each drainage step, a contact **25** is provided in the face, whereby the contacts are set flush into the dial. Assuming the clockwork **18** to provide a rate of travel of the small hand **19** of 360° in 60 minutes, it would cover an angle of 2° in 20 seconds. Since the contacts **25** must not control the begin and end of each drainage step, they are made peripherically somewhat longer, viz. 4° or so. The preferred peripheral extension depends on the accuracy of the clockwork, travel of hands, on the relative lengths of the steps in the process etc. The contacts **25** are set into the dial and spaced such that the countercontact **26** at the tip of travelling hand **19** engages with each contact approximately 10 seconds or so prior to the termination of each of the treating and washing steps 1, 3, 5, 7, 9, 11, 13, 15, and 17 listed above. The begin of the first step (developer) is thereby located exactly in the 12 o'clock position (no contact need be provided there, if it is so desired). Accordingly, countercontact **26** disengages each contact **25** approximately 10 seconds after the termination of each of drainage steps 2, 4, 6, 8, 10, 12, 14, 16, and 18.

Each of contacts **25** is conductively connected, by suitable electrical conductor means, (wiring, socket **23** and plug **24**) to one of a series of bulbs contained in a light bar, such as illustrated in FIG. **3** and as set out hereinafter in the wiring diagram in FIG. **6**, so that each contact **25** and its coordinated bulb is part of a different primary circuit, which all are powered by battery **27** contained in housing **15**.

Hand **20** comprises at its tip countercontact **28**, which cooperates with arclike auxiliary contact **29** set flush into the exchangeable dial in a radius somewhat larger than the radius of the circle comprising contacts **25**. Contact **29** covers an arc of 120°, corresponding to 20 seconds at 1 r.p.m. of hand **20**. Switch **30** is an on-off switch for controlling the power supply to the clockwork **18** and switch **31** is an on-off switch controlling the power supply to the above-mentioned primary circuits.

In FIG. **3** is schematically illustrated a color-developing apparatus **32** of the kind described and claimed in my U.S. Pat. No. 3,349,689, comprising a compartmented water jacket **33** with separatory walls **34** forming nine working compartments, in which are contained in sealing relationship six treating vessels **35** and three wash vessels **36** in the order in which the treating steps and washing steps alternate in said Process P-122, from left to right. To the front of the water jacket is attached a light bar of the kind described in my copending application Ser. No. 302,902 comprising a housing **37** with nine windows **38**. Each window is superimposed on a lighttight cell, containing a light bulb and each window is fitted with a Kodak safelight filter Wratten Series 10. The spacing of the windows **38** corresponds exactly to the spacing of the treating and wash vessels in the developing apparatus, so that each window is juxtaposed to one of the vessels. The bulbs in the cells are individually connected to the contacts **25**, the bulb at the left to the first contact at the top representing the end of the first treating step (development) and the first drainage step. The bulb second from the left is connected to the second contact **25**, representing the end of the second treating step (step 3 in the schedule above) and the second drainage step (step 4 in the above schedule) etc. as shown e.g. in FIG. **6**.

For the operation of the process to be timed by the timer, the treating solutions are filled into the treating vessels in the required order and adjusted to the required treating temperature (85° F.) and wash water is flown through the washing vessels. The photographic material is exposed and inserted in a suitable hanger. Plug **24** is inserted in socket **23** and switch **31** is thrown to "on" position to connect the battery to the primary circuits. The timer is then set to its starting position by moving both hands into the 12 o'clock position. The hanger with the exposed photographic sheet is then inserted into the treating vessel at the far left containing the developer and at the same time switch **30** is thrown into the "on" position, which starts the clockwork of the timer. In the alternative, a contact may be provided in the 12 o'clock position, plus an additional cell and bulb at the left of the light bar, and the timer is started first, so that the photographic material is inserted in the developer at the extinction of the first (adjuvant) bulb as described in my copending application Ser. No. 302,902. The photographic material is then maintained and agitated in the first developer until the bulb under the window opposite the first developer lights up at the end of the first developing step. This occurs at the very moment, when countercontact **26** on hand **19** as engaged with the first contact **25** at the top right and when at the same time countercontact **28** on hand **20** just engages the bottom end of auxiliary contact **29** (opposite the number **20**). This occurs exactly 6 minutes and 40 seconds after starting of the timer. At this moment, when the bulb lights up, the operator removes the hanger from the developer and holds it for drainage until the light in the first window extinguishes. At this moment, he inserts the hanger into the second treating vessel, and leaves it there for treatment until the light opposite the second vessel lights up, holds for drainage as long as the window is lighted and inserts into the third treating vessel at the moment the light extinguishes etc.

ntil he has completed all the steps at the extinction of the ..indow at the far right. He then may submit the photographic material to the required drying treatment.

In the position of the hands of the timer as illustrated in FIG. 1, the No. 5 window, counted from the left, will be lighted.

For the treatment of the next batch of photographic material, the timer is reset to its starting position and the procedure is repeated. To compensate for the partial exhaustion of the developer, the manufacturer thereof recommends an increase of the development time in the second and in each of the successive runs or batches based on the square footage of material treated in relation to the total quantity of developer. The time increase is calculated on the basis of a constant factor *x*. Assuming that the required time increase would be 45 seconds, the starting position for the hand **20** is now at the numeral 45 provided on the scale running counterclockwise around the dial or front face of the timer, respectively. The hand **19** will stand a corresponding portion (three-fourths minute) to the left of the 12 o'clock starting position. If the timer is now started, the time required for the lighting up of the left bulb will automatically be increased by exactly 45 seconds. If in a successive batch the developing time is to be increased by 90 seconds, the hand **20** is set to numeral 30 at the bottom of the circular scale and the minute hand is set between the second and third mark on the inner scale (short scale) at the left top portion of the dial face, adjusting itself to the exact position by help of the gear train connecting hands **19** and **20**. In this manner, the timer may be set to automatically provide any desired extension of the duration of the first developing step, without loosing the advantage of the timer signalling the begin and end of each step by the actuation or end of actuation of the signal source operated by the timer, and especially of the light source coordinated to each step.

Instead of using for the extension of the treating time in the first step the just-described expedient, one may also use auxiliary or adjuvant contacts and suitably coordinated automatic or manual switching means as described and illustrated e.g. in my copending application Ser. No. 302,902 now U.S. Pat. No. 3,349,685.

The windows have been shown in FIG. **3** to be located in exact juxtaposition to the respective treating vessels to which they are coordinated. It is also possible to arrange the windows in a position between two neighboring vessels, i.e. by moving the light bar by one-half of the distance between centers of the vessels to the right. This latter arrangement is particularly beneficial, when the light bar is used on an apparatus, in which only a single washing vessel serves for all the washing steps, provided e.g. at the far right. In this case the hanger, with the photographic material thereon, is moved from a treating vessel to the far right into the washing vessel and back into the next treating vessel down the line etc. Thus, in this case, as before, the windows do not only indicate the timing of the step proper, but also indicate the position of the vessel into which the material is to be inserted after the washing steps, eliminating errors in the repositioning of the material in the series of treating vessels. Of course, in this case all the contacts **25**, timing the washing steps, are wired together to energize at the proper times the bulb serving the single washing station. If more than one washing station is provided, any desired combination between the above-described form and the just-described form of the timer and treating apparatus is possible.

The light bar has been described hereinbefore in its simplest, basic form. This embodiment is very similar to the embodiment of the light bar, described in my copending application Ser. No. 302,902 now U.S. Pat. No. 3,349,635 to which special reference is made herewith and which is herewith made the subject of the present application.

Generally, the windows of the light bar are made from a colored light filter material, which permits the passage of only those wavelengths of the light, which are ineffective or least harmful to the photographic materials to be processed. One will therefore use preferably those light filter materials which are recommended by the manufacturer of the photographic material as the safelight filter for their processing. To provide for ready adaptability of the requirements of the various types and makes of photographic materials and especially of color materials, the light bar may be provided with a plurality of exchangeable lids, in each of which the windows are fitted with a different safelight material.

If this is not desired, and if the light bar is to be used with photographic materials, which are to be processed in absolute darkness, one may use with advantage another embodiment of the light bar, which is characterized by windows which are recessed in a well, with the openings of the wells pointing in a direction away from the processor such that the photographic materials are not subjected to the direct light emanating from the light bar. The windows are fitted in this embodiment of the light bar, likewise with safelight filters, which permit the escape of only a narrow range of the least harmful wavelengths of light. As a further precaution, the light bulbs contained in the light bar, are advantageously operated at a voltage considerably less than their rated voltage, e.g. at one-half or 1 volt for a bulb which is made to be operated at 3 volts. In this manner, only faint light signals are generated with no noticeable harmful effect on the photographic material, particularly also in view of the fact, that the light signals are on only for very short periods of time, viz for 10 or 20 seconds in each step. Yet, in the absolute dark of the darkroom, these faint signals can be readily noted and observed.

An embodiment of the light bar, which is designed such that no direct light falls onto the photographic material in or above the processor unit, is illustrated in FIGS. **4** and **5**. The light bar comprises a tray type of body **40**, having a high rear wall **41**, a low front wall **42**, end walls **43** and bottom **44**. The tray body is subdivided by transversal divider walls **45**, having a form and dimensions similar to the end walls **43**, into a plurality of cells **46**, usually of a number at least equaling the number of wet-treating steps of the process to be controlled and timed. Each cell **46** contains a light bulb **47**. The tray body **40** is covered by a lid **48**, which comprises a vertical rear wall **49**, a horizontal top portion **50**, slanted top portion **51**, slanting at an angle against the horizontal, preferably between 30° and 60°, most advantageously of about 45°, downwardly at the front, a vertical front portion **52** and end portions **53**, such that the lid may be removably superimposed on the tray body **40** in lighttight fashion. In the slanted top portion **51** of the lid are provided slanted wells, being preferably perpendicular to the slanted top portion **51** of the lid, and having advantageously a horizontal bottom with an aperture in the center. The aperture is fitted with a safelight filter **55** as described above. The wells are located such, that one each penetrates into each cell to a position approximately above light bulb **47** contained therein.

The light bar is made from a light-impervious material, such as metal or dark-colored plastic or the like. Advantageously the interior of the cells and the exposed surfaces of the wells are provided with a nonreflective or low reflective finish, so that only direct light rays pass through the top openings of the wells upwardly into the room at an angle preferably between 30° and 60°. As can be readily seen, a light bar constructed in this manner is not only safe for the photographic material contained or handled in the processing apparatus, but also for light-sensitive material located away from the light bar somewhere in the darkroom on a work table or the like.

For very critical work with highly sensitive film material, the light bulb in the first and second to third cell or so may be replaced by sonic signal sources of different pitch, so that light is avoided in the original critical stages, and light signals are optionally only used in the later steps where the photographic material is already desensitized. Alternatively, the light signal sources produced by the bulbs in the individual cells may be luminescent or phosphorescent spots of suitable material, which are normally covered by a dark or opaque lid and which lids are removed at the respective times (e.g. drainage times) by the effect of a magnetically operated device, which in turn, if operated electromagnetically, forms part of the primary cir-

cuits of the timer and which are energized and deenergized by the timer in the manner described hereinbefore.

The wiring of the timer and light bar of the invention is exemplified in the wiring diagram in FIG. 6. The timer comprises individual contacts **60** arranged in a partial circle, arclike auxiliary contact **61**, minute hand **62**, made of an electrical conductor with insulated central base portion **63** and sliding countercontact **64**, second hand **65** made of an electrical conductor material with sliding auxiliary countercontact **66** and inner base portion **67** made of an electrically nonconducting material and a contact ring **68** for sliding contact brushes **69** and **70** provided at the underside of the hands **62** and **65** and in contact with the conductive portion of the hands so as to establish electrical contact between the countercontacts **64** and **66** at all times. Hand **65** travels at a considerably higher rate than hand **62**, hand **62** rotating e.g. at 1 r.p.h. and hand **65** e.g. at 60 r.p.h. The light bar is represented at the right by a row of incandescent bulbs **61**. The clockwork driving the hands and the switch energizing the clockwork are not shown.

One terminal of each of the bulbs **71** is conductively connected to one each of contacts **60**. The second terminals of the bulbs **71** are wired together and conductively connected to the plus terminal of the battery **72**, providing the nine primary circuits with electrical power. The minus terminal of the battery **72** is connected, over on-off switch **73** to the arclike auxiliary contact **61** cooperating with the auxiliary countercontact **66** of second hand **65**. When the switch **73** is closed and the hands **62** and **65** are positioned as shown, the third primary circuit is closed resulting in the lighting up of bulb **71***a*. This primary circuit is formed by and includes bulb **71***a*, the third contact **60***a* from the top, countercontact **64** which engages said contact **60***a*, hand **62**, contact brush **69**, contact ring **68**, contact brush **70**, hand **65**, countercontact **66**, auxiliary contact **61**, closed switch **73** and battery **72** including the suitable electrical conducting means connecting these components where needed.

As stated, in the position of the timer as shown in FIG. **6** bulb **71***a* lights up and remains lighted, until auxiliary countercontact **66** disengages auxiliary contact **61**. Thereafter countercontact **64** disengages contact **60***a*, travelling on, while hand **65** rotates at a rapid rate, until countercontact **64** engages contact **60***b*, and shortly thereafter, auxiliary countercontact **66** engages, on its rapid travel around the dial, arclike auxiliary contact **61** at its low end. At this moment, the fourth primary circuit is closed and completed, and bulb **71***b* lights up, and so forth.

As a further expedient, the wiring diagram in FIG. **6** shows a bell **74**, serving as an auxiliary sonic signal. One terminal of the bell is conductively connected to arclike auxiliary contact **61**, the other terminal is conductively connected to a series of narrow, short contacts **75**, which all are connected conductively to each other and which contacts are arranged in a partial circle in a position slightly offset from contacts **60**, so that countercontact **76** at the underside of hand **62** engages each contact **75** just slightly ahead of time of the closing of each of the primary circuits controlling the lighting of the bulbs. The bell circuit is thus closed or completed slightly ahead of time, say 10 to 20 or 30 seconds or more prior to the closing of the lamp circuit, thus actuating the bell by a short burst of ringing or humming or other sonic signal as a prewarning signal, indicating that the lamp signal will soon appear, requiring the forwarding of the material in the photographic treating stations.

Contact ring **68** and contact brushes **69** and **70** have the purpose of permitting the setting of the hands in insulating relationship to the clockwork and housing of the timer, which may be grounded to avoid shock or interference of the clockwork circuit with the primary circuits. The battery **72** is preferably a low-voltage battery delivering a few volts or so, if the components of the primary circuit are not protected against contact by the operator.

The countercontacts **26**, **28** or **64** and **66** respectively, provided at the hands, may have any desired form, provided they assume positive sliding engagement with their coordinated contacts. It was found that lightweight, elastic or springlike countercontacts are particularly advantageous. Sichel-shaped contacts such as those shown in FIGS. **8** and **9** provide many benefits over other forms. Hands **80** are made of a relatively nonelastic, stiff, electrically conducting material, preferably metal. To the free end **81** of the hand is fastened, by soldering, welding, screw or rivet means or other means known per se, the sichel-shaped countercontact **82** with its curved section **83** pointing towards the contact with which it cooperates. In top elevation, the sichel-shaped spring has a triangular shape, with its fine tip **84** slightly raised up. At the point **83** of the curved section, where it engages the cooperating contact, is provided an elevated, narrow indenture **85**, extending in the direction of the axis of the hand. This expedient assures contact of an extended area, rather than point contact, in radial direction, without excessive peripheral extension of the contact area, so as to make the begin and end of engagement more accurate.

In another embodiment of the timer of the invention, the contacts are set on the inside of a cylinder section formed in the dial. Referring to FIGS. **9** and **10**, this embodiment of the timer comprises, as before, housing **90** with a circular portion of the front face recessed so as to form cylindrical ringlike surface **92** all around the dial. Contacts **93** cooperating with the slow-moving hand **94** (minute hand) are set to the rear of the cylinder surface in a circle. Arclike auxiliary contact **95**, cooperating with the auxiliary countercontact **98** provided on the fast-moving hand **96** is set in the front of the cylinder ring surface. Both hands **94** and **96** are provided at their free ends with bladelike countercontacts **97** and **98**, respectively, each travelling over and in contact with the respective tracks of contacts with which they cooperate, so that their free ends engage on their travel around the ring contacts **93** and **95**, respectively. The operation of this embodiment of the timer is in principle the same as that described hereinbefore.

The light bar embodiment of the timer may be used with particular benefit in the development of color reversal materials. Kodak processes P-111, E-2 or E-3 for instance, require 13 wet-treating steps. If one wishes to carry out the process in a conventional tank processor or in the new apparatus described and claimed in my U.S. Pat. Nos. 3,236,649 and 3,349,689, the apparatus becomes bulky, if a separate wet-treating station is provided for each chemical treating and for each washing and rinsing step. If one wishes to utilize for these processes equipment, having only eight or nine processing stations, several or all washing steps must be carried out in one and the same washing station. This requires carrying the material back and forth with the inherent danger, that the photographic material is reinserted in the wrong chemical treating solution after the completion of a washing step. Using the light bar or other light signal sources which are coordinated to the respective chemical tanks and washing tanks, makes it possible to avoid any error in the proper sequence of steps. In this case the contacts controlling the light signal for a multiple-washing station are wired together, so that the light signal appears at the washing station every time a washing step is due. The light signal sources controlling the timing of the chemical treating steps are separately wired as described hereinbefore. In this manner, each light source or bulb provides not only an indication of the correct length of each step, but also an indication of the location of the treating station which is used next.

Process P-111, requiring a total treating time (not counting the reversal exposure) of 76¼ minutes can not readily be accommodated on e.g. a dial-type timer, having a timing cycle of 60 minutes. In order to be able to utilize the standard clockworks and timer, described hereinbefore, the process may be broken up in two parts, part I comprising 25 minutes up to the reversal exposure, part II comprising 51¼ minutes up to the end of the process. Part I is programmed on the timer in one track (or with one countercontact in the case of using perforations), and part II on a separate second track, or with a separate countercontact, whereby the timer comprises

switching means for activating one or the other countercontact or contacts, as may be desired. In this manner, the operator switches the timer to activate the program of part I, carries through all steps up to the reversal exposure, resets the timer to the starting position and activates part II of the program by the said switch, and after completion of the reversal exposure, he continues with the part II of the process in the usual manner as described herein.

The just-described "long" processes, as exemplified by the said color reversal processes, may be operated beneficially with another embodiment of the timer, in which two sets of contacts are provided, one set programmed to provide the signal for the exact begin of each drainage step and for the exact end of each drainage step, as described hereinbefore. The second additional set of contacts is programmed to provide e.g. a light signal of different color or in different positions at the light bar, such that one signal each is coordinated to each of the treating vessels and to the wash vessel. This group of signals is energized a little before the end of each drainage step, so that it indicates to the operator the vessel, into which the photographic material is to be inserted next, when the drainage step, controlled by the first set of bulbs, is completed. Instead of providing a whole set of bulbs in the light bar, a separate single bulb or light source at the timer or at a place above the processor may be provided which, by its ontime indicates the drainage times as before. Instead of providing the extra set of contacts, one will, of course, provide one or several extra tracks of perforations in combination with suitable contact countercontact combinations as described hereinafter, in connection with the "perforated carrier" type timing mechanism.

If the "long" contact or perforation is used for the exact control by utilizing the high-speed travel of the perforation or countercontact, a second "long" contact or perforation with coordinated contact countercontacts is provided, controlling the ontime of the primary circuits, signalling the position of the next step. The light may be on for the whole duration of the treating or washing step, or it may be on only during the first part, e.g. coming on about 10 to 20 seconds prior to the begin of the treating step and staying on for about 30—45 seconds.

The timer has been hereinbefore described for the operation in conjunction with a plurality of signal or light sources, preferably arranged in a light bar in juxtaposition to the treating location, which they control. Sometimes it is desired to use only a single signal source, e.g. in the case of the processing machines, wherein the photographic material is successively treated in the same location with different treating fluids, as is the case e.g. in Kodak's Rapid Color Processor. In this case, it is preferred to employ a single signal source, preferably a light signal and/or a sonic signal. In my copending application Ser. No. 302,902 is described and claimed timing mechanism, which is specifically designed to operate with a single signal source. However, it may be desirable to use an existing timer of the kind, described herein alternatingly with the multiple-lamp light bar or with a single-lamp light source, or a single sonic source. In this case, the contacts **25** in the exchangeable dial face may be simply wired together, or if the multiprong socket is provided, as described hereinbefore, a modified plug may be used as shown in FIG. **11**. Plug body **100** comprises in conventional manner lugs **101**, which all are wired together except for lug **102**. On the top of plug body **100** is secured lamp **103**, covered by a dome **104** of safelight material, as described hereinbefore. One lead of the lamp **103** is conductively connected to lug **102**, the other lead is conductively connected to the remaining lugs **101** as a group. The plug may simply be inserted into the socket **23**, provided in the timer e.g. that shown in FIG. **1**. Every time, that a primary circuit is energized, the lamp will light up as described hereinbefore. Thus, the operator utilizes as before, the exact moment of lighting up and of extinguishing as the signal for the begin and the end of a treating or drainage step, respectively. With this expedient, the same timer containing the same exchangeable face may also be used for the operation with the light bar, as described hereinbefore without any further changes to be made.

Many changes may be made, which modify or improve the design and operation of the timer, to form new embodiments of the timer of the present invention. All these modifications and changes are within the scope of the present invention.

Instead of using a battery, a transformer may be provided to provide low voltage alternating current, or if the hands and contacts are well protected from access by the operator, the primary circuit may be operated at the standard 110 volts household current. Instead of using an electrical clock movement, a suitably geared synchronous motor or similar devices or a regular spring-driven mechanical clock movement may be substituted as the driving means.

The provision of an exchangeable dial has many advantages, e.g. the possibility of timing by a single timer as many different process schedules, as may be desired and the possibility of providing to the owner of a timer of the invention at low cost a new dial face in the event, that a new or altered process schedule is accepted by the manufacturer of the photographic material. However, for certain applications, it may be preferred to employ a timer with an integrated dial, instead of the exchangeable dial face, which embodiment falls also under the scope of the present invention.

The exchangeable dial may have any other desired form. Instead of slipping it into a cutout in the front of the timer, it may be constructed as a whole panel, which is set onto the front of the timer. If desired, the exchangeable dial face may be inserted reverse, i.e. with the contact pointing towards the rear of the timer, such that the hands, countercontacts and contacts are all situated within the assembled timer and out of contact by the operator. In this case an insulated hand or hands, connected to the shafts of rotation may be provided at the front of the timer, pointing out on a printed scale, (as will be shown hereinafter in FIG. **17**), the progress of the time schedule.

It need not be mentioned, that the timer of the invention may also be operated in such manner, that the countercontacts are stationary and that the dial or dials, containing the contacts, are rotated as has been described in detail in my said copending application Ser. No. 302,902.

In another embodiment of the invention, the contacts may be provided on a rotary drum, belt, or disc, or on a pair of drums, belts or discs, rotating at different speeds, if the expedient of the auxiliary arclike contact is used. Alternatively, the contacts may be provided in a straight line with the countercontact, travelling likewise in a straight line. The contacts may be set onto a drum, made of an insulator, with countercontacts provided on both sides, so that upon rotation of the drum, the pair of countercontacts make contact on either side, thus establishing the closing of the primary circuit.

Of course, the timer may also be provided with a plurality of spaced minute hands and countercontacts thereon, or of spaced countercontacts, travelling at the low speed, respectively, in any desired manner, so as to provide the timing of a plurality of process sequences of the same kind in a successive, delayed and partially overlapping fashion. These modifications of the timer have been described and claimed in detail in my said copending application Ser. No. 302,902, to which special reference is made. Of course, this embodiment requires only one second hand and auxiliary countercontact mounted thereon, which is capable of controlling more than one step at a time.

The contacts and countercontacts are made from an electric conducting material, preferably metal and the contacts are set from each other in insulated fashion. Of course, metals which are not or as little as possible subject to corrosion by the atmospheric components and chemicals encountered in the darkroom are preferred. Generally, those metals, which are customarily used in the construction of electrical switches or plugs, are also excellently suited for the construction of the contacts and countercontacts or as a plating provided thereon.

The contacts may be made exactly of the desired size and set upon the carrier of an insulator, or preferably they may be recessed into the carrier of an insulator, so as to be flush with the insulating area between the contacts. They may also be made oversized, and covered by a disc, ring or partial ring of an insulating material, having perforations of the exact desired size at exactly the required relative positions. This expedient is described in detail in my copending application Ser. No. 302,902. Alternatively, an insulator may be printed onto the dial and contacts, leaving exactly dimensioned and positioned contact areas free of insulator.

In the foregoing, the timer has been described and illustrated as the various embodiments, wherein the begin and end of each step is determined by the fast-travelling auxiliary countercontact **28** or **98**, respectively. As the relative rate of travel of the countercontact **26** or **97**, respectively becomes faster, e.g. as a result of increasing the absolute diameter of the dial or of the length of the hand, carrying the countercontact, or as is the case, when a short process schedule of a total duration of e.g. 10 minutes or so is programmed on essentially a whole circle, the relative accuracy of the timing of the individual steps by the basic contacts **25** or **93**, respectively, increases considerably, so that in favorable cases the faster travelling hand and auxiliary countercontacts **28** or **98**, respectively and the arclike coordinated auxiliary contact **29** or **95**, respectively, may no more be needed. The present invention encompasses also such embodiments of the timer, which do not use the expedient of the auxiliary contact and countercontact, yet have an accuracy sufficiently high for the practicing of the presently available color developing processes, as exemplified e.g. in FIGS. **14** to **16** and described hereinafter.

The contacts **25** and **93** have been shown hereinbefore as contact areas having a definite peripheral extension in degrees corresponding to the time value represented by them, with their contact face extending parallel or essentially parallel to the insulating areas or to the dial face respectively, so that a predetermined time will be required until the cooperating countercontact engages, stays in engagement, and disengages after it has travelled for a predetermined distance over and in contact with the contact area. The pin-type wiper blade contact-countercontact combination is much less accurate than the just-described arrangement, and is for this reason not recommended in those cases where the timing of the drainage steps and treating steps is solely provided by the duration of engagement of the basic contact and countercontact pair. However, if the exact begin and end of the drainage steps and treating steps is actually timed and determined by an auxiliary contact-countercontact combination as described hereinbefore, e.g. by the arclike contact **29** or **95**, and by a cooperating auxiliary countercontact engaging therewith, at a considerably high rate of relative travel, the pin-type contacts may be used in certain situations as the basic contacts, if a sufficient degree of accuracy is employed in the placing and dimensioning and in the design and positioning of the wiper blade countercontact. However, it is to be noted that additional problems are introduced and complications may result, if the pin contacts are spaced too close (in the case of very short processing steps), by the fact that the wiper blade may vibrate when it looses contact, intermittently closing the next primary circuit at a premature time. Thus, generally the contacts representing a "contact area" for sliding contact and engagement of the countercontact are generally preferred.

An example of a timer, employing this type of pin contacts as the basic contacts is illustrated in FIGS. **12** and **13**, in which dial **110** is provided with pin-type contacts set in a circle or partial circle in insulating fashion from each other. Minute hand (or slow hand) **112** carries at its free end as the countercontact wiper blade **111**, which as it travels around the dial, successively engages in "wiping fashion" with pin contacts **113**. The length of the wiper blade countercontact and its radial spacing from the pin are designed such that the contact countercontact pair engages for a time in excess of the actual duration of the drainage steps, represented by their engagement. An excess of 10 seconds or more engagement time at the begin and end of the drainage step is usually satisfactory and can usually be achieved with a well-designed pin wiper blade arrangement. Auxiliary arclike contact **114** is provided on the dial as described hereinbefore, and is in cooperation with auxiliary countercontact **115** mounted at the free end of fast-travelling hand **116**. Both hands are set on shafts **117** and **118**, respectively, rotating at differing speeds, shaft **118** being of the tubular type. The actual timing of the treating steps and drainage steps is, in this embodiment of the timer, achieved by the engagement and disengagement of the auxiliary contact and countercontact, as is described hereinbefore, giving an accuracy within a second or less, and permitting an inaccuracy of 10 seconds or even more for the engagement time of the basic pin contacts with their respective countercontact.

In the foregoing the contacts have been described as being dimensioned and positioned such that they represent the drainage steps of the photographic processes to be timed. The drainage steps are usually very short, e.g. 5 seconds, 10 seconds, 20 seconds or 30 seconds or so, and the angular extension of the contacts is accordingly very short. This applies also to the arclike auxiliary contact. If desired, the contacts may also be dimensioned and positioned so as to correspond to and represent the chemical treating and washing steps. In the former case, the primary circuits are completed and closed for the duration of the drainage steps and the signal source is accordingly actuated or activated for that time period. In the latter case, the situation is reversed. The signal source is activated and actuated for the duration of the treating steps. However, as will be apparent, the letter mode of arrangement is limited in its applicability, particular in the case where the expedient of the auxiliary contact and countercontact are used. The former mode of representing the drainage steps by the contact areas is therefore preferred.

In the embodiments of the timer described hereinbefore, the individual contacts have been shown as being part of different primary circuits, so that only one of a plurality of light sources or other signal sources is actuated at different times, in a succession as required by the time schedule of the process to be timed. If only a single signal source, e.g. one light bulb is desired, the individual contacts may be wired together or be part of a contact ring or the like, as described and illustrated in my copending application Ser. No. 302,902. Of course, the contacts or contact ring or the like is also in this case insulated from arclike auxiliary contact. This embodiment of the timer is likewise part of the present application and special reference is made in this respect to said copending application Ser. No. 302,902 now U.S. Pat. No. 3,349,635.

The present invention is also specifically concerned with photographic program timers, which are adapted to provide additional signals such as prewarning signals etc. The present invention is also concerned with timing mechanism of any desired structure and design, such as dial type, belt type, tape type, card type or disc and drum type, in which multiple spaced, travelling or stationary countercontacts make it possible to time simultaneously a plurality of treating sequences in spaced, overlapping fashion as taught e.g. in my copending application Ser. No. 302,902 now U.S. Pat. No. 3,349,685. The multiple countercontacts are spaced from each other by a distance, which corresponds to the time value by which a successive treating schedule is to be started after a previous one. In the case of the perforation type of timing mechanism, the multiple-sequence timing is achieved by spacing a plurality of cooperating countercontact-contact combinations along or around the track of perforations. Advantageously, the multiple countercontacts or countercontact-contact combinations, respectively, are adapted to be adjustable, so that their spacing may be changed according to the desired delay times in a particular situation. The disclosure and teaching of this embodiment of timing mechanism and of the various aspects and features of the multiple-sequence timers, contained in my copending applications Ser. No. 302,902 now U.S. Pat. No.

349,685 and Ser. No. 621,382, now U.S. Pat. No. 3,538,270, is herewith made the subject of the present application and special reference thereto is herewith made herein.

The present application concerns also a process for the timing of photographic multistep batch-treating processes. In its preferred embodiments the process comprises the discontinuous, batchwise treatment of photographic materials in a plurality of photographic baths or stations, comprising the forwarding of the material in steps from one bath or station to the next, after a predetermined residence or treating time in each bath or station, such as the development of photographic color materials of the positive or negative or reversal type, the improvement of providing successive electrical impulses at predetermined time intervals, corresponding to the time schedule required for the treating and drainage steps in said photographic process, whereby a change in the energization of at least one primary electrical circuit is brought about at the end of each chemical treating or washing step, comprised in the process, and at the beginning and end of each drainage step, respectively, forming part of the photographic treating sequence. In this manner also the beginning of each treating schedule is timed as being essentially identical with the end of each drainage step, preceding said treating step. In the preferred embodiment of the process of the invention the primary circuit is energized for the duration of the drainage steps and deenergized for the duration of the chemical treating and/or washing steps, and, if desired, vice versa, it may be energized for the duration of the chemical treating and/or washing steps and deenergized for the duration of the drainage steps.

Advantageously, a signal source is actuated or energized, directly or indirectly, by the primary circuit. The signals may be, for instance, visual or sonic or mechanic or a combination of any two or more of these signals. Visual signals are, for instance, light sources or mechanical devices bringing about a visual change as described, e.g. in my copending application Ser. No. 302,902. Sonic signals may be provided by bells, gongs, or other mechanical devices bringing about a sonic signal. Mechanical signal devices comprise such means as levers or handles changing their position, e.g. by popping pup from a recess, which are particularly suited to be made out by feel in the dark, e.g. by blind persons. The latter type of signal sources is advantageously combined with sonic signals, so that the time is determined by the sonic signal and the location where a change is to be brought about, is indicated by the mechanical signal. In consideration of the foregoing, the process of the invention comprises the steps of inserting the photographic material into a treating bath or station, leaving it therein until a sonic or other signal appears, removing it therefrom at the point of time, when the signal is actuated or beginning, holding the photographic material for drainage as long as the signal is actuated and inserting it into the next bath, when the signal discontinues or stops, and so forth, until all steps of the process including all the drainage steps have been carried out exactly in the required time schedule. Examples of this mode of operating the process of the invention are described and provided hereinbefore in connection with the various embodiments of the timer.

Alternatively, in another embodiment of the process, the material may be inserted into a treating bath or washing location at the appearance of a visual or sonic signal, held therein for treatment, until the signal source is deactivated and discontinues, sending the signal. At this point, the material is removed from the treating bath or washing location, held for drainage, while no signal is emitted and reinserting it into the next bath at the point of time, when a signal is emitted again, and so forth, until the material has been passed through all the steps of the process.

In other words, the signal is emitted or present exactly for the duration of the treating steps and/or washing steps and it is not emitted or present for exactly the length of the drainage steps between treating steps or vice versa, if the signal is present or emitted for the duration of the drainage steps, and it is silent or not emitted for the duration of the treating and/or washing steps. In this manner, the exact point of change of signal is taken as the point of time, at which the material is removed from, or inserted into a treating or washing bath. This makes the timing of photographic processes very exact and reliable, providing also the timing for the drainage steps, which should be observed as closely as possible, particularly in the developing processes for high-quality tricolor photographic materials.

The perceptible signals may be sonic signals, like bells or buzzers, or visual signals like light signals, generated by light bulbs or the like, or mechanical signals, as described in my application Ser. No. 302,902. The change of the energization of the primary circuit may be brought about in exactly the correct time schedule required for the processing of a given material by the use of one of the program timers, described or claimed in the present application or in my copending applications Ser. No. 302,902 or Ser. No. 621,382, or by any other suitable device. In exceptional cases, the signal may also be a mechanical signal, made out by touch or feel, such as a lever popping out or retracting.

In the preferred embodiment of the process, the perceptible signal is a light signal or a sonic signal, which has a duration corresponding to the drainage time desired between steps, (of e.g. 5, 10, 20 or more seconds duration) and wherein the material is removed from the treating bath, wherein it is contained, when the signal appears, and the material is inserted in the next bath, when the signal disappears.

In a more preferred embodiment of the method, an acoustical prewarning signal of short duration is generated at a short interval, e.g. several seconds, prior to the appearance and/or disappearance of each of the light signals.

It is of particular advantage, to employ a plurality of light signal sources, one each coordinated to each treating and washing step, or to each drainage step between the chemical treating and washing steps, as the case may be, or a signal source may be coordinated to each treating, washing and drainage step. Preferably, the light signal sources are physically coordinated to the treating and washing stations, so that the respective light signals do not only indicate the time, when the photographic material is to be removed, held for drainage and reinserted, but it provides also an indication of the exact bath or treating location, where a change is to be made. In this manner, it is possible to treat the material in treating and washing stations, which are not arranged in the required order, eliminating all errors in the proper sequence of insertion. It makes also possible to treat a plurality of batches of material in different stages of the processing schedule simultaneously, so that a plurality of batches of material can be passed through a processor in spaced sequence and treated simultaneously in this manner, as described hereinbefore and in my application Ser. No. 302,902.

Thus, the new method of the invention makes it possible to faithfully carry out the exact time schedule of even the most complex photographic color processes, requiring little attention and no skill for the timing of the photographic operation. For more detail of the method and its operation, special reference is made to the disclosure, appearing hereinbefore, in my copending application Ser. No. 302,902 and in my application Ser. No. 621,382 and the disclosure of these applications is herewith made in this respect part of the present application.

The present application concerns also an exchangeable dial for use in the dial-type program timer, disclosed herein and in my copending application Ser. No. 302,902. The dial comprises at least one track of alternating contact areas and insulating areas, wired together or separately, means for connecting said contacts to one terminal of a signal sources, and means for securing the dial exchangeably in a timer housing, comprising driving means, at least one hand carrying at least one countercontact, and a power source and means for electrically connecting one terminal of the power source to the said countercontact, and means for electrically connecting the

second terminal of the power source to the free terminal of the signal source or signal sources, respectively. For a detailed description of the exchangeable programmed dial, special reference is made to FIGS. **12** and **20** of my copending application Ser. No. 302,902 and to the respective disclosure contained therein, which is made herewith expressly part of the present application. The present invention concerns also exchangeable carrier means, comprising one or more tracks of perforations, dimensioned and spaced, so as to duplicate the process schedule of a photographic multistep treating process. The perforations may represent the chemical treating or washing steps, or the drainage steps, or any other function, as set out hereinbefore, or in my copending applications Ser. Nos. 302,902 and 621,382.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood, that I do not limit myself to the specific embodiments, described or illustrated herein, except as defined in the appended claims.

I claim:

1. A program timer for the timing of a multistep photographic treating process comprising treating steps A and drainage steps B, the latter being all of the same length, which timer comprises at least one carrier on which are contained at least one track of a plurality of electrical contact means *a* spaced from each other, at least one track of at least one contact means *b* on the same carrier or on a separate carrier, said contact means *a* and contact means *b* being electrically insulated from each other, at least one countercontact *x* adapted to cooperate engagingly with said contact means *a*, and a countercontact *y* adapted to cooperate with said contact means *b* engagingly, driving means for bringing about intermittent engagement of said countercontact *x* with said contact means *a* and of said countercontact *y* with said contact means *b*, the latter at a rate of relative travel of at least three times as high as the rate of relative travel of countercontact *x*, whereby either the carriers containing the contact means *a* and *b* are movable and the countercontacts *x* and *y* are stationary or the carrier for contacts *a* and *b* are stationary and the countercontacts *x* and *y* are movable, said timer comprising furthermore an electrical power source and means for conductively connecting the said contact and countercontact means to form at least one primary circuit, which is completed when both countercontacts *x* and *y* engage their respective coordinated contact means *a* and *b*, respectively, wherein contact means *a* have a length, in the direction of relative travel greater than the length of said contact *a* calculated as the product $U_T \cdot t$, wherein U_T is the relative rate of travel of the contact means *a* and the coordinated countercontact *x* in length units per time unit, and *t* is the number of time units of the drainage step B represented by the respective member, and wherein contact means *b* have a length, in the direction of relative travel, which is the product $U_{T1} \cdot t$, wherein U_{T1} is the relative rate of travel of the countercontact means *y* in relation to its coordinated contact means *b* in length units per time unit, and *t* has the above meaning.

2. The timer of claim **1**, in which the contact *a* is a pin-type contact and countercontact *x* is a wiper blade contact cooperating therewith, so that the time of engagement of countercontact *x* and contact means *a* is longer than corresponds to the duration of the drainage step B represented by it.

3. The timer of claim **1**, in which the contact means *a* and *b* are stationary and in which the countercontact means *x* and *y* travel, in successive engagement with their respective coordinated contact means.

4. The timer of claim **1**, in which the carrier is a dial on which the contact means *a* are contact areas, arranged in at least one at least partial circle having a radius r_1, and the contact means *b* is an arclike contact area, having a radius r_2 being different from r_1, and in which the countercontact *x* is provided on a hand S, and countercontact *y* is provided on a second hand T, whereby hand T travels rotatably at a rate which is at least five times higher than that of hand S.

5. The timer of claim **1**, in which the carrier or carriers are exchangeable, comprising means for support

6. The timer of claim **1**, in which all contacts *a* are wired together to form a single primary circuit comprising at least one signal source in addition.

7. The timer of claim **1**, which comprises a plurality of primary circuits, each of which comprises a separate signal source.

8. The timer of claim **1**, in which the tracks of contact means *a* and of contact means *b* are provided on the periphery of at least one cylindrical carrier.

9. The timer of claim **1**, in which at least one of the countercontacts *x* and *y* is stationary and the carrier carrying its coordinated track of contact means is driven by said driving means.

10. The timer of claim **1**, in which all the countercontacts *x* and *y* are stationary and the carriers carrying the tracks of the respective coordinated contact means *a* and *b* are driven by said driving means.