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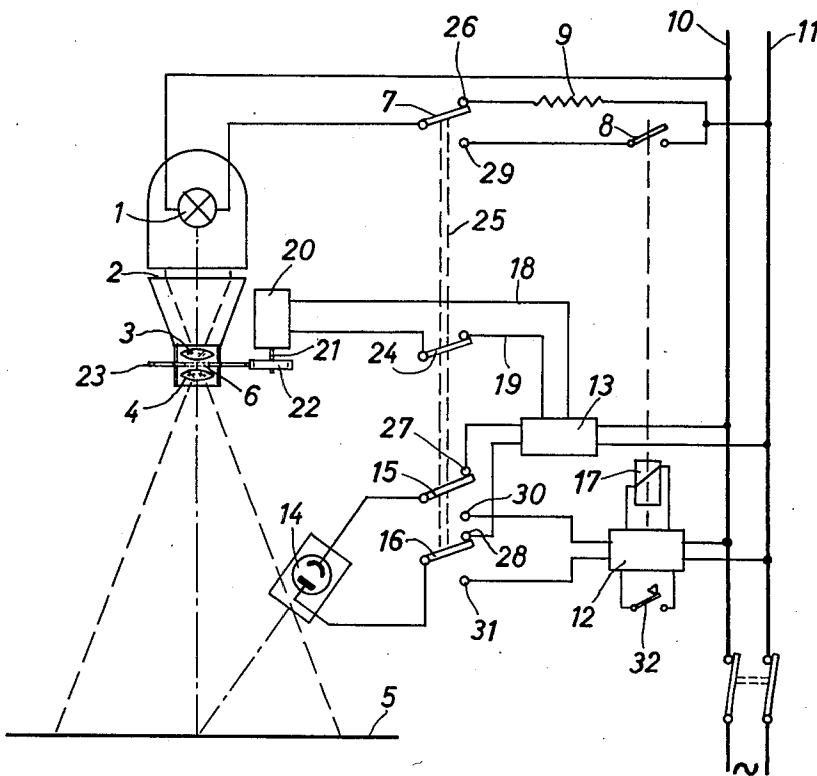
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PHOTOGRAPHIC PRINTING SYSTEM AND METHOD

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2 Sheets-Sheet 1

Fig. 1



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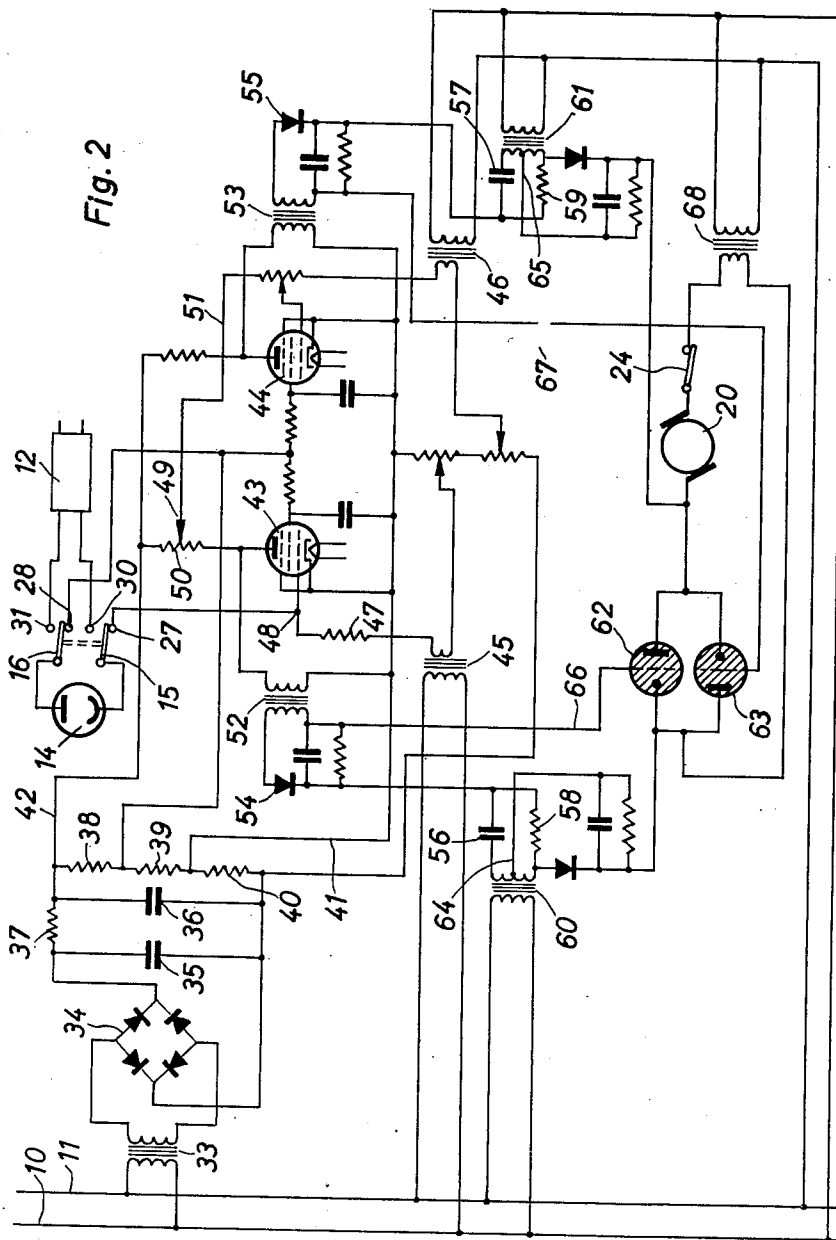
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PHOTOGRAPHIC PRINTING SYSTEM AND METHOD

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The present invention concerns a photographic printing system, and more particularly to a system which comprises photoelectric means for automatically controlling and limiting the exposure time used in the printing operation.

In the following specification and claims the element, usually a negative, from which the desired copy is printed, will be called "image carrier," while the element on which the desired copy is photographically produced, which is usually a photosensitive paper, film or the like, will be called "image receiver."

It is known that in using conventional photographic printing apparatus of the type mentioned above the exposure times to be used vary greatly depending upon the average density or transparency of the image carrier so that, particularly when image carriers of extreme density are to be copied the so-called "Schwarzschild effect" takes place as described for instance in Handbuch der Kamerakunde, Verlag Luitpold Lang, München, 1954, page 190 and page 408.

Photographic printing apparatus with automatic exposure control have been proposed which operate in such a manner: the exposure time is kept constant while the intensity of the copying light is varied corresponding to the density of the particular image carrier. By using an apparatus of this particular type the above mentioned Schwarzschild effect is eliminated but the constant exposure time must be chosen in such a case to be so long that even image carriers or negatives of the greatest density can still be printed with the copying light of the maximum available intensity. It can be seen that in this manner of operation the exposure time for image carriers of lesser or medium density will be extremely long so that consequently the production time for the photographic printing process is greatly extended. This is certainly most undesirable and therefore the conventional printing apparatus cannot be considered to be satisfactory in view of present requirements.

In view of this situation, it is the main object of this invention to provide a photographic printing system and method which overcomes the disadvantages of the known apparatus and processes.

It is another object of this invention to provide a photographic printing system and method which is comparatively simple and reliable, yet most economical particularly with respect to the required production time.

With above objects in mind, the present method and the photographic printing system according to this invention mainly comprises, in addition to automatic photoelectric means for controlling and limiting the exposure time, additional photoelectrical control means which automatically adjust the illuminance produced by the light flux passing through the image carrier and produced on the surface of the image receiver, to a selected normal value corresponding to a desired standard exposure time, yet compatible with the image-producing characteristics of the image receiver material.

It is to be understood that the above mentioned photoelectrical means comprise photo-responsive means as for instance a photocell, located in the path of the light radiation in an area beyond the image carrier so that the action of these photo-responsive means depends upon

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the illuminance produced on this photo-responsive means. As a rule photo-responsive means for the above-mentioned purpose cannot be placed in the plane of the image receiver but will be suitably arranged either laterally offset opposite the front face of the image receiver support in which case the light reflected from the surface of the latter or from the image receiver proper will impinge on the photo-responsive device and create a certain illuminance thereon, and, seen in the direction of radiation, at a point beyond the image receiver so that in the system according to the invention the illuminance produced on the photoresponsive device can be used instead of the actual illuminance appearing on the surface of the image receiver, for deriving therefrom the required controls.

In a preferred embodiment of the invention the illuminance produced on the photo-responsive means, and thereby the illuminance appearing on the image receiver, is automatically controlled. For this purpose, control means depending upon the response of the photoresponsive means to the illuminance produced thereon, may comprise an electromotor which is operatively connected with means for adjusting the luminous flux reaching the image receiver after passing through the image carrier. The adjustment of the flux may be carried out for instance by varying emission intensity of the source of light, e.g. by changing the effect of an additional variable resistor in the circuit of said source of light, through the operation of the above-mentioned motor. Preferably, however, the flux is adjusted by means of an adjustable light stop or diaphragm incorporated in the optical system of the light source and operatively connected with the above-mentioned motor.

Arrangements can be provided permitting to have the adjustment of the luminous flux carried out at a time before the exposure of the image receiver takes place in the actual printing operation, or so that the above-mentioned adjustment takes place automatically during the exposure of the image receiver.

In a special embodiment of the invention as set forth the above-mentioned photoresponsive means may consist in a photoelectric cell, the effect produced thereby in response to the applied illuminance being used by both said first and second control means for carrying out the adjustment of the luminous flux as well as the control and limitation of the exposure time, respectively. If both these control operations are not to be carried out simultaneously then it is advisable to connect the photoelectric cell with switch means which permit to alternatively connect the photocell with either said first or said second control means.

Usually photographic printing apparatus are provided with a switching device which permits altering of the emission intensity of the source of light from the value ordinarily used for the actual copying or printing process, to a reduced value in fixed proportion therewith which is preferably used in the period during which the image receiver is properly located on some support-surface of the apparatus or otherwise only experimentally handled before the start of the actual exposure. In certain cases it is advisable to connect the above-mentioned switching means for the photocell with the switching means just mentioned for joint operation so that the photocell can be electrically connected with a control means at the same time and by the same manual operation as the switching means for altering the light intensity as mentioned above.

In a similar manner the switching means for altering the light intensity as mentioned above may be connected for joint operation with a switch controlling the operation of the above-mentioned electromotor.

It can be seen that a photographic printing system as provided by this invention entails substantial advantages

since the range of exposure times required in printing from image carriers of various densities or transparencies can be substantially reduced on account of the proposed adjustment of the luminous flux which adjustment does not even have to be extremely accurate. In this manner the so-called Schwarzschild effect is substantially eliminated hereby. In the course of ordinary commercial operation of such printing devices handling image carriers of varying density the total of the exposure times is greatly reduced as compared with those required in conventional apparatus operating with constant exposure times. This is particularly true because the above-mentioned selected normal value of the illuminance produced on the surface of the image receiver, expressed in terms of illuminance appearing on the photoresponsive means, to which the apparatus according to the invention is adjusted, can be chosen to be comparatively large. This will suffice for all ordinary cases. But even in case the image carrier has an extreme density so that the above-mentioned predetermined value of illuminance would still not be sufficient on account of the great absorption of light in the image carrier, then the automatic control of the exposure time will still serve to obtain entirely satisfactory prints or copies also in cases of this nature.

On the other hand by adjusting the luminous flux for an illuminance of a selected normal value a procedure is secured by which even in handling image carriers of little density or great transparency the exposure time will not fall short of a certain desirable amount in spite of the small absorption of light in the image carrier. This just mentioned lower limit of the exposure time is mainly predetermined simply by the inertia or time lag characteristic of certain relays used in the apparatus, and in the case of printing devices comprising means for additional light exposure of the image receiver material for the purpose of obtaining desired contrasts, the above-mentioned lower limit value of exposure time is determined by the required time of applying the said additional light exposure.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIGURE 1 is a diagrammatic schematic illustration of a photographic printing system according to the invention, comprising means for automatic control of the exposure time and automatic means for changing the size of a light stop or diaphragm incorporated in the optical system of the device; and

FIGURE 2 is a schematic electrical wiring diagram illustrating a circuit incorporated in the means for adjusting the aperture of the light stop or diaphragm shown in FIGURE 1.

Referring now particularly to FIGURE 1, an optical, i.e., enlarging type, printing apparatus is shown as incorporating a lamp 1 constituting the source of light, a holding device 2 for receiving in sequence the particular image carriers, and a projection system comprising objective lenses 3, 4 whereby an accurately focused image can be produced on an image receiver (not shown) placed on the image receiver support 5. Between the lenses 3 and 4 an adjustable light stop, for instance an iris diaphragm 6 is arranged. The light source or lamp 1 can be operated at two different emission intensities because the circuit connecting the lamp 1 with the general supply lines 10 and 11 includes two branches, one of which contains a light switch 8 while the other one contains a resistor 9. A change-over switch 7 is connected between said two branches and the lamp 1, each of said branches ending in one of the two stationary contacts 26 and 29. Therefore the switch 7 can be used for altering the emission intensity of the lamp 1 by throwing this switch into one or the other

of its two positions. It is clear that the emission intensity will be lower when the switch 7 is in the position shown in FIGURE 1, i.e., in series with the resistor 9.

The printing system as shown in FIGURE 1 further contains a control device 12 for automatically controlling or limiting the exposure time and a second control device 13 for automatically controlling and adjusting the luminous flux caused by the emission radiation from the lamp 1, the device 13 controlling the iris diaphragm 6. The last-mentioned control devices 12 and 13 are also connected to and supplied by the power lines 10, 11. Either one of the control devices 12 and 13 can be connected by means of a two-pole change-over switch 15, 16 with a common photoelectric cell 14 which constitutes the photo-responsive means of the system. As can be seen, the switch arm 15 can alternatively contact either the stationary terminal 27 belonging to the control device 13 or the stationary terminal 30 belonging to the control device 12, while similarly the switch arm 16 can in its first position contact the stationary terminal 28 of the device 13 and in its second position contact the stationary terminal 31 belonging to the control device 12. The photoelectric cell 14 being preferably a secondary emission photomultiplier tube, is arranged in a predetermined location within the path of the light radiation coming from the lamp 1, in this particular case in such a manner that light is reflected from the surface of an image receiver placed on the support surface 5, and directed as a reflected beam onto the photocell 14. The control device 12 for controlling or limiting the exposure time is not illustrated in detail because devices of this type are entirely conventional. It may suffice to state that devices of this type include a time control capacitor the charge of which is influenced by the current derived from the cell 14, and a relay 17 which controls the previously mentioned light switch 8 by mechanical connections suggested by the dotted line connecting the relay with said switch. A starter switch 32 is provided for closing the operative circuit of the device 12 and thereby to energize the relay 17 and to close the light switch 8, while the relay 17 is de-energized and the light switch 8 is returned to open position under the action of the circuit contained in the device 12 under the influence of the photo cell 14 when the particular image receiver has been sufficiently exposed under the prevailing circumstances.

The second control device 13 is connected by conductors 18 and 19 with an electromotor 20 which carries on its shaft 21 a gear 22 which, in turn, meshes with a gear 23 constituting the control ring of the iris diaphragm 6. Consequently the aperture of the diaphragm 6 can be adjusted by the motor 20 depending upon its direction of turn in such a manner that this aperture is either enlarged or reduced. A motor switch 24 is provided in the connection 19.

As can be seen, in this preferred embodiment the switch arms 15, 16 are mechanically coupled with the motor switch 24 and also with the above-mentioned change-over switch 7 of the lamp circuit, the connection being illustrated diagrammatically by the dotted lines 25. Consequently the just-named switches can be operated jointly.

In operation, when the just-mentioned switches are in the position shown in FIGURE 1, i.e., if the photo cell 14 is connected with the second control device 13, the motor 20 being connected with the device 13 by the closed switch 24, then the response of the photo cell 14 to the illuminance produced thereon by the reflected light as mentioned above, will influence the device 13 in such a manner that the motor 20 adjusts the iris diaphragm 6 until through the corresponding adjustment of the luminous flux the illuminance on the photo cell 14, or the related illuminance on the image receiver placed on the supports surface 5, reach, at least approximately, the above-mentioned selected normal value. Further details of an example of the control device 13 are described further below with reference to FIGURE 2.

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It can now be seen, that after the insertion of an image carrier or negative into the holder 2 the emission intensity of the lamp 1 may be reduced so that the projection of the image onto the plane 5 can be examined with respect to the accuracy of focusing, the quality of the image in the image carrier and the quality of contrast thereof etc. For this purpose the switch 7 and together with it the switches 24 and 15, 16 are in the position shown in FIGURE 1. Consequently, the photoelectric cell 14 and the motor 20 are both connected with the control device 13.

The illuminance produced on the photo cell 14 by the light rays reflected by the image receiver on the surface 5 causes the photo cell 14 to produce a current the strength of which has a predetermined relation to the illuminance produced by the light emitted by the lamp 1, and more specifically to the luminous flux reaching the image receiver after the light has passed through the image carrier and the aperture of the iris diaphragm 6. It is to be noted that said values depend on the emission intensity of the light source 1 which is now reduced at a fixed ratio by the action of the switch 7 and by the fixed resistor 9. Now, due to the action of the motor 20 which is controlled by the device 13, the iris diaphragm 6 will be adjusted until the current produced by the photo cell 14 reaches a value which substantially corresponds to the illuminance produced by the reduced emission intensity of the lamp 1 on the surface of the image receiver placed on the support surface 5. It must be noted that depending upon the characteristics of the image carrier the iris diaphragm 6 will have to be either opened to a larger aperture or closed to a smaller aperture, from whatever previous aperture there may have existed, by the rotation of the motor in one or the other direction. For obvious reasons the aperture adjustment of the diaphragm 6 is limited in both directions. It could well occur that in the case of handling an image carrier of extremely great density the aperture of the diaphragm 6 is opened by the above-described operation to its maximum, in which case possibly the illuminance produced on the surface of the image receiver has the greatest obtainable value which may still be below the desired and predetermined value. It must be also borne in mind that in this particular form of operation of the device the value of illuminance predetermined by the magnitude of resistor 9 and produced on the image receiver for causing the adjustment of the aperture of the diaphragm 6 is related to a predetermined value of emission intensity of the lamp 1 which is not the same as the emission intensity to be used later during the actual printing operation when the effect of resistor 9 is eliminated. However it is evident that things can be arranged in such a manner that the reduced emission intensity determined by resistor 9 during the above-described preliminary operation is in a fixed relation to the emission intensity used in the printing process, so that the corresponding values of the illuminances in either case also are in a fixed relation. Thus it is possible that the aperture adjusted in the above-described preliminary process is the correct aperture for the subsequent printing process.

Now the group of switches 7, 24 and 15, 16 may be swung into their opposite positions so that the lamp 1 is now directly connected via terminal 29 to the light switch 8 while the motor 24 is switched off so that the adjusted aperture of the diaphragm 6 will not change any more, and moreover the photo cell 14 is connected by the switch arms 15, 16 with the exposure time control device 12.

It is quite feasible that in the above described operation no image receiver is placed on the support surface 5 so that the reflection from this surface instead of the reflection from the image carrier material is being used for directing rays to the photo cell 14. In that case now the photo receiver material is to be placed on the

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support surface 5. In fact, this latter procedure will be the rule if image receiver material of comparatively high sensitivity is being used. In any case, now the starter switch 32 of the device 12 is operated whereby the light switch 8 is closed through the action of the relay 17 so that the exposure is started. Due to the previous adjustment of the aperture of the diaphragm 6 the illuminance on the image receiver has now the predetermined value. Should however, as described above, in the case of an extremely dense image carrier the opening of the aperture of the diaphragm 6 have been limited by reaching its maximum, then at least the illuminance on the image receiver will be at a value which is as close as possible to the predetermined value thereof.

As soon as the required and predetermined amount of illumination has been applied to the image carrier and thereby to the photo cell 14 the relay 17 will be de-energized in the well known manner of operation of the exposure time control device 12 so as to open the switch 8 whereby the exposure is automatically terminated.

Referring now to FIGURE 2, a preferred embodiment of the second control device 13 is described in detail. A power supply unit of conventional type comprising a transformer 33, a rectifier 34 and the elements 35, 36, 37 of a filter chain circuit is connected to a regular power supply line 10, 11 which furnishes alternating current. The necessary operating voltages for the cathode and anode of each of two control tubes 43, 44 are furnished via a voltage divider 38, 39, 40 through lines 41, 42. The control tubes 43, 44 are pentodes the cathode heating coils whereof are connected in a well known manner, not shown, with the alternating current supply. The tubes 43, 44 are supplied at their control grids with approximately 1 volt A.C. voltage by means of transformers 45, 46. When the arms 15, 16 of the above-described changeover switch are in the position shown in the drawings, the photoelectric cell 14 is connected with the stationary terminals 27, 28, respectively, of the device 13 and therefore constitutes together with the resistor 47 a voltage divider the junction point 48 between them constituting a center tap of the voltage divider which is connected with the control grid of the tube 43. Therefore, depending upon the intensity of the current produced in the cell 14, the potential at the control grid of the tube 43 is altered so that the amplification produced by this tube is correspondingly changed.

A movable tap 49 of the resistor 50 arranged in the anode circuit of the tube 43 is connected by the conductor 51 with the control grid of the tube 44 so that the latter is controlled in a sense opposite to that of the tube 43. Consequently, the more illuminance is produced on the photo cell 14 the output A.C. voltage of the tube 43 increases while the output voltage of the tube 44 decreases. Thus, by adjustment of the tap 49 the device 13 can be calibrated to the sensitivity of the image receiver material, and corresponding to the desired or selected normal illuminance.

Between the cathodes and anodes of the control tubes 43, 44, respectively, are connected the primary windings of transformers 52, 53, respectively, which transform the anode voltages of the control tubes 43, 44, respectively, and furnish the transformed voltages to the rectifiers 54, 55, respectively. These rectifiers are connected with phase shifting devices which comprise in well known manner each a condenser 56, 57, respectively, and a resistor 58, 59, respectively, the current supply being carried out by the secondary windings of the transformers 60, 61, respectively.

The two-phase shifting devices are connected respectively with thyratrons 62, 63 which are connected with each other in anti-parallel relation, and both in series with the armature of the diaphragm adjustment motor 20, and in series with the motor switch 24, the latter being connected with the secondary winding of the trans-

former 68. The cathode bias voltage for the thyratrons 62, 63 is obtained from the center taps 64, 65, respectively, of the secondary windings of the transformers 60, 61, respectively. The anode output voltages of the control tubes 43, 44 are rectified by the rectifiers 54, 55, respectively, and are superimposed to the voltages derived from the phase shifting devices 56, 58 and 57, 59, respectively, and said superimposed voltages are then furnished to the grids of the thyratrons 62, 63, respectively, via the connections 66, 67, respectively. On account of the interpolation of the above-mentioned phase shifting devices the grid and anode voltages in each of the two thyratrons 62, 63 are out-of-phase with respect to each other, preferably by 90°.

By means of proper selection of elements or adjustment of adjustable elements shown but not described in detail the whole circuit is so adjusted that in the case of an image carrier of average transparency or density requiring for a desired standard exposure time a corresponding selected normal illuminance, adjusted by tap 49 to suit the particular image receiver material, the anode A.C. voltages of the two control tubes 43, 44 are equal to each other. Therefore the two thyratrons 62, 63 carry currents which are of equal magnitude but directed opposite to each other. These currents compensate each other in the motor circuit and have therefore no effect. The armature of the motor 20 which is actually a D.C. motor with a permanent magnet field is therefore at rest.

In case a negative or image carrier of little density or little black content is placed into the support device 2 of the projector then the illuminance produced on the photoelectric cell 14 will be greater than the above mentioned selected normal illuminance whereby the potential at the grid of the tube 43 is increased. Consequently the amplification effected by this tube increases and the anode voltage of the tube 43 and consequently also the D.C. grid voltage component of the thyatron 62 are increased with the result that the ignition point of the thyatron 62 is reached later and the current passing through this tube 62 is reduced. At the same time the amplification of the control tube 44 is reduced whereby the D.C. voltage component at the grid of the thyatron 63 is likewise reduced with the effect that the current through this tube increases. Now the current passing through the thyatron 63 is no longer completely compensated by the oppositely directed current passing through the thyatron 62 so that the armature of the motor 20 will start to rotate in one particular direction depending upon the direction of the difference current and at a speed depending upon the strength of that current. Hereby the aperture of diaphragm 6 of the printing apparatus is reduced in the above-described manner until the illuminance produced on the photoelectric cell 14 is approximately reduced to the above-discussed selected normal illuminance. In extreme cases it may happen that the aperture is reduced to complete closure thereof.

On the other hand, if the particular image carrier is rather dense or of intense blackness with little transparency, the same control process develops except in the opposite direction.

It will be understood that the photographic printing system according to the invention can be modified in various ways departing in certain respects from the details of the embodiment illustrated in the drawings. For instance, the adjustment of the luminous flux from the lamp 1 could be obtained by using instead of the iris diaphragm 6 a number of adjustable light stops of a different kind, or by other suitable means for reducing the flux, among which may be a variable electrical resistance in the circuit of the lamp 1, particularly in the branch thereof which contains the light switch 8. In such a case, the shaft 21 of the motor 20 would have to be operatively connected with the movable tap of such a variable resistor.

Instead of using a motor 20 and a motor controlled

variable resistor in the lamp circuit, the variation of the emission intensity of the light source may also be obtained by electronic means controlling the lamp current directly in response to the varying conductive condition or other effect of the photoelectric cell, a method which is known per se as being used in electronic light control equipment. Since in this particular case the variation of the emission intensity of the light can be achieved without any time lag it is well possible to carry out the adjustment of the luminous flux instead of during the preliminary operations described above, simultaneously with the actual exposure of the image receiver.

While in the above-described embodiments of the invention one photoelectric cell 14 has been proposed for being used commonly and jointly for both control devices 12 and 13, the system is not basically changed if instead two separate photoelectric cells are provided one of which would be associated and connected with the control device 12 while the other one would be associated and connected with the second control device 13.

It should be further noted that it is quite possible to arrange in the path of light radiation between the image carrier and the image receiver a semi-transparent mirror for reflecting the light onto the photoresponsive means. Particularly in this latter case it is possible to mechanically connect the starter switch 32 with the switch 7 so that the exposure time control device 12 is automatically started the moment the intensity of the light source 1 is switched from reduced intensity to full printing intensity. Of course, in that case the image receiver material must be placed on the supporting surface 5 before the switch 7 is moved into the position shown in the drawings and the lamp 1 is switched on to reduced intensity, and then the image carrier material should be covered in the preliminary operation of the lamp 1 at reduced intensity, for which the use of an automatically operating covering device is advisable as it is known in so-called roll copying machines. Moreover, the starter switch 32 may also be operated by means of other devices forming part of the apparatus and having to be operated anyway during the operation; for instance the switch 32 may be operated automatically by a cover which may be provided for temporarily covering the surface 5.

While in all the embodiments described and mentioned reference has been had to a photographic printing device of the projector or enlarger type, it should be understood that the invention can be applied with the same advantageous effects also to so-called contact type printing apparatus. The invention is also applicable to roll copy machines, particularly to those which comprise a device for additional, uniform light exposure of the image receiver for the purpose of influencing the production of suitable contrast in the printed copy.

While in the above specification the means for adjusting the luminous flux have been described as operating automatically, it is still possible to modify the invention in such a manner that instead of the automatic control of this adjustment means are provided which merely indicate when the desired and predetermined value of illuminance on the image receiver is obtained. This means, that in this case the measurable effect of the photoresponsive means is such an indication. In accordance with the indication mentioned above the actual adjustment of the luminous flux will have to be carried out by hand separately, the means of changing the flux being of any one of the types described above. The indicating means mentioned above could simply be a photo-electrical exposure meter the indicating member whereof would have to be moved by adjusting the aperture of the diaphragm or by adjusting a resistor in the lamp circuit until it registers with a fixed index or, in the case of working with image carriers of extreme density, would be caused to move as closely as possible to such an index mark.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of photographic printing systems differing from the types described above.

While the invention has been illustrated and described as embodied in photographic printing system with automatic exposure time control, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention as defined in the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a photographic printing apparatus for producing photographic prints from transparencies on light-sensitive printing material, in combination,
 - (a) projecting means for projecting an image of a transparency to an area at which a light-sensitive printing material is to be located so as to be exposed at said area to light passed through said transparency;
 - (b) adjustable intensity varying means cooperating with said projecting means for adjusting the intensity of the illumination of said area, said adjustable intensity varying means having a given range of adjustability;
 - (c) adjusting means for adjusting said intensity varying means and including sensing means for sensing the intensity with which said area is illuminated by light passed through said transparency, said sensing means being operatively connected with said intensity varying means for automatically adjusting the latter depending on said intensity so sensed so as to provide within said range of adjustability an intensity of illumination at said area which with a given exposure time will provide a given exposure; and
 - (d) timing means cooperating with said projecting means for providing said given exposure determined as the product of said adjusted intensity of illumination and said given exposure time, said timing means being operatively connected with said sensing means and controllable thereby for providing said given exposure time in the case where the characteristics of said transparency are such that within said range of adjustability of said intensity varying means it is possible to provide said given exposure, and for providing, in the case where the characteristics of said transparency are such that within said range of adjustability of said intensity varying means it is not possible to provide said given exposure, an exposure time different from said given exposure time and which with said intensity varying means at one end of its range of adjustability will provide said given exposure.
2. Apparatus as claimed in claim 1, wherein said sensing means include a photoelectric cell operatively connected with both said adjusting and said timing means.
3. Apparatus as claimed in claim 2, wherein said adjusting and timing means include switch means operatively connected with said photoelectric cell for alternatively connecting the latter with said adjusting and timing means.
4. Apparatus as claimed in claim 3, including control means for altering the intensity of said light passed through said transparency, and wherein said control means is coupled for joint operation with said switch means.
5. Apparatus as claimed in claim 2 wherein said adjusting means includes electric motor means operatively connected with said intensity varying means for adjusting the latter, and wherein said adjusting and timing means include switch means operatively connected with said photoelectric cell for alternatively connecting the latter with said adjusting and timing means, said adjusting means including auxiliary control means for establish-

ing the operability of said motor means, said auxiliary control means being coupled for joint operation with said switch means.

6. In a photographic printing apparatus for producing photographic prints from transparencies on light-sensitive printing material, in combination,

- (a) projecting means for projecting an image of a transparency to an area at which a light-sensitive printing material is to be located so as to be exposed at said area to light passed through said transparency;
- (b) adjustable intensity varying means cooperating with said projecting means for adjusting the intensity of the illumination of said area, said adjustable intensity varying means having a given range of adjustability;
- (c) sensing means including at least one photoresponsive means for sensing the intensity with which said area is illuminated by light passed through said transparency;
- (d) adjusting means for adjusting said intensity varying means and controllable by said sensing means for automatically adjusting said intensity varying means depending on said intensity sensed by said sensing means so as to provide within said range of adjustability an intensity of illumination at said area which with a given exposure time will provide a given exposure; and
- (e) timing means cooperating with said projecting means for providing said given exposure determined as the product of said adjusted intensity of illumination and said given exposure time, said timing means being operatively connected with said sensing means and controllable thereby for providing said given exposure time in the case where the characteristics of said transparency are such that within said range of adjustability of said intensity varying means it is possible to provide said given exposure, and for providing, in the case where the characteristics of said transparency are such that within said range of adjustability of said intensity varying means it is not possible to provide said given exposure, an exposure time different from said given exposure time and which with said intensity varying means at one end of its range of adjustability will provide said given exposure.

7. Apparatus as claimed in claim 6, wherein said adjusting means for automatically adjusting said intensity includes electric motor means and adjustment means operatively connected with said intensity varying means for adjusting the latter.

8. Apparatus as claimed in claim 6, wherein said adjustable intensity varying means comprises adjustable light stop means located in the path of said light passed through said transparency.

9. Apparatus as claimed in claim 6, including means for changing the emission intensity of said light passed through said transparency from that used for the printing operation to an intensity being a fixed fraction of the former.

10. Apparatus as claimed in claim 6, wherein said adjusting and timing means are capable of operating simultaneously.

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