Aug. 3, 1965 H. KORETZ 3,198,104

PORTABLE PHOTOCOPYING APPARATUS

Filed Aug. 14, 1962 4 Sheets-Sheet 1

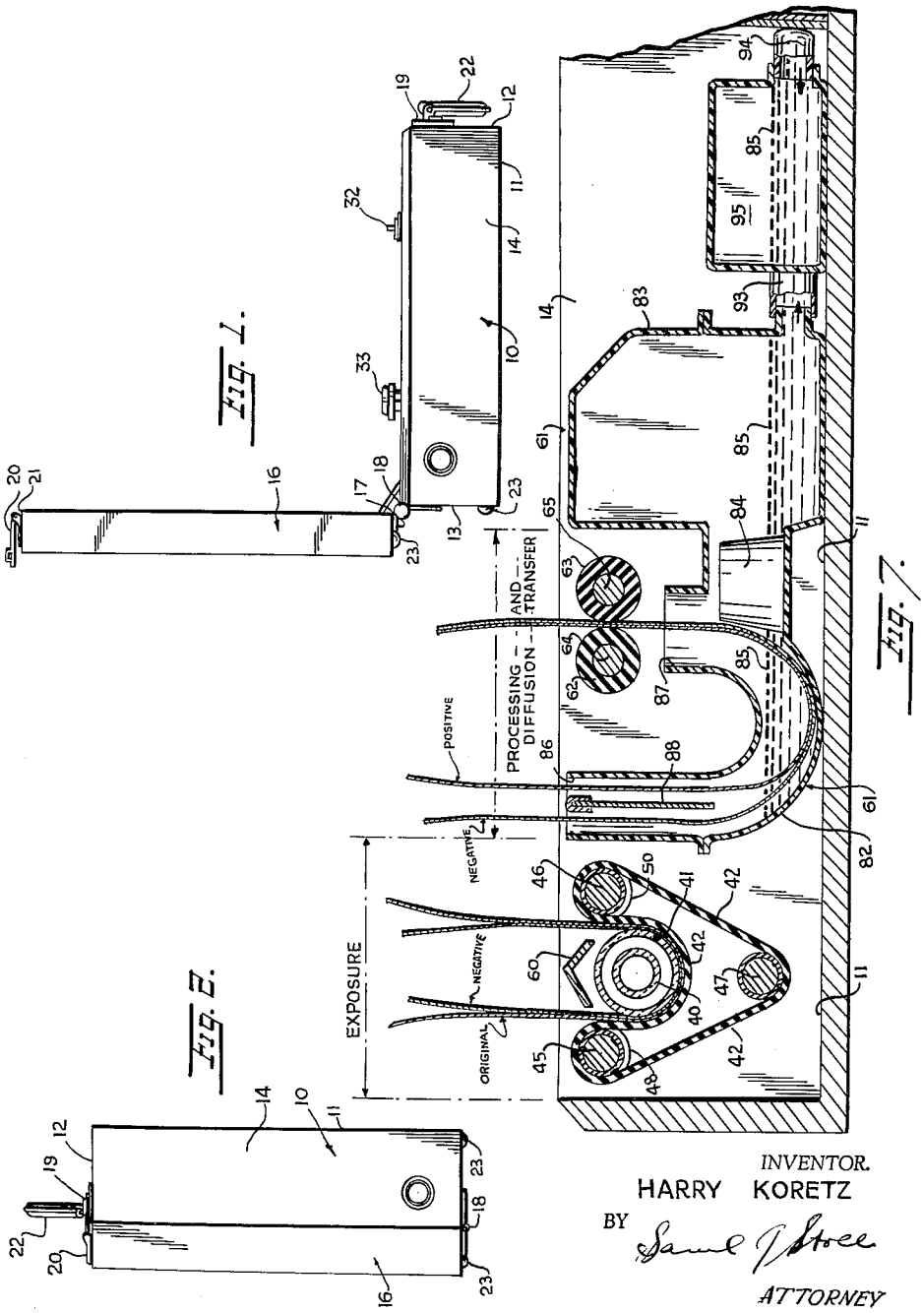


Fig. 1.

Fig. 2.

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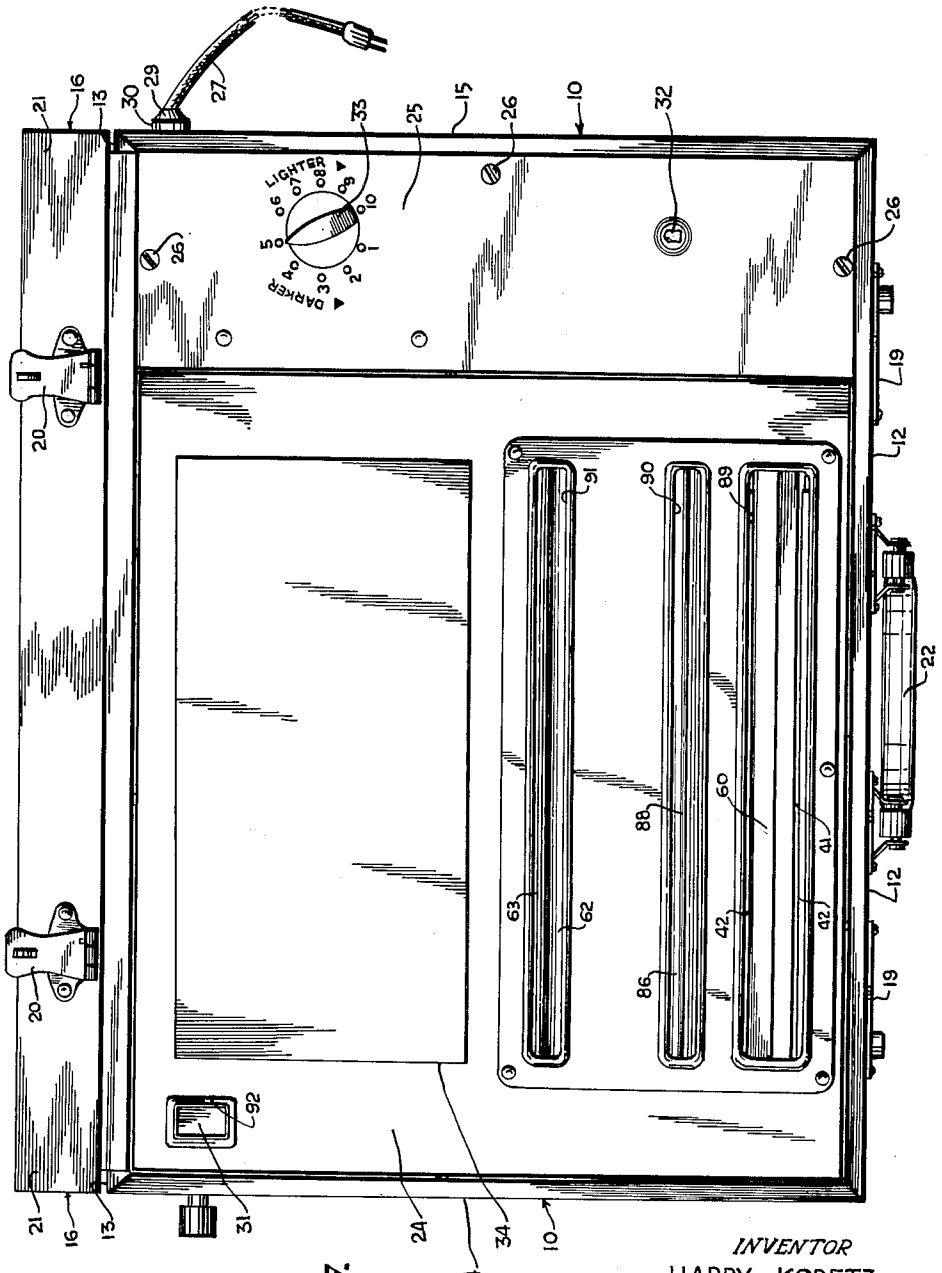


FIG. 7.

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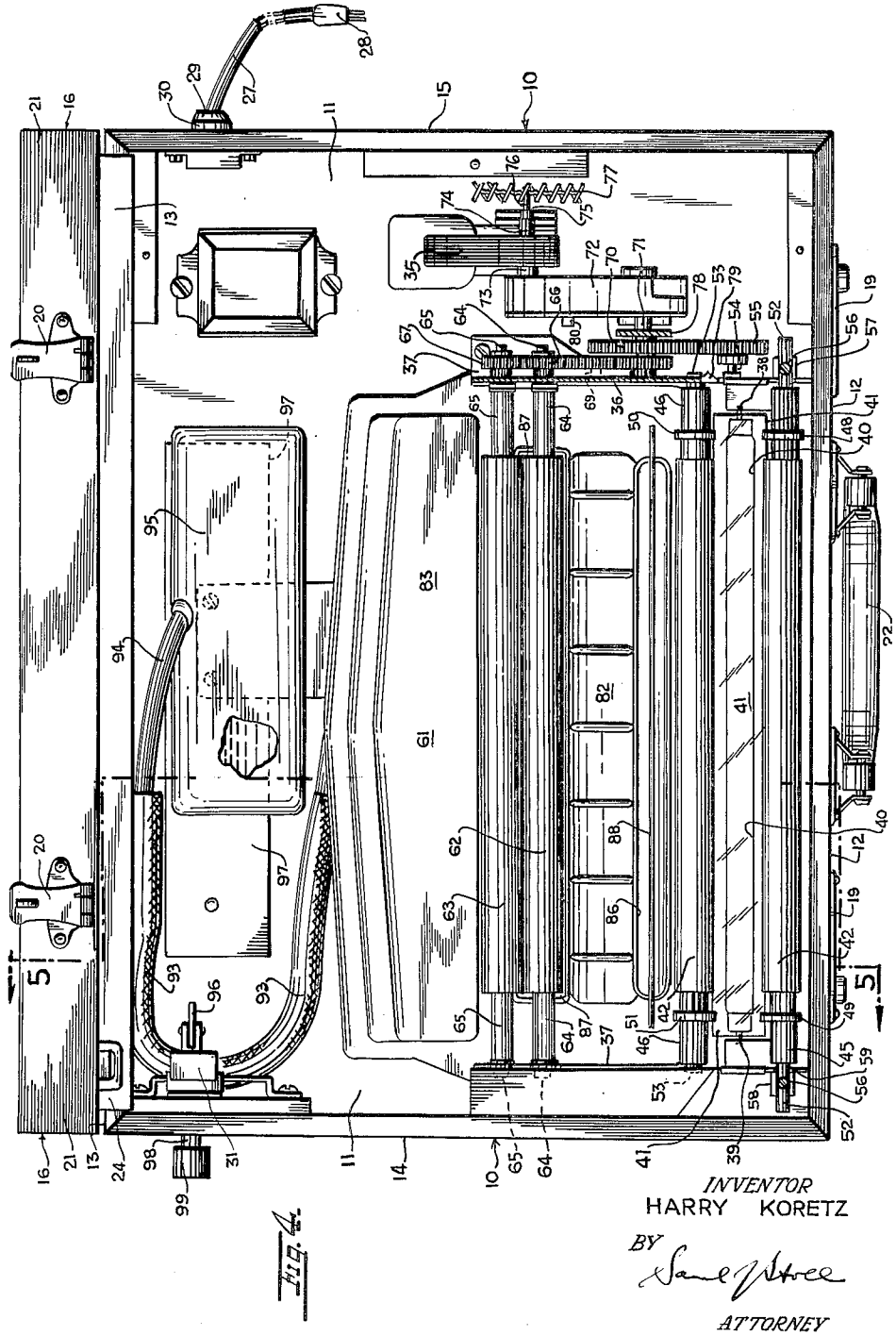


FIG. 4

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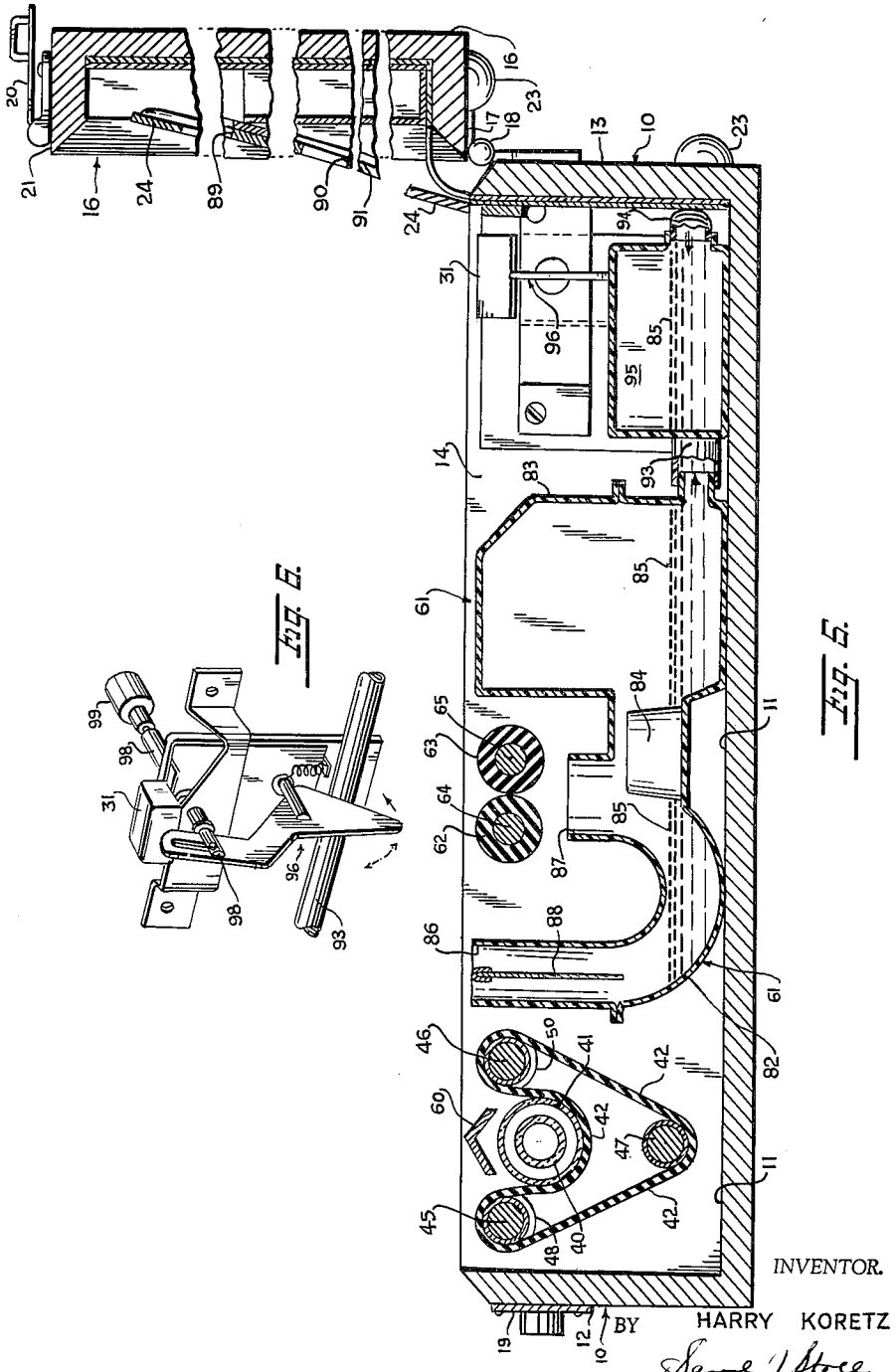


Fig. 5.

Fig. 6.

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3,198,104

PORTABLE PHOTOCOPYING APPARATUS

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Filed Aug. 14, 1962, Ser. No. 216,869
10 Claims. (Cl. 95—77.5)

This invention relates to photocopying apparatus and, in particular, to portable diffusion transfer photocopying machines.

The diffusion transfer process for producing photographic positives or photocopies is well known and is described, for example, in United States Patents 2,352,014 and 2,834,676. In producing photocopies of documents, letters, business forms and other types of indicated words by the diffusion transfer process, a light-sensitive photographic paper is exposed to the original record to form a latent image of the original in the light-sensitive coating of the photographic paper. The exposed paper and a sheet of transfer or positive coated paper are then moistened with a photographic transfer processing solution and the coated surfaces of both sheets are then pressed into intimate contact with each other to effect transfer and formation of a photographic copy of the original record on the transfer paper. The said intimate contact of the coated surfaces is conveniently obtained by passing the moistened and contacted sheets between a pair of squeegee or wringer rollers. After emerging from the rollers, the laminated sheets are separated while still slightly damp and air-dried.

In the process, the necessity of using a highly alkaline transfer processing solution has presented problems of handling, contamination, oxidation, and others. The solution, besides being subject to spillage, may stain an operator's hands and clothing, and other nearby objects; and also, the solution is seriously deteriorated by protracted contact with atmospheric oxygen.

It is perfectly obvious that in preparing a diffusion-transfer copy, the exposing step and the steps of immersing the sheets in the transfer solution and then pressing them together are separate operations. It is equally obvious that it is a practical advantage of the first importance—particularly to an operator in a business office—that all necessary steps be possible within the least compass and within a minimal period of time. Accordingly the tendency in the art has been to associate means for photocopying as closely as practicable with means for diffusion transfer processing. Desirably, such means should be easily portable together from place to place, as special copying requirements demand. Heretofore however, the signal difficulty in attaining this end has been the chemical nature of the transfer processing solution.

Hence, the general object of the present invention is to provide a novel, simple, reliable, and inexpensive portable photocopying apparatus, in the form of a lightweight and relatively small, self-contained photoprinting, developing, and diffusion-transferring machine in a single compact unit which incorporates the advantages of manual portability and ready operability. This general object necessarily involves solving the problems presented by the highly alkaline and readily oxidizable transfer processing solution.

A primary object of the invention is that the apparatus be adapted to employ pre-mixed processing solutions which are commercially available in an alkali-resistant and oxygen-impenetrable plastic bag which may be removably installed in the apparatus; and that the apparatus include selective means for effecting filling the developing tray with solution from such containers, for draining solution from the tray back into the bag, and for sealing the solution stored in the pouch against atmospheric oxidation. This object includes the features that the solution in the developing tray is not subject to spillage under ordinary operating conditions or under nonoperating conditions obtaining when the apparatus is to be moved from place to place; and that, under normal operating conditions, the solution in the processing tray is actually inaccessible to the operator's hands.

A further object related to the processing solution is that the apparatus parts subject to contact with the solution be particularly resistant to the action of highly alkaline solutions. In connection with this object it is a feature of the present invention that when the apparatus is placed in operating position, as upon a level surface, processing solution may be caused to flow freely into the processing tray in pre-determined volume, and that when the apparatus is disposed in the carrying position the processing solution automatically drains from the tray back into the storage container.

A particular feature of the invention is that the main frame of the apparatus is also the main frame of a carrying case having a handle and a hinged top which may be opened and closed and locked in usual manner. This feature involves a photocopying apparatus, part of which is a carrying case shaped and adapted to be handled like a small overnight bag—the apparatus being in operable position as well as condition when the case is set down flatwise and, opened and containing no spillable processing solution when the case is closed, locked, and suspended from its handle or standing with that edge opposite the handle downward.

A further object of the invention is to provide a portable photocopying apparatus which comprises a carrying case the main frame of which is also the main frame of the apparatus, the case having a handle, a hinged lockable top; rotary means for making required photographic contact copies; means for processing exposed sheets; rotary means for making diffusion-transfer copies; means for controlling the flow of processing solution, and for preventing spillage thereof, and for storing it when desired, sealed against the atmosphere; a light source for photographic use; a motor for driving the rotary means named; means for controlling the density of diffusion-transfer copies; and common means for connecting the light source and motor to a suitable electrical power source, such last-named means being wholly enclosable within the carrying case.

Another object of the invention is to provide a portable photocopying apparatus as described above having a processing tray made of polyethylene foils laminated together, especially designed to render photographic processing solution carried therein inaccessible to an operator's hands and to prevent spillage of the solution even when the apparatus is abruptly changed from its operating to its carrying position. In connection with this object, a processing tray is contemplated which has a dia-

phragm to prevent initial contact between two sheets being simultaneously immersed in solution in the tray; and, further, a tray is envisioned which may be readily removed from the apparatus for cleaning.

These and other objects, features, and advantages of the invention will be more fully understood from the following description and claims, and from the drawing.

In the description of the drawing, as well as in the following detailed description of the present apparatus, to avoid confusion due to the two cardinal positions which it may be expected to assume, directional words such as "right," "left," "front," "rear," "up," and "down," and their derivatives and synonyms, generally refer to the apparatus itself when in its operating position and not to an observer. Variations from the foregoing will be found to be self-explanatory.

FIGURE 1 is a right side elevational view of the apparatus in operating position with its top opened.

FIGURE 2 is a right side elevational view of the apparatus, with its top closed and latched, in carrying position.

FIGURE 3 is a top plan view of the apparatus in operating position with its top opened.

FIGURE 4 is a top plan view of the apparatus in operating position with its top opened, a fenestrated panel provided as a cover and guard for the exposing and diffusion transfer processing units raised to disclose them, and the control panel removed to disclose the motor and certain other electrical parts and a speed reducer and the intergearing of rollers seen in this figure.

FIGURE 5 is the section 5—5 of FIGURE 4, partly erased.

FIGURE 6 is a perspective view of a valve mechanism for controlling the flow of developing solution to and from the developing tray of the apparatus and a pouch for storing solution.

FIGURE 7 is an enlarged sectional view showing the original and negative sheets passing through the exposure station of the apparatus and the negative and positive sheets passing through the developing station of said apparatus.

The drawing illustrates a preferred embodiment of the invention. The main frame of the portable copying apparatus is also the principal part of a carrying case, and in effect, the apparatus, as an entity, actually comprises not only photographic, developing, and diffusion transfer means, and means for the proper handling of developing solution, but also means for adequately housing the means mentioned above when the apparatus is desired to be manually carried from place to place as if it were a piece of light luggage.

The main frame is indexed, in its entirety, 10 (arrow) and is seen in all figures; the frame is in the form of a relatively shallow right parallelopipedonal open-topped box having a flat bottom 11 and front, rear, right, and left walls perpendicular thereto, the walls being respectively designated 12, 13, 14, and 15. The material of construction of the main frame is required principally to be relatively light, inflexible and strong so that the resulting structure is rigid, durable, and easy to lift. The bottom and walls may be of a suitable wood. The main frame is provided with a top 16 of appropriate size and shape and which may be, and is assumed to be, of the same material as that of the frame, as well as of the same class of geometric form, but with walls of considerably less height. The top is hingedly attached to the main frame by means of suitable hinges joining the rear wall 13 of the frame to the rear wall 17 of the top. Only one such hinge appears in the drawing and it is designated 18. The front wall 12 of the frame is provided with locking elements 19 adapated to cooperate with locking elements 20 provided on the front wall 21 of the top. The apparatus is shown with the top in open position in all figures except FIGURE 2, wherein the apparatus is shown with the top in closed position and locked to the main frame—the apparatus in this figure being in non-operating position and ready to be carried manually, as if it were a piece of luggage, by a handle 22 seen in the drawing to be attached in usual manner to the front wall 12 of the main frame. When the apparatus positioned as in FIGURE 2, is set down upon a level surface, the load is borne by four hemispherical feet 23 (only two seen) of common make attached in suitable manner to the rear walls 13 and 17.

The carrying case comprising the main frame 10 and the top 16 may be, and preferably is, coated in usual manner with sheet material appropriate for like use in connection with small rigid articles of luggage; and the interior of the case may be appropriately coated or lined.

The apparatus is in operating position when it is resting with the bottom of the main frame upon a level surface, and the apparatus is designed so that it is most conveniently used by an operator working before the front thereof.

If, prior to use and positioning therefor, the apparatus has been properly handled in its carrying position (FIGURE 2), the top 16 will first have to be unlocked from the main frame and swung into opened position. The operator's view, then, from the front of the apparatus is best illustrated in FIGURE 3. A fenestrated panel 24, made of suitably rigid, light material, and hinged to rear wall 13 of the main frame, generally obscures the mechanism of the apparatus to the right of the control panel 25, which is also a sheet of rigid, light, and preferably insulating material fixed substantially in the normal operating plane of panel 24 to the left by means of screws 26 which engage blocks (unindexed; see FIGURE 4) secured to the rear, left, and front walls of the main frame beneath the control panel.

The disconnected extension cord 27 for the apparatus is generally coiled in suitable manner and placed on panel 24 before the top 16 is closed and locked preparatory to transportation of the apparatus. The cord 27 is only shown partly erased in the drawing and appears only in FIGURES 3 and 4. The cord is provided at one end with a common plug 28 adapted to fit the ordinary 110 v. A.C. outlet socket, and at the other end with a connector 29 adapted to fit a cooperating connector 30 permanently secured to the left wall 15 of the main frame (FIGURES 3 and 4).

The panel 24, which functions primarily as a cover and guard, rests upon static parts of the apparatus structure; and while it may readily be raised as indicated in FIGURE 4, this is neither necessary nor desirable for operation of the apparatus. Near the right rear of the panel 24 a button 31 is accessible, through a fenestration of the panel. (See, also, FIGURES 4, 5 and 6). Pressure upon button 31 permits developing solution, which under the conditions specified above, has been stored out of contact with atmospheric oxygen in a pouch that also prevents spillage, to flow into the developing tray of the apparatus, as will be more particularly described below.

Mounted on the control panel 25 is a switch 32, near the front, for starting and stopping the motor and for turning on and off the light source of the apparatus, and, near the rear, a rheostat, generally indexed 33, for controlling the lightness and darkness of prints made by the apparatus. (See below for further particulars.) The only part of the rehostat seen in the drawing is its handle, which is on the top side of panel 25 and appears in FIGURES 1 and 3; the rheostat proper, of usual construction, is secured to the underside of panel 25.

When the apparatus has been placed upon a level surface with the bottom of the main frame downward, the button 31 pressed, and switch 32 also pressed to turn on the motor and the light source, the apparatus is ready to produce copies. In FIGURE 3, the outline of a sheet 34 of instructions adhering to panel 24 is indicated.

FIGURE 4 is mainly different from FIGURE 3 in that,

in the former, panel 24 is in raised position and panel 25 has been entirely removed so that the working parts of the apparatus may be clearly seen in plan. No wiring is shown in the drawing as the hook-up of the apparatus is quite conventional, and requires no illustration.

Mounted on the bottom 12 of the main frame 10 on the left side of the apparatus beneath the control panel 25 is a motor 35. Mounted also on the bottom of the frame just right of the motor and near the right wall 14, respectively, are two brackets 36 and 37, situated in the front half of the frame, with each bracket being preferably of metal and mainly providing two oppositely disposed vertical walls to serve as journal supports for certain rollers, described below, and for supporting the terminals 38 and 39 of a fluorescent tube 40. The tube, which is the exposing light source in the apparatus, extends from right to left near the front of the frame.

The means for producing the exposed copy include, besides the fluorescent tube 40, a glass tube 41 coaxially surrounding but out of contact with the fluorescent tube; an endless elastic belt 42 with its outer surface engaging a lower sector of the glass tube for rotating it and for feeding superposed sheets partly around the glass tube at a predetermined distance from the fluorescent tube. In FIGURE 5, an anterior-posterior sectional view of the apparatus looking toward the right side thereof, the direction of rotation of the belt and of the glass tube, and associated moving parts, described below, is indicated by arrows; and in this figure dotted lines are seen, indicating the general paths of sheets during the contact exposing process. Three rollers 45, 46 and 47, all parallel to the glass tube 41 and all journaled in brackets 36 and 37, are partly engaged by the inner surface of the belt 42 with all rollers maintaining the belt under tension and with two of the rollers—45 and 46—and the belt itself holding the glass tube at all times in coaxiality with the fluorescent tube 40. Actual contact between rollers 45 and 46, which are the topmost of the three rollers mentioned and the axis of each of which is in a horizontal plane (cf. FIGURE 5, particularly), and the glass tube 41 is effected by flanges 48 and 49, respectively to the left and to the right of belt 42 on roller 45 and by flanges 50 and 51, respectively to the left and to the right of the belt on roller 46 shown in FIGURE 4, and FIGURE 5. Rollers 45 and 46 are substantially alike except that roller 45 is provided with means for correcting crabbing of belt 42 and flanges 48, 49, 50 and 51 are alike. The third roller 47 is journaled in brackets 36 and 37 directly beneath the fluorescent tube 40 and the coaxial glass tube 41 but, of course, within the loop of belt 42; and this roller is the driver of the above-described sheet-feed mechanism of the photographic contact-exposing means of the apparatus.

The rollers—45, 46, and 47—are provided with coaxial shafts, respectively indexed (FIGURE 4) 52, 53 and 54, which actually engage brackets 36 and 37. The shaft 54 of the driver roller 47 extends sufficiently to the left of bracket 36 to carry a spur gear 55 by means of which the roller is rotated (visible only in FIGURE 4; see below). Rollers 45 and 46 are idlers insofar as belt 42 is concerned; their flanges 48 and 49, and 50 and 51, in contact with the glass tube 41, can hardly be considered drivers; the function of the flanges is essentially that of holding the glass tube 41, in cooperation with belt 42 (see FIGURE 5), in coaxiality with the fluorescent tube 40. The shaft 52 of roller 45 is freely inserted therein and does not rotate with the roller, and extends sufficiently both to the left of bracket 36 and to the right of bracket 37 so that adjustment screws 56 may be threaded through the shaft to engage an ear 57 (preferably stamped and formed out) of bracket 36 and a similar 58 of bracket 37 for the purposes of raising and lowering the left and right ends of roller 45 slightly, as desired, for tightening, loosening, and correcting crabbing of belt 42. Roller 45, while said above to be

journaled in brackets 36 and 37, is, in reality journaled in the brackets only in the sense that its shaft 52 is supported by the ears 57 and 58 of brackets 36 and 37, respectively—the roller actually rotating on its own shaft. The shaft 52 does not rotate at all, and it is supported by brackets 36 and 37 only indirectly, in that the shaft passes through two like vertical slots 59 extending downwardly a short distance from the tops of brackets 36 and 37—the slots 59 limiting shaft 52 as to horizontal movement but permitting it some vertical movement, the latter movement being determined by the tension of belt 42, the set of the adjustment screws 56, and the fixed ears 57 and 58. See FIGURES 4 and 5.

A shield 60 for keeping the direct rays of the fluorescent tube 40 out of an operator's eyes is provided; this element, entirely removed for clarity in FIGURE 4, but seen in section in FIGURE 5, is an elongated strip, preferably of aluminum bent lengthwise in the center so that it is of V-shaped cross-section, which normally rests on the glass tube 41 without interfering with rotation of the latter and which is hingedly connected to the shaft 53 of roller 46.

The processing tray of the apparatus is a composite structure, preferably made of two polyethylene moldings cemented together and forming an integral unit which is removably mounted in the main frame 10 on the bottom 12 thereof behind the photographic means described above and partly between the brackets 36 and 37. The tray, in its entirety, is designated 61, and is more particularly described below.

Above the tray, and positioned to receive and press together sheets which have been passed through the tray for immersion in developing solution, are two cooperating feed rollers 62 and 63, journaled in the brackets 36 and 37. The directions of rotation of the rollers are, of course, those suited to withdrawing sheets from the tray. See FIGURE 5.

The rollers 62 and 63 may be of rubber, and are respectively provided with coaxial shafts 64 and 65. The shafts are geared together in usual manner to the left of bracket 35 by spur gears 66 and 67 respectively.

Gear 66 is driven by a spur gear 68 rotatably mounted on a stud 69 fixed to bracket 36. Gear 68 is driven by another spur gear 70 mounted on a shaft 71 of a speed reducer generally designated 72—the latter being housed and attached to the motor 35 by two horizontally disposed screws, one above the other. In FIGURE 4, a plan view and the only figure in which the motor 35, the speed reducer 72, and the intergearing of the apparatus appear, the two screws employed to attach the motor and reducer together (in a quite conventional manner) are completely obscured by the housing of the reducer and by a spacer 73, upper parts of the motor, another spacer 74, a lock washer (unindexed), and a nut 75, through all of which the upper screw passes—this latter further being in position in any event to obscure its lower companion in a plan view. The motor shaft 76 passes into the reducer, but is obscured by spacer 73; however, on the left side of the motor the shaft 76 extends outward slightly and carries a fan 77 on its end portion, and the shaft is briefly visible between nut 75 and the fan. The speed reducer, which extends forward of the motor, is also attached to a bracket 78, the latter being fixed in suitable manner to the bottom 12 of the main frame and to bracket 36, but, in order clearly to show the intergearing of the apparatus, it has been deemed expedient to break away, in FIGURE 4, a portion of a horizontal flange 79 at the top of bracket 36 to which the top portion of bracket 78 is attached (as by a screw). A boss 80 on the right side of the housing of the speed reducer surrounds and completely obscures a screw by means of which the reducer is jointed to bracket 78. The latter, for the same reason that a portion of flange 79 has been broken away, is in section. With the foregoing explanatory matter FIGURE 4 will be found to be a completely

adequate illustration of the interconnections by means of which the motor 35 drives the other rotating parts of the apparatus. Mounted on the shaft 71 of the speed reducer to the left of spur gear 70, is another spur gear 81 which meshes with spur gear 55 of the shaft 54 of roller 47.

Thus it will readily be seen from FIGURE 4 how the motor, through the speed reducer, operates to drive simultaneously the rotating parts of the photographic exposing means and the diffusion-transfer processing means of the apparatus.

While the wiring of the apparatus has been omitted from both the description and the drawing for simplification, as the hook-up of the apparatus is quite conventional, it may be said here that the rheostat 33 is in series with the motor 35 and the fluorescent tube 40.

The processing tray 61 has been specially designed in view of the fact that the apparatus is rotated through ninety degrees from its operating position to its normal carrying position; and the special design shown in the drawing effectively prevents spillage of the solution during rotation of the apparatus from one position to another and while the apparatus is at rest in either position.

The general designation "processing tray 61" has been previously applied herein to a composite structure, preferably made of two rigid plastic moldings cemented together to form an integral removable unit; the entire unit is adapted to the safe carrying of processing solution whenever such solution is normally required to be therewithin—that is, for the most part when the apparatus is in its operating position, and, usually, for an extremely short period of time during and after rotation of the apparatus through ninety degrees from its operating position to its normal carrying position. But that portion of the unit which actually serves as a vessel into and out of which sheets desired to be bathed in processing solution are passed is normally disposed toward the front of the apparatus just behind the photographic exposing means described above, and this portion of the unit is designated 82; the adjacent rear portion of the unit is indexed 83, and will be seen to be a reservoir from which processing solution cannot spill when the apparatus is rotated to normal carrying position. While the tray 61 is seen in plan in FIGURE 4, its essential structure is much more readily understood in FIGURE 5, which is an anterior-posterior sectional view through the whole apparatus. The front portion 82 of the tray 61 is an elongated vessel of V-shaped cross-section, as best seen in FIGURE 5; the annexed rear portion 83 is an equally elongated vessel of roughly quadrilateral cross-section—also best seen in the last-named figure. The two portions are connected together for interflow of solution between them by a plurality of conduits of relatively large cross-section; no conduit, as such, can be seen in the drawing, but, in FIGURE 5, a supporting island 84, of which there may be several for the purpose of holding portions 82 and 83 more rigidly together, separating two such conduits, is clearly shown.

When the apparatus is in operating position, as e.g. in FIGURE 5, processing solution 85 may freely seek a common level, in both portions 82 and 83 of tray 61 as soon as such solution has been released from the storage pouch (see above and below). It will be seen with considerable clarity in FIGURE 5 that portion 82 of tray 61 is provided at its forward part with a longitudinally divided opening 86 for the ingress of sheets desired to be subjected to processing solution, and at its rearward part with an opening 87 for the egress of treated sheets. The first-named opening is seen wholly in plan in FIGURE 4; from left to right along the approximate longitudinal centerline of opening 86 is a septum 88. That part of the septum 88 which extends beneath the surface of the processing solution when the conditions illustrated in FIGURE 5 obtains, is preferably made of material having the properties of polyethylene; for reinforcement of the upper edge of the septum and for force-fitting it into the end walls of opening 86 (cf. FIGURES 4 and 5), metal may be used. It is well known in the art that it is desirable that two sheets introduced (simultaneously) into the processing solution be at least initially separated so that the solution may act independently with respect to each sheet; however, separation of the sheets after the beginning of immersion is not necessary; accordingly, it will be noticed in FIGURE 5 that septum 88 extends downwardly from opening 86 only far enough to terminate short of or just within the solution.

Opening 86 and its septum 88 are almost but not wholly seen in FIGURE 3, which is a plan view of the apparatus in operating position with the fenestrated panel 24 in lowered position (see above). The panel 24 is provided with four fenestrations 89, 90, 91 and 92 (see FIGURE 3; also compare FIGURE 5). Fenestration 89 permits ingress and egress of sheets into and out of the photographic exposing means of the apparatus. Fenestration 90 permits ingress of two sheets into the processing tray—the sheets being purposefully separated by the septum 88. Fenestration 91 permits egress of two sheets which have passed through the solution within the processing tray and through the diffusion transfer squeegee rollers 62 and 63. Opening 87 of the tray is not seen in FIGURE 3, and barely appears at the ends of the squeeze rollers in FIGURE 4; but see FIGURE 5. Fenestration 92 of panel 24 permits access to button 31 (see above), actuation of which initially effects release of processing solution from the storage pouch to the processing tray.

When the apparatus has been in operating position, with processing solution in the tray 61, and it is desired to close and lock the carrying case and to position the latter so that handle 22 is uppermost for convenient manual transportation of the apparatus (see FIGURE 2), processing solution in portion 82 of the tray immediately flows into portion 83 thereof through the (unindexed) conduits between islands such as 84 (FIGURE 5) as soon as the apparatus is rotated.

Notwithstanding the two considerable openings 86 and 87 of portion 82 of the tray, processing solution does not spill as the position of the apparatus is varied by ninety degrees.

The reservoir portion 83 of tray 61, which is downwardly disposed when the apparatus is in normal carrying position, is connected by means of a flexible tube 93 of alkali-resistant material with a nozzle 94 (actually also a flexible tube of like properties) of a storage pouch 95 which is positioned behind the tray. Obviously when the apparatus is in normal carrying position the storage pouch 95 is below the tray, and solution flows by gravity from the latter to the former.

Situated at the rear righthand corner of the main frame is a pinch-valve structure designated in its entirety 96 (arrow; FIGURES 4, 5, and 6). The flexible tube 93 is led from the tray to the storage pouch in connection with this structure, which has the sole function of choking and unchoking tube 93.

The storage bag 95, which may be of any suitable design and essentially of materials substantially inert to alkali and impervious to gaseous diffusion (so that solution sealed within the bag is not subjected to the action of atmospheric oxygen), is held at a predetermined distance from the bottom 12 of main frame 10 by means, for example, of a fixed block 97, so that, when the apparatus is in operating position, the bag 95 is higher than tray 61, and solution may flow by gravity from the former to the latter if permitted to do so by the pinch-valve 96. Passed through wall 14 of the main frame is a plunger 98 having a headed portion 99 exposed on the outside of the carrying case. When the portion 99 is pressed inward the plunger 98 operates the pinch-valve 96 (actually a rocker of suitable design,) one end of which may squeeze tube 93 against the main frame so as to flatten the tube

and render the flow of solution therethrough impossible. When plunger 98 moves inward a predetermined distance not only is choking of tube 93 accomplished but the plunger, which is spring-loaded, is caught and held by any convenient detent which can be disengaged from the plunger only by pressing button 31 (see above).

It may be pointed out here that while the top of the carrying case may be closed and locked, and the apparatus rotated into normal carrying position, with great speed, the complete drainage of processing solution from the tray into the bag may take a few seconds longer; therefore the headed portion 99 of plunger 98 is provided on the outside of the carrying case for operating the pinch-valve slightly later without disturbing the carrying position of the apparatus.

What is claimed is:

1. A portable photocopying apparatus comprising a carrying case having a main frame in the shape of an open-topped box with a flat bottom and walls perpendicular thereto including a front and a rear wall, and a top for the main frame, the main frame of the box also being the main frame of the apparatus; means positioned near said front wall for photographically exposing a sensitized sheet; means positioned near said rear wall for storing processing solution, a tray for holding processing solution when the apparatus is positioned with the bottom of the main frame downward for the immersion in the solution of the exposed sheet and a transfer sheet, said tray being positioned intermediate said photographic means and said storing means; means for pressing the two sheets together after immersion to effect diffusion to the transfer sheet; means for the gravity flow of processing solution from the storing means to the tray when the apparatus is positioned with the bottom of the main frame downward and from the tray to the storing means when the apparatus is rotated ninety degrees in a particular direction; means for sealing stored processing solution from the atmosphere; and said front wall being externally provided with a handle for carrying the apparatus, whereby, when the apparatus is suspended by the handle, the rear wall is the lowest part of the apparatus.

2. The apparatus of claim 1, wherein the means for photographically exposing a sensitized sheet to an original comprises a fluorescent tube; a glass tube coaxially surrounding but out of contact with the fluorescent tube; an endless elastic belt under tension with its outer surface engaging a sector of the glass tube for rotating it and for feeding superimposed sheets partly around that tube at a predetermined distance from the fluorescent tube; at least three rollers parallel to the glass tube, each roller being partly engaged by the inner surface of the belt, with all rollers maintaining the belt under tension and with two of the rollers and the belt holding the glass tube in coaxiality with the fluorescent tube, one of the rollers being a driver; a motor for rotating the driver; and means for controlling the exposure of sheets fed by the belt partly around the glass tube.

3. The apparatus of claim 1, wherein the tray for holding processing solution when the apparatus is positioned with the bottom of the main frame downward provides, to one side, a conduit shaped in cross-section like a U for guiding sheets into and out of processing solution held by the tray, and, to the other side, a reservoir in open communication with the conduit, whereby the lower portion of the conduit is flooded with processing solution when the apparatus is so positioned, and the processing solution in the conduit immediately drains into the reservoir when the apparatus is rotated ninety degrees in a particular direction.

4. The apparatus of claim 1, wherein the means for pressing the two sheets together after immersion to effect diffusion transfer comprises two cooperating feed rollers adapted to receive the sheets between them under pressure as the sheets leave the tray, the rollers being geared together; and means for driving the rollers at a predetermined speed.

5. The apparatus of claim 1, wherein the means for the gravity flow of processing solution from the means for storing it to the tray when the apparatus is positioned with the bottom of the main frame downward and from the tray to the means for storing processing solution when the apparatus is rotated ninety degrees in a particular direction comprises the tray positioned on the bottom of the main frame, and a flexible tube connecting the tray with the storing means, the rear wall being the lowest portion of the apparatus when the latter is rotated ninety degrees in the above-mentioned particular direction.

6. The apparatus of claim 1, wherein the tray is positioned on the bottom of the main frame, the means for storing processing solution is a pouch positioned at a predetermined distance from the bottom of the main frame, and a flexible tube connects the pouch with the tray; and means including a valve operable from the outside of the carrying case for choking the tube and operable from the inside of the carrying case for unchoking the tube.

7. The apparatus of claim 3, wherein the means for storing processing solution is a flexible pouch having relatively high resistivity to alkali and impermeability to atmospheric oxygen, the reservoir of the tray being positioned nearest the pouch, said pouch being higher relative to the bottom of the tray when the apparatus is positioned with the bottom of the main frame downward to effect a gravity flow of processing solution from the pouch to the tray and said pouch being lower relative to the tray when the apparatus is rotated ninety degrees in a particular direction to effect a return gravity flow of processing solution from said tray back to said pouch.

8. In a portable diffusion transfer process copying apparatus comprising a carrying case which is part thereof, a container for diffusion transfer processing solution, one part of the container being a processing tray and an adjacent part of the container being a reservoir, at least one passage communicating between the two parts of the container to permit rapid flow of said processing solution therebetween, the relative positions of the two parts of the container being such that processing solution therein occupies both parts when the case is oriented in a particular manner and flows into the reservoir part when the case is oriented in another particular manner, a storage pouch for processing solution being provided in communication with said reservoir part of the container by means of a flexible tube, the relative positions of said reservoir and said storage pouch being such that processing solution flows from the storage pouch to the reservoir when the case is oriented in the first mentioned manner and from the reservoir to the storage pouch when the case is oriented in the second mentioned manner, and means including a valve operable from the outside of the carrying case for choking the tube and operable from the inside of the carrying case for unchoking the tube.

9. Portable diffusion transfer copying apparatus, comprising a carrying case as part thereof, said case having a vertical carrying position and a horizontal operating position, a diffusion transfer processing solution tray mounted within said case, a solution accumulator mounted adjacent said tray, and a solution pouch mounted adjacent said accumulator, said tray, accumulator and pouch being in communication with each other and occupying a generally common horizontal plane when the case is in horizontal operating position, whereby solution contained in the pouch flows by gravity via a flexible tube into the accumulator and tray, some of the solution remaining in the pouch, said tray, accumulator and pouch occupying a generally common vertical plane when the case is in vertical carrying position, the tray uppermost, the pouch lowermost, and the accumulator between them, whereby solution flows by gravity from the tray to the accumulator and from the accumulator to the pouch via said flexible tube, and means including a valve operable from the outside of the carrying case for choking the tube and

operable from the inside of the carrying case for unchoking the tube.

10. Apparatus in accordance with claim 9 wherein the tray and accumulator are connected by means of at least one relatively large conduit to permit a rapid flow of solution from said tray to said accumulator to quickly empty the tray when the case is moved from its horizontal operating position to its vertical carrying position.

References Cited by the Examiner

UNITED STATES PATENTS

2,900,889 8/59 Jaffe.

3,001,463 9/61 Reick ..... 95—77.5
3,031,942 5/62 Carlson ..... 95—77.5
3,054,340 9/62 Limberger ..... 95—89
3,101,036 8/63 Carlson ..... 95—89

FOREIGN PATENTS

843,362 7/52 Germany.

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