

April 2, 1963

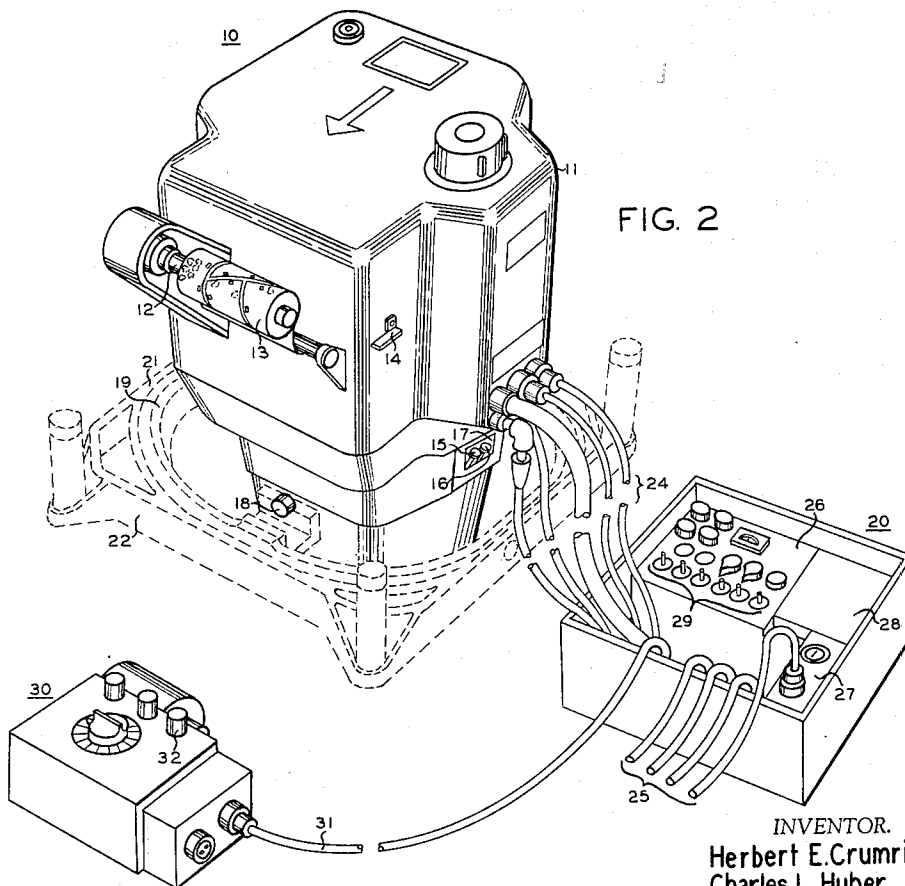
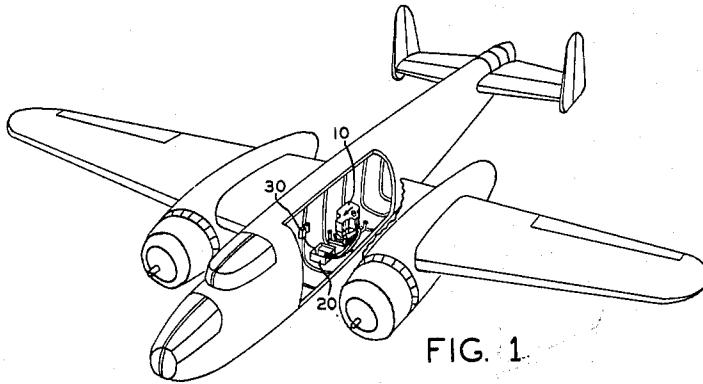
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3,083,869

XEROGRAPHIC PLATE MAGAZINE AND FEEDING APPARATUS

Original Filed June 3, 1957

5 Sheets-Sheet 1



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XEROGRAPHIC PLATE MAGAZINE AND FEEDING APPARATUS

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5 Sheets-Sheet 2

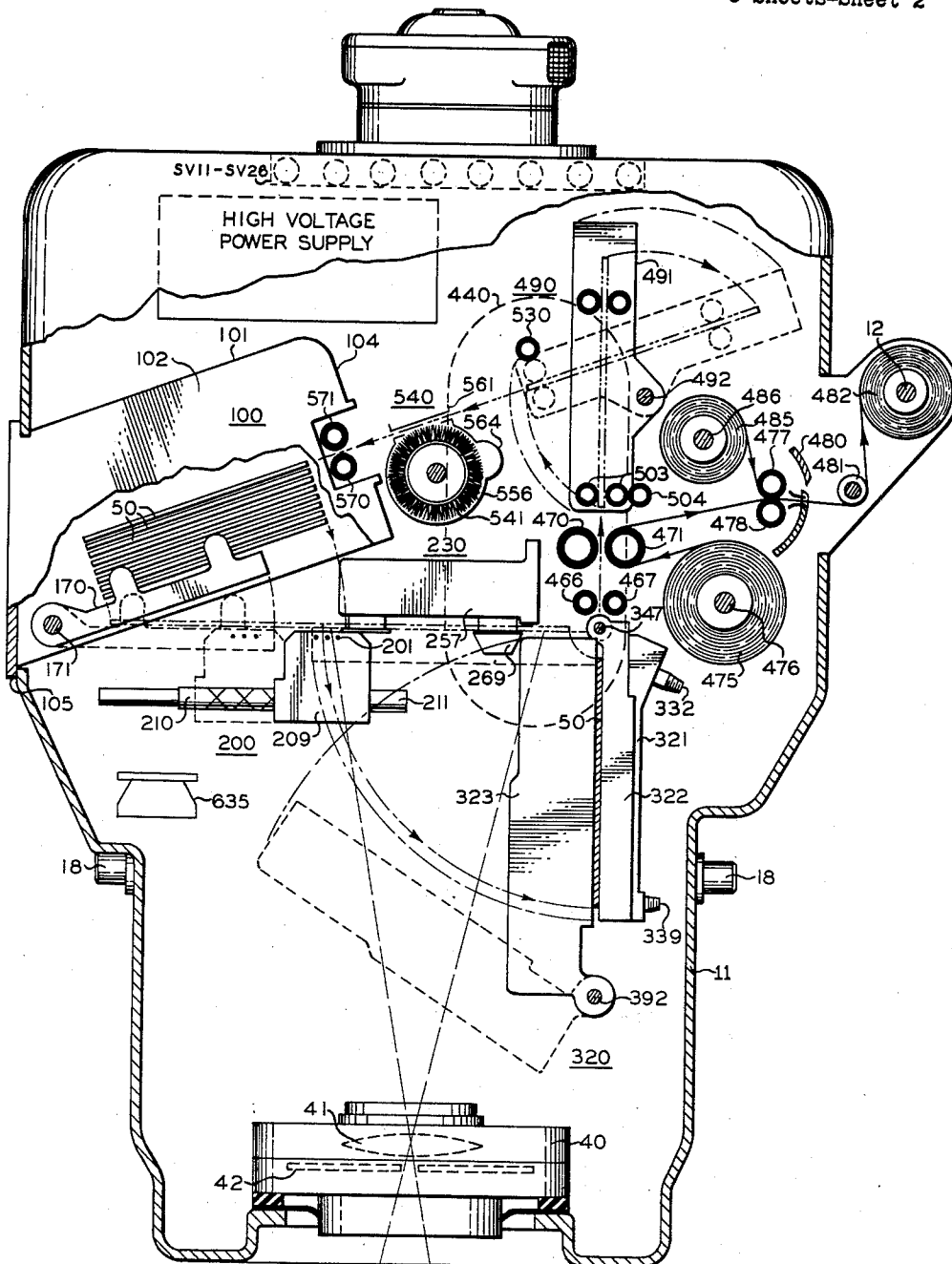


FIG. 3

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5 Sheets-Sheet 3

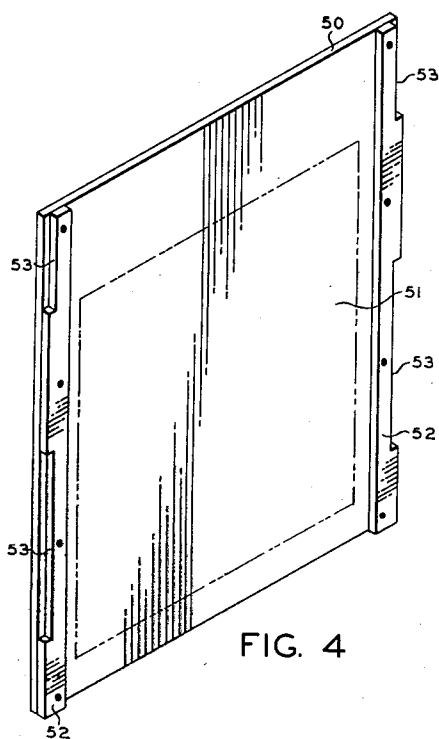


FIG. 4

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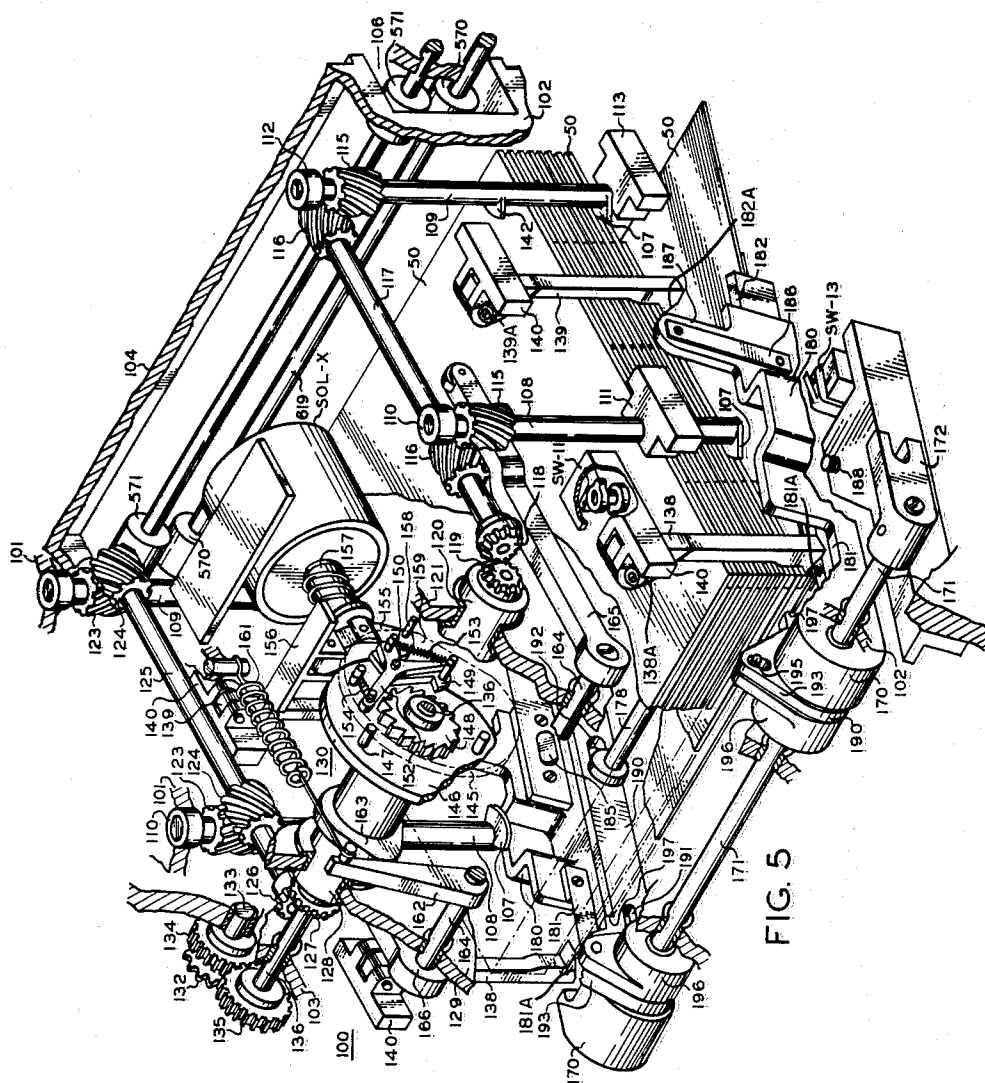
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XEROGRAPHIC PLATE MAGAZINE AND FEEDING APPARATUS

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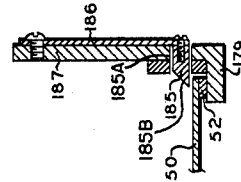
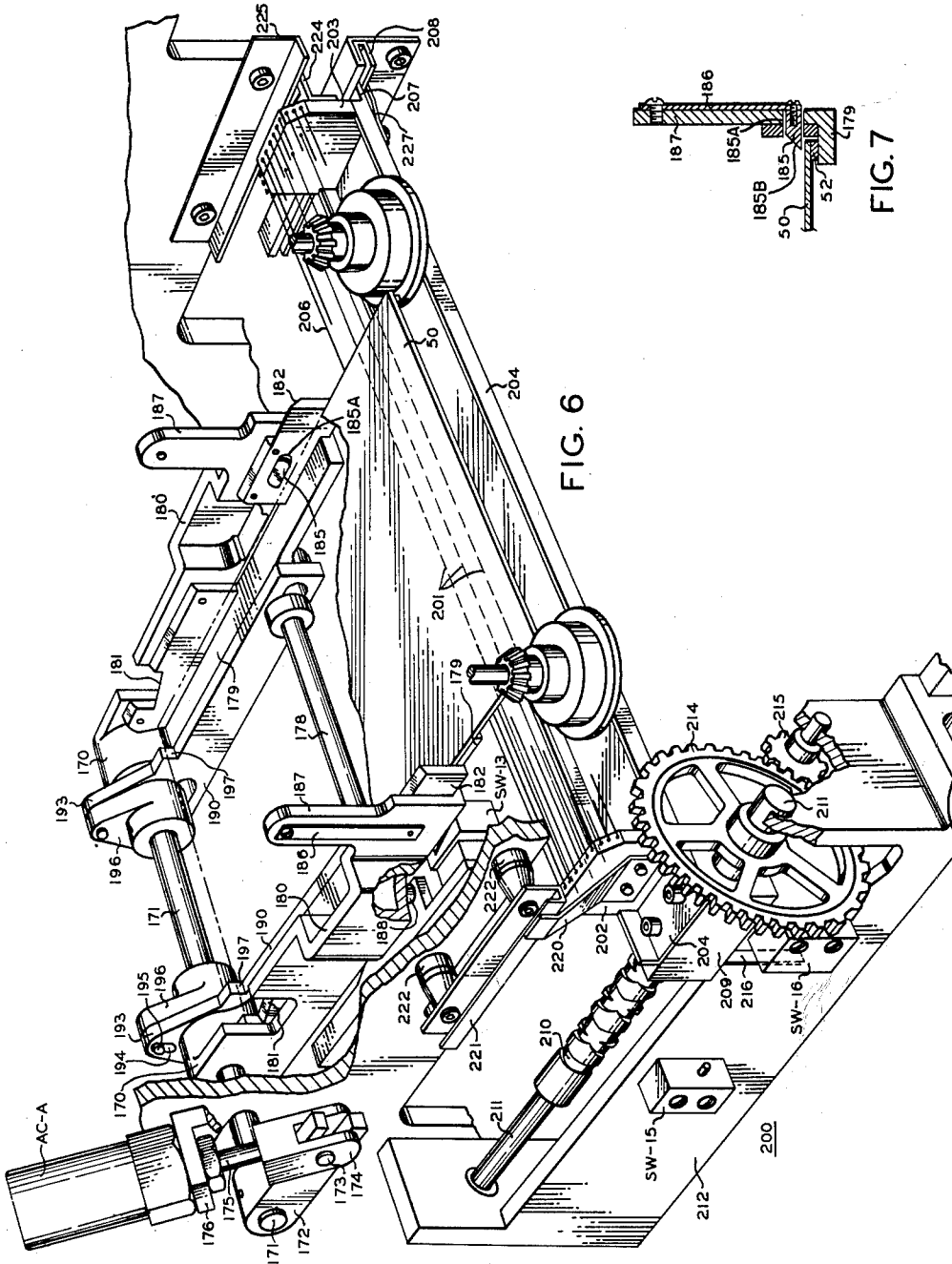
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XEROGRAPHIC PLATE MAGAZINE AND FEEDING APPARATUS

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3,083,869

XEROGRAPHIC PLATE MAGAZINE AND FEEDING APPARATUS

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Original application June 3, 1957, Ser. No. 663,085, now Patent No. 3,009,402, dated Nov. 21, 1961. Divided and this application Dec. 24, 1958, Ser. No. 782,773
4 Claims. (Cl. 221-293)

This invention relates to the field of xerography and, particularly, to improvements in automatic xerographic processing equipment for forming direct xerographs.

In the process of xerography, for example, as disclosed in Carlson Patent 2,297,691, issued October 6, 1942, a xerographic plate comprising a layer of photoconductive insulating material on a conductive backing is given a uniform electric charge over its surface and is then exposed to the subject matter to be reproduced, usually by conventional projection techniques. This exposure discharges the plate areas in accordance with the light intensity that reaches them, and thereby creates an electrostatic latent image on or in the photoconductive layer. Development of the latent image is effected with an electrostatically charged, finely divided material, such as an electroscopic powder, which is brought into surface contact with the photoconductive layer and is held thereon electrostatically in a pattern corresponding to the electrostatic latent image. Thereafter, the developed xerographic powder image is usually transferred to a support surface to which it may be fixed by any suitable means.

Following the disclosure of the basic electrophotographic or xerographic techniques in the Carlson patent, many improvements have been made in xerographic plates and developing materials to increase plate sensitivity and panchromaticity and to improve resolution of the final image structure. In addition, many improvements have been made in each of the component devices for effecting xerographic processing, i.e., in devices for electrostatically charging xerographic plates, in devices for exposing such plates, in apparatus for developing electrostatic latent images, in xerographic powder image transfer devices, and in powder image fixing devices. For the most part such improvements have been employed in apparatus for reproducing line copy images, and such devices are presently in wide commercial use for this purpose. However, the additional complexities involved in forming continuous tone images by xerographic techniques has heretofore hindered the application of such techniques to the field of direct photography.

The principal object of the invention is to improve xerographic plate handling devices to permit rapid, uniform and positive movement of a rigid xerographic plate through an automatic xerographic processing apparatus. A further object of the invention is to improve xerographic plate storage devices to permit repetitive processing of successive xerographic plates seriatim.

These and other objects of the invention are attained in a preferred embodiment which comprises a self-contained, fully automatic, xerographic system that is intended for use in an aircraft for producing successive, continuous tone, aerial xerographs under the control of an intervalometer. Essentially, the apparatus includes a magazine assembly for storing xerographic plates, a charging assembly for forming a uniform electrostatic charge on the photoconductive surface of each plate, a lens and shutter assembly for making exposures, a development assembly for developing the latent images on the plates, a printing assembly for transferring developed images to a continuous paper strip, brush cleaning devices for removing residual developing powder from the

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xerographic plates and the development electrode of the developing assembly, and plate handling and control devices associated with these assemblies to form a completely integrated and fully automatic system.

In operation, xerographic plates are fed seriatim from the magazine to an exposure position and, in transit, each plate is charged by a scorotron or screened corona discharge device that places a uniform positive electrostatic charge over the surface of the plate. The plate is then passed to an exposure position wherein it is exposed in conventional manner to form a latent pattern of electrostatic charges thereon that corresponds to the subject of the exposure, and is then transported to a development chamber wherein it is positioned adjacent to a development electrode. Development is effected by a negatively charged developing powder that is injected into the chamber from a powder cloud generator connected thereto, the powder particles being electrostatically attracted to the positive charge pattern formed on the plate. When development is complete, the chamber is scavenged by low pressure air to remove developing powder suspended in the air of the chamber. The chamber is then partly opened, and the plate is advanced to feed rolls that pass it through pressure rolls in conjunction with a continuous, adhesive-coated, paper strip whereby the powder image formed on the plate is transferred to the adhesive strip. Once the plate is clear of the developing chamber, the chamber is reclosed and scavenged with high pressure air to eliminate residual powder, and the development electrode is cleaned by a brush assembly that is actuated through a clutch that forms part of the development chamber assembly. After leaving the pressure transfer rolls, the transfer paper with the powder image thereon is passed through a second set of pressure rolls conjointly with a transparent plastic web which adheres to the adhesive on the transfer strip and fixes the powder image thereon by forming a protective cover thereover.

Simultaneously, the plate is passed to a pivotable direction-changing mechanism having plate driving rolls frictionally driven from a drive roll geared to the transfer pressure rolls. Plate holding rolls retain the plate within the direction-changing mechanism as it is pivoted about its axis to engage the driving rolls with a second drive roll that reverses the direction of rotation of the plate driving rolls. On engagement with the second drive roll, the plate is withdrawn from the direction-changing mechanism and is advanced through a cleaning position wherein residual powder is dusted therefrom by a cleaning brush which, in turn, is cleaned of residual powder by a flicking bar. Suitable vacuum means are provided to remove this residual powder from the machine. After passing through the cleaning position, the plate is gripped by another set of drive rolls and is returned to the magazine wherein it is deposited on top of the other plates therein for reuse.

A preferred form of the invention is disclosed in the appended drawings, in which:

FIG. 1 is a schematic perspective view of a xerographic camera system in which the invention is adapted for use as installed in an aircraft;

FIG. 2 is an enlarged perspective view of the several components of a xerographic camera system in which the invention is intended to be used;

FIG. 3 is a functional schematic cross-sectional view of a xerographic camera and processing apparatus including the invention;

FIG. 4 is an isometric view of a xerographic plate adapted for use with the invention;

FIG. 5 is an isometric view of the xerographic plate magazine assembly, with side walls broken away, illustrating the several plate actuating mechanisms therein;

FIG. 6 is an isometric view of the plate transfer mechanism of the invention for advancing plates to the plate charging mechanism;

FIG. 7 is a detail sectional view of the xerographic plate latching mechanism of the plate transfer mechanism.

In the particular embodiment shown in the drawings (see FIGS. 1 and 2) the invention is adapted for use in an aerial camera system which is shown as comprising a xerographic camera 10, containing a lens and shutter mechanism as well as all xerographic processing equipment; a control unit 20, wherein the several pneumatic and electrical control circuits of the system are housed; and an intervalometer 30, for initiating operation of the system. The camera and processing mechanism is preferably housed in a cast magnesium cover assembly 11 that is separable substantially at its mid-section to permit access to the interior of the apparatus. Within the housing, two spaced side plates or frames are integrally connected by tie rods to form a rigid framework for supporting the several components of the xerographic processing equipment.

On the front wall of the exterior of housing 11 there is located a power-driven, take-up roll spindle 12 for storing aerial xerographs 13 taken and processed by the apparatus. A lever 14 is provided to actuate a web cutter inside the housing, whereby finished xerographs may be detached from those in process. Manually settable knobs 15 and 16 project through an opening 17 to permit adjustment of the diaphragm and speed-setting mechanisms, respectively, of the lens and shutter assembly of the camera. On the lower portion of housing 11 there are provided two trunnions 18, at the front and rear of the camera, whereby the camera portion of the system may be supported on the inner gimbal ring 19 of a gyroscopic stabilizing system which, together with an outer gimbal ring 21, is pivotally supported in a shock-mounted frame 22 within the aircraft. By the latter means the xerographic camera is maintained in a proper attitude with reference to the ground for taking aerial xerographs by means of suitable gyroscopically controlled servomotors (not shown) that function to compensate for pitching, rolling and yawing motions of the aircraft.

For actuating the several components of the camera mechanism, a plurality of electrical, pneumatic and vacuum lines 24 connect camera 10 to control unit 20 which, in turn, is connected to the aircraft electrical and pneumatic supplies via a plurality of lines 25. Housed within the control unit is an electrical circuit unit 26 including relay circuits for controlling the various automatic and interlocking functions of the several components of the camera apparatus, a pneumatic control system unit 27 for controlling the operation of a plurality of high pressure air systems and vacuum systems essential to the proper functioning of the camera mechanism, and a dust filter unit 28 for removing xerographic developing powder from air exhausted from the system. A plurality of control knobs and switches 29 are provided on electrical circuit unit 26 for conditioning the system for automatic operation and for testing the several components thereof in accordance with prescribed maintenance requirements. Intervalometer unit 30 is connected to control unit 20 via a cable 31 and is provided with a plurality of setting knobs 32 whereby the camera apparatus may be conditioned for taking single exposures or successive exposures in timed relation, in accordance with conventional aerial photography practice.

The relative arrangement of the several components of the interior of the xerographic camera and processing apparatus are best shown in the schematic sectional view of FIG. 3 wherein a lens and shutter assembly 40 is mounted over an opening in the lower end of housing 11 in a manner to form a light-tight seal with the housing. Assembly 40 includes a lens system 41, a diaphragm 42 which is settable under control of knob 15, as described above, and a shutter mechanism (not shown) that may

be cocked and released in accordance with conventional practice in aerial photography.

For forming xerographic images, the system is provided with a plurality of xerographic plates 50 (see also FIG. 4), each of which comprises a conductive backing plate, preferably of brass, having a photoconductive layer 51, preferably of amorphous selenium, formed on one face thereof. Each plate 50 is provided with two side rails 52 that are integrally secured thereto and are so constructed to position the plate with reference to the several mechanisms with which it cooperates, and to form a recessed area for photoconductive layer 51 to protect a xerographic powder image formed thereon from smearing during transit of the plate through the system.

Prior to their use in the system, a supply of xerographic plates 50 is manually inserted in a magazine assembly 100 which is then placed in the camera wherein it is supported on suitable guide rails (not shown) formed on the framework of the apparatus. From the magazine, plates 50 are passed seriatim over a charging mechanism assembly 200, whereby the photoconductive surface of each plate is given a uniform electrostatic charge, and is then passed to an exposure position mechanism 230 wherein each plate is held momentarily during the exposure period. During exposure a charge pattern or electrostatic latent image, corresponding to the subject being xerographed, is formed on each plate. After exposure, the plate is passed to a development mechanism assembly 320 wherein the electrostatic latent image of the subject is converted to a xerographic powder image thereof. After development each plate is passed through an image transfer assembly 470, wherein its xerographic powder image is transferred to an adhesive support surface, and thence to a direction-changing mechanism 490, whereby the plate is aligned with and passed through a brush-cleaning apparatus 540 wherein residual powder remaining on the photoconductive surface of the plate is removed. After cleaning, the plate is returned to magazine assembly 100 for reuse.

The plate magazine comprises a self-contained, light-tight, box-like structure wherein a plurality of xerographic plates are loaded preparatory to use in the system. Preferably, the magazine is of such construction to prevent the admission of light, and is provided with a dark slide covering the bottom opening thereof when the magazine is removed from the camera. When the magazine is placed in position in the system it cooperates with the framework of the machine in a manner such that a light-tight structure is maintained when the dark slide is removed. As an integral part of the magazine structure there is provided a plate spacing and advancing mechanism that is actuated by a motor through a single-revolution clutch, whereby plates fed to the magazine are retained in their respective positions and are released singly from the bottom of the magazine for use in the system. Also forming a part of the magazine structure is a plate transfer mechanism actuated by an air cylinder, whereby plates in the magazine may be withdrawn seriatim and be advanced to the plate charging apparatus.

Specifically, plate magazine assembly 100 (see FIGS. 3 and 5) includes a box-like casting having a cover portion 101, side walls 102 and 103, a front wall 104 and a rear wall 105 that forms a rear cover plate for the camera, and is provided with suitable bosses and interior wall portions for supporting the several components of the magazine mechanism. Before the magazine is inserted in the camera, a supply of xerographic plates 50 is placed therein. The plates are inserted in the magazine through a rectangular opening 106 in front wall 104, with photoconductive layer 51 facing downwardly, and are adapted to be supported within the magazine by four interponent members 107, one of which is fixed on each of two pairs of shafts 108 and 109 arranged on opposite sides of the magazine. Each of the shafts 108 is rotatably mounted in a bearing 110 set in cover portion 101 and a bearing

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block 111 fixed on the respective side walls 102 and 103. Similarly, each of the shafts 109 is rotatably mounted in a bearing 112 and a bearing block 113.

On the right-hand side of the magazine (as shown in FIG. 5) each of the shafts 108 and 109 has fixed thereto a helical gear 115 that meshes with a similar helical gear 116 fixed on a shaft 117 that is provided at one end with a bevel gear 118 that is driven by a bevel gear 119 fixed on a tubular sleeve 120 that is rotatably mounted in a vertical wall portion 121. Similarly, shafts 108 and 109 on the left-hand side of the magazine are provided with helical gears 123 that mesh with gears 124 fixed on a shaft 125 that is provided with a bevel gear 126 that meshes with a bevel gear 127 fixed on a tubular sleeve 128 that is rotatably mounted in a vertical wall portion 129. Tubular shafts 120 and 128 form part of a single-revolution clutch mechanism 130, described below, whereby power from the drive mechanism of the camera is transmitted via a sprocket 132, shaft 133, pinion 134, gear 135, shaft 136, and the clutch mechanism to effect intermittent rotation of the shafts 117 and 125 whereby xerographic plates may be released from interponent members 107, as described below.

For supporting xerographic plates after they are released by interponent members 107, two hook members 138 and 139 are provided on each side of the magazine, each of which is pivotally suspended from an associated block 140 that is secured to the inner face of the side walls 102 and 103. Each of the hook members is resiliently urged inwardly against the plates in the magazine by a suitable spring 138A and 139A, respectively, and is provided with a hook portion that underlies the lowermost plate in the plate stack when the parts are in the position shown in FIG. 5.

The single-revolution clutch mechanism 130 is an adaptation of a conventional form of single-revolution clutch such as that used in the shutter winding mechanism of the K-17 aerial camera. Briefly, it constitutes a solenoid-actuated device which, upon energization of the solenoid, serves to engage the several operating mechanisms of the magazine with a constantly rotating shaft, during a single revolution thereof, to effect the required actuation of such mechanisms. As shown in FIG. 5, the clutch mechanism includes a pair of side plates 145 and 146 that are held together for unitary movement by pins 147 and are fixed respectively to sleeves 120 and 128 which are rotatably mounted on drive shaft 136. In the space between side plates 145 and 146, there is a ratchet 148 that is fixed on drive shaft 136 and rotates constantly therewith. Cooperating with the ratchet 148 is a ratchet pawl 149 that is pivotally mounted on a stud 150 extending between the side plates, and is resiliently urged into engagement with the ratchet by a three-armed lever 152 that has a lug extending over a tail portion of ratchet pawl 149 and is resiliently connected to the ratchet pawl by a spring 153 that is extended between a stud on the lever and a stud on the pendant end of the ratchet pawl. The entire pawl and lever assembly is resiliently urged clockwise about stud 150 by a spring 154 extended between the upwardly extending end of lever 152 and a stud secured on side plate 146. When the clutch mechanism is disengaged, as shown in the drawings, ratchet pawl 149 is held out of engagement with ratchet 148 by a holding pawl 155 that underlies a forward extension on ratchet pawl 149. The upper end of holding pawl 155 is pivotally mounted in a bracket 156, that is secured to the underside of cover portion 101, and is pivotally connected at its midportion to a spring-urged armature 157 of a solenoid SOL-X, that is also secured on cover 101.

When the clutch is inactive, the several parts thereof remain in the position shown so that ratchet 148 rotates freely with drive shaft 136. When the clutch is to be activated, solenoid SOL-X is energized, thereby drawing armature 157 inwardly against the tension of its spring and disengaging holding pawl 155 from ratchet

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pawl 149. When this occurs, the ratchet pawl is rotated clockwise about stud 150 by its actuating spring 154 and engages ratchet 148 on drive shaft 136, whereby side plates 145 and 146 are caused to rotate as a unitary structure with the drive shaft and thereby serve to actuate the several associated mechanisms.

The particular circuitry employed to control the actuation of clutch mechanism 130 is such that solenoid SOL-X is energized only momentarily to initiate the clutch operation and is immediately deenergized so that the spring on armature 157 urges holding pawl 155 to a position to re-engage ratchet pawl 149. To prevent interference with other elements of the mechanism, holding pawl 155 is provided with a pin 158 that rides on the outer edges of plates 145 and 146 to retain the pawl in ineffective position during a substantial portion of the movement of the plates. However, as side plates 145 and 146 approach the completion of a single revolution, pin 158 rides onto low portions 159 of the side plates and permits holding pawl 155 to engage the forward extension of ratchet pawl 149 and thereby disengage it from ratchet 148. It should be noted that holding pawl 155 first engages the forward extension of lever 152 to pivot it about stud 150 and thereby tension spring 153 connecting the lever with ratchet pawl 149. As a result of this tensioning, when holding pawl 155 disengages ratchet pawl 149 from ratchet 148, spring 153 snaps the ratchet pawl to its counterclockwise position to effect a complete disengagement of the parts and to prevent interference between the ratchet and the ratchet pawl as the ratchet continues to rotate with shaft 136.

In this position of the parts it may be noted that the ratchet pawl spring 154, through the interaction of lever 152 and ratchet pawl 149, tends to rotate the ratchet pawl into engagement with ratchet 148. Specifically, spring 154 urges the forward end of the ratchet pawl on holding pawl 155 as a fulcrum and tends to rotate the entire clutch assembly, including side plates 145 and 146, in a counterclockwise direction. However, the relatively light spring pressure exerted by ratchet pawl spring 154 is completely overcome by the substantially greater pressure exerted by a restoring spring 161 that maintains a cam follower arm 162 engaged with a cam 163 fixed on sleeve 128. In this position of the parts, cam 163 is at its dead center position with reference to cam arm 162 and provides a spring biased locking action to hold the clutch mechanism in its inactive position until pawl 149 is again released by solenoid SOL-X.

Cam follower arm 162 is fixed on a shaft 164 that is journaled in suitable bearings in vertical wall positions 121 and 129, and is provided with roller bearing arms 165 and 166 fixed thereon. By this arrangement, the rocking motion imparted to shaft 164 by cam 163 during the rotation of clutch mechanism 130 is utilized, via arms 165 and 166, to exert downward pressure on the uppermost xerographic plate 50 in the magazine to ensure proper downward feeding of the plates.

In order to withdraw the lowermost plate from the plate supply, magazine assembly 100 is provided with a plate transfer mechanism that includes two transfer arm assemblies 170 of mirror-image conformation that are rotatably mounted on a shaft 171 which, in turn, is rotatably mounted in side walls 102 and 103 of the magazine. Fixed on the end of shaft 171 is a bifurcated arm 172 which, when the magazine is in operating position in the apparatus, engages a pin 173 (see FIG. 6) in a clevis 174 that is fixed on the piston rod 175 of an air cylinder A which, in turn, is fixed on a bracket 176 secured to the frame of the machine. Air cylinder A may be activated in timed relation to the remainder of the apparatus, as described below, to retract piston rod 175 to rock shaft 171 counterclockwise to move transfer arm assemblies 170 upwardly, as shown in FIG. 3, or to extend rod 175 to rock shaft 171 clockwise to move assemblies

170 downwardly, as shown in FIGS. 5 and 6, and in dotted lines in FIG. 3.

The transfer arm assemblies 170 are integrally connected near their forward end by a rod 178 and each is provided with a rail portion 179, for supporting a xerographic plate 50, and with an offset portion 180 whereby, when the arm is moved to its upper position, interference is avoided with the lower end of the associated shaft 108. In addition, each transfer arm 170 includes two cam portions 181 and 182 which coact with corresponding cam surfaces 181A and 182A, respectively, formed on the lower ends of the associated hook members 138 and 139 whereby, when arms 170 are moved upwardly, cam surfaces 181 and 182 are effective to move their associated hook members outwardly to release them from engagement with the xerographic plate supported thereby. Also forming a part of each transfer arm assembly 170 is a spring-urged latch mechanism including a latch member 185 (see also FIG. 7) that extends through an opening 185A in the arm and is resiliently urged to its inner position by a leaf spring 186 fixed on an upwardly projecting arm 187 of the assembly. Each latch member 185 is arranged a sufficient distance above the upper surface of its associated support rail 179 so that a xerographic plate can be accommodated between the upper surface of the rail and the lower edge of the latch member. In addition, each latch member 185 is provided with an inclined upper surface 185B whereby, as arms 170 are moved upwardly to engage a plate, each latch member 185 is cammed outwardly until it passes over the plate and then is moved inwardly by its spring 186 so that it latches over the upper surface of the plate.

By means of the mechanism thus far described, the operation of the plate transfer mechanism can be clearly visualized by reference to FIGS. 3, 5, and 6. If it be assumed that the xerographic plate held by the plate transfer mechanism, as shown in FIGS. 5 and 6, is removed in the normal operation of the machine, and that a suitable signal is received to retract air cylinder A to obtain another plate from the supply in the magazine, the operation is as follows: As piston rod 175 of air cylinder A is retracted, shaft 171 is rocked counterclockwise to move transfer arm assemblies 170 upwardly, as described in detail above. During their upward movement, cam surfaces 181 and 182 rock hook members 138 and 139 outwardly to permit the xerographic plate 50 held thereby to be seated on rails 179 of the transfer arm assemblies. Simultaneously, latch members 185 are cammed outwardly against the tension of their springs 186, as the plate passes thereby, and immediately latch over the upper surface of the plate. At the end of the upward movement of transfer arm assemblies 170, the lowermost xerographic plate 50 in the magazine is thus supported on guide rails 179 and is held thereagainst by latch members 185, while hook members 138 and 139 are held disengaged from the plate and interponent members 107 underlie the lowermost of the remaining plates in the magazine.

At this point in the operation, piston rod 175 of air cylinder A is extended to rotate shaft 171 clockwise and thereby move transfer arm assemblies 170 downwardly. Since the xerographic plate supported by guide rails 179 is now held thereagainst by latch members 185, it moves downwardly with the transfer arm assemblies. As this occurs, hook members 138 and 139 are released by their respective cam surfaces 181 and 182 and move inwardly until the upwardly extending portion immediately above the hook portion thereon abuts the edges of the remaining xerographic plates which are now supported on interponent members 107. As transfer arm assemblies 170 reach their lower limit of movement, as determined by an adjustable limit stop 188, the right-hand assembly actuates a microswitch SW-13 that is effective simultaneously to initiate the operation of the shutter winding mechanism and to initiate the operation of the plate charging mechanism, and, in addition, to initiate the operation of

single revolution clutch mechanism 130 to advance another plate into position in the magazine for utilization in the next cycle of operation. Clutch mechanism 130 functions, as described above, to rotate shafts 108 and 109 through a single revolution during which interponents 107 are momentarily removed from beneath the plates supported thereby to permit the entire supply of plates to drop downwardly and rest on hook members 138 and 139. The parts are so arranged that the plate supply moves downwardly a distance equivalent to the thickness of a single plate. Thus, as shafts 108 and 109 complete their revolution of movement, interponent members 107 are moved above the plate now supported by hooks 138 and 139 and are again in a position to support the remaining supply of plates when the lowermost plate is next removed. By this arrangement it is apparent that only a single plate is metered downwardly during each operation of single revolution clutch mechanism 130.

For actuating transfer arm assemblies 170 and for advancing a new plate 50 for use in the apparatus, the plate transfer mechanism includes a lost-motion actuating connection whereby assemblies 170 are raised and lowered, as desired, and whereby the plate is partially ejected from transfer arm assemblies 170 and is caused to engage with the drive rolls of the exposure position mechanism. For this purpose, the plate transfer mechanism includes a slide 190 associated with each of the transfer arm assemblies 170 that is provided with elongated slots 191 and 192 whereby it may move horizontally on shaft 171 and rod 178. In addition, each slide 190 has an upwardly extending portion 193 provided with a slot 194 that encompasses a pin 195 fixed in a crank arm 196 fixed on shaft 171. Furthermore, each slide is provided with a shoulder portion 197 to engage the trailing edge of a xerographic plate 50 held by the transfer arm assemblies 170. The arrangement of slots 194 in slides 190 is such that crank arms 196 impart no motion to the slides during the first portion of movement of the transfer arm assemblies. However, toward the end of the movement imparted by air cylinder A, pins 195 in cranks 196 actuate slides 190 and move them forwardly relative to transfer arm assemblies 170, whereby shoulders 197 on the slides push the plate forwardly on guide rails 179. The amount of movement imparted to the plate at this point is relatively slight but is sufficient to engage the leading edge of the plate with a pair of continuously rotating drive rollers of the exposure position mechanism 230, whereby the plate is gripped by the rollers and moved forwardly from the plate transfer mechanism.

At the end of a cycle of operation on a xerographic plate, during which it is charged, exposed, developed, subjected to image transfer, and cleaned, the plate is ultimately engaged by drive rolls 570 that are mounted on a driven shaft 619 and cooperate with rolls 571 to return the plate to magazine 100. As the plate enters the magazine it is fed on top of the remaining plates therein in a manner such that its leading edge actuates a microswitch SW-11 to initiate a cycle of operation of single revolution clutch mechanism 130, and the plate itself tends to rest on the remaining plates but is momentarily upheld by interponent members 142 fixed on each of the shafts 109. During the ensuing cycle of operation of clutch mechanism 130, shafts 108 and 109 are driven through a single revolution, as described above, whereby interponents 142 are momentarily moved from beneath the returned plate and permit it to fall on the plates therebeneath. As shafts 109 complete their revolution of movement, interponents 142 are restored to the position shown in FIG. 5, wherein they overlie the newly returned plate. By this arrangement, the entire supply of plates in magazine 100 is secured against excessive movement or displacement regardless of the attitude of the aircraft in which they are carried. It should be noted that the operation of single revolution clutch mechanism 130 also momentarily removes interponent members 107 from their positions

between the two lowermost plates. However, since the entire supply of plates is supported by hook members 138 and 139 at this point of operation, the movement of interponent members 107 does not affect the position or alignment of the xerographic plates in the magazine.

This application is a division of our copending application Serial No. 663,085, filed June 3, 1957, now Patent No. 3,009,402, issued November 21, 1961.

Since many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A xerographic plate magazine apparatus for advancing xerographic plates seriatim to utilization apparatus including a box-like housing for substantially enclosing a plurality of xerographic plates, a plurality of support devices within said housing for supporting a plurality of xerographic plates, a second plurality of support devices for supporting a single xerographic plate beneath said first-mentioned support devices, a plate transfer means for withdrawing a plate held by said second plurality of support devices, means operable concomitantly with said plate transfer means for advancing a xerographic plate from said first plurality of support devices to said second plurality of support devices, and means operable by said plate transfer means for ejecting a plate withdrawn from the magazine.

2. A xerographic plate magazine apparatus for advancing xerographic plates seriatim to utilization apparatus including a box-like housing for substantially enclosing a plurality of xerographic plates, a plurality of support devices within said housing for supporting a plurality of xerographic plates, a second plurality of support devices for supporting a single xerographic plate beneath said first-mentioned support devices, a plate transfer means for withdrawing a plate held by said second plurality of support devices, and means operable concomitantly with said plate transfer means for advancing a xerographic plate from said first plurality of support devices to said second plurality of support devices.

3. A xerographic plate magazine apparatus for advancing xerographic plates seriatim to utilization apparatus including a box-like housing for substantially enclosing a

plurality of xerographic plates, a plurality of support devices within said housing for supporting a plurality of xerographic plates, a second plurality of support devices for supporting a single xerographic plate beneath said first-mentioned support devices, a plate transfer mechanism for withdrawing a plate held by said second plurality of support devices, said transfer mechanism including means to render said second plurality of support devices ineffective and means for securing a plate supported thereby, and means operable concomitantly with said plate transfer means for advancing a xerographic plate from said first plurality of support devices to said second plurality of support devices.

4. A xerographic plate magazine for advancing xerographic plates seriatim to utilization apparatus including a box-like housing for substantially enclosing a plurality of xerographic plates, support devices within said housing for supporting a plurality of xerographic plates, a plate transfer mechanism for withdrawing a lowermost plate from said support devices, said transfer mechanism having plate support means, means to secure a withdrawn plate on the support means, and means for ejecting from the magazine a plate withdrawn from the first support devices, said last-recited means including movable members disposed adjacent to a plate supported on the plate support means, and means adapted to move said members against a plate to effect ejection thereof off said support means; and means effective with said plate transfer means including second support devices adapted to support a plurality of xerographic plates above a withdrawn lowermost plate, and means to advance xerographic plates from said second support devices to said first support devices.

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