

March 3, 1970

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3,498,709

DESK TOP ELECTROSTATIC COPYING MACHINE

Filed April 12, 1967

7 Sheets-Sheet 1

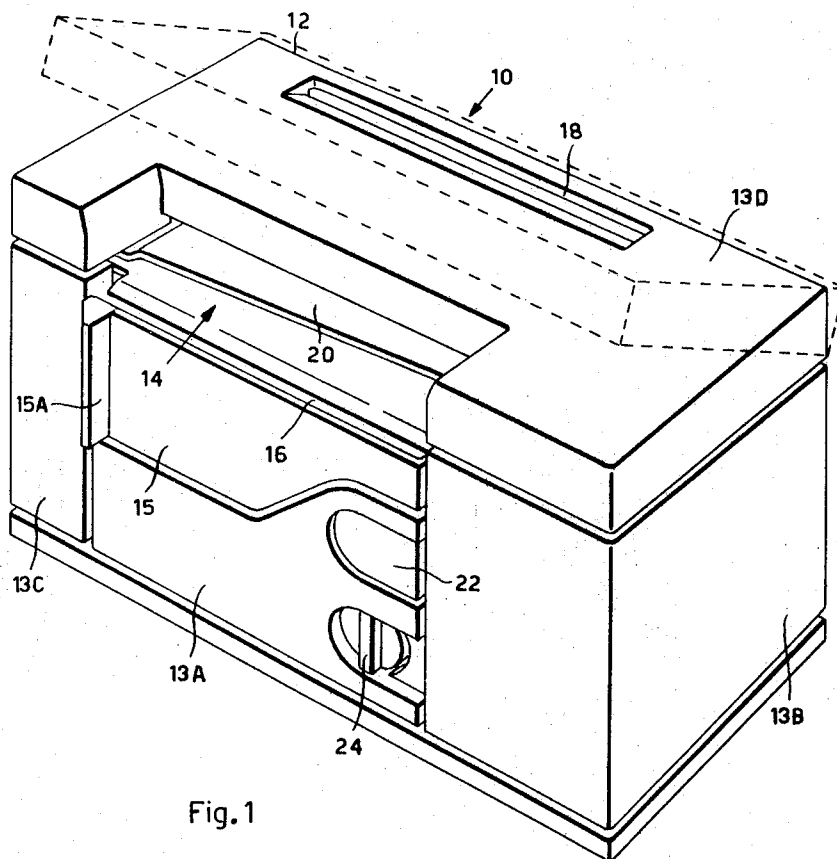


Fig. 1

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7 Sheets-Sheet 2

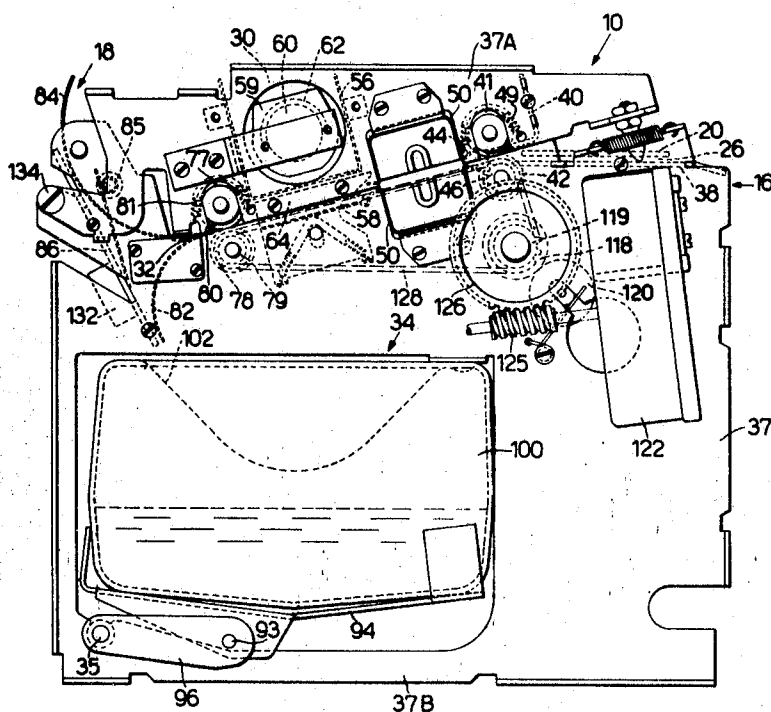


Fig. 2

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7 Sheets-Sheet 3

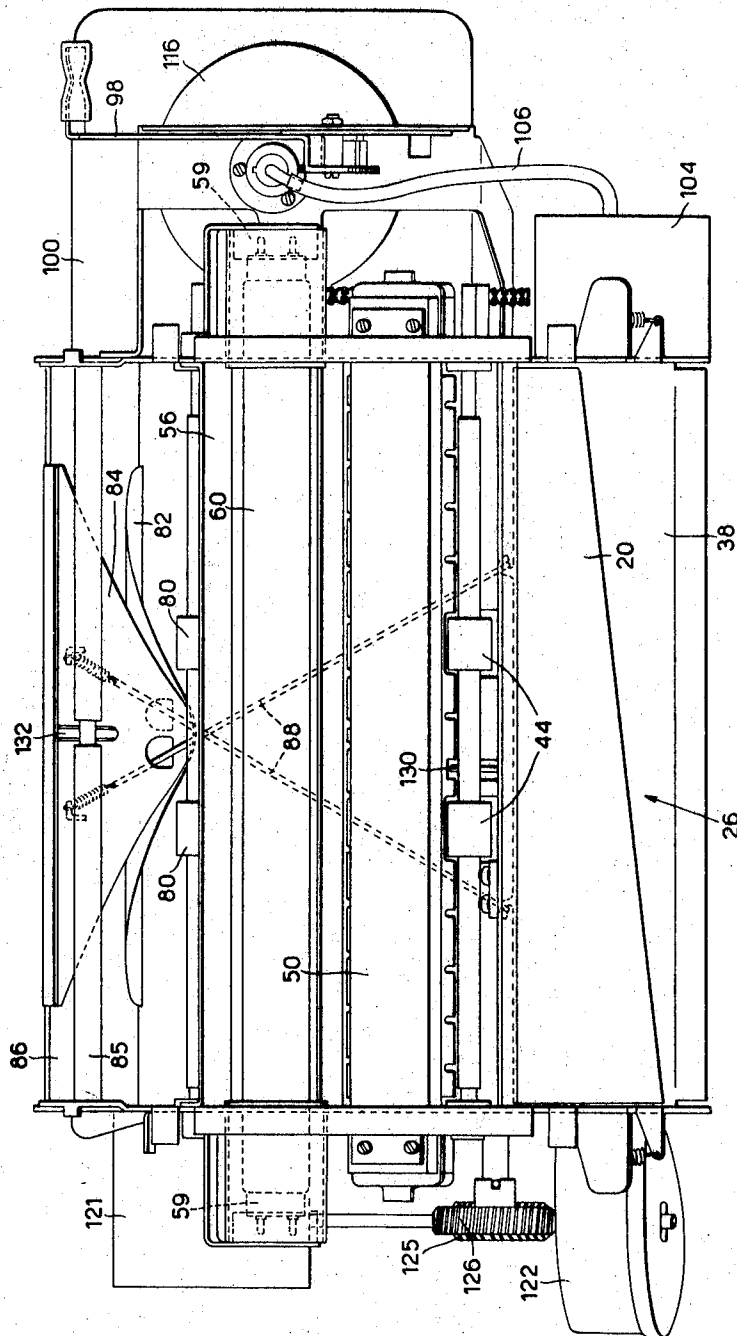


Fig. 3

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7 Sheets-Sheet 4

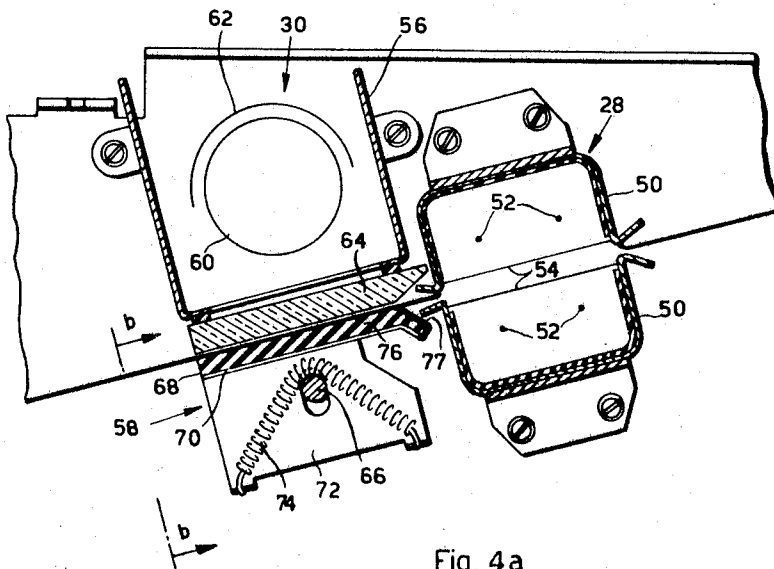


Fig. 4a

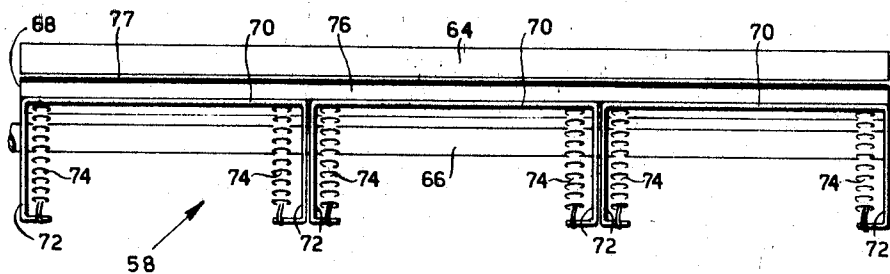


Fig. 4b

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7 Sheets-Sheet 5

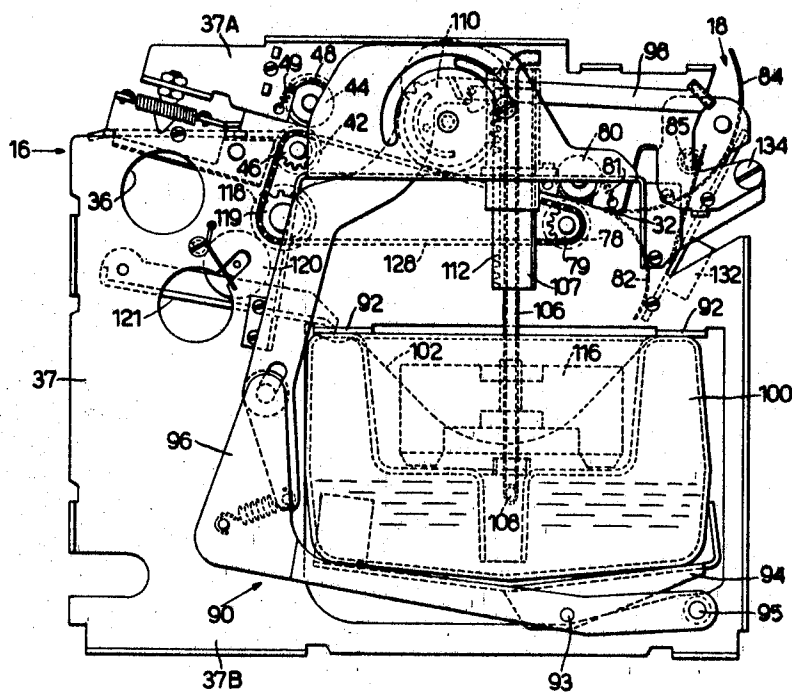


Fig. 5

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7 Sheets-Sheet 6

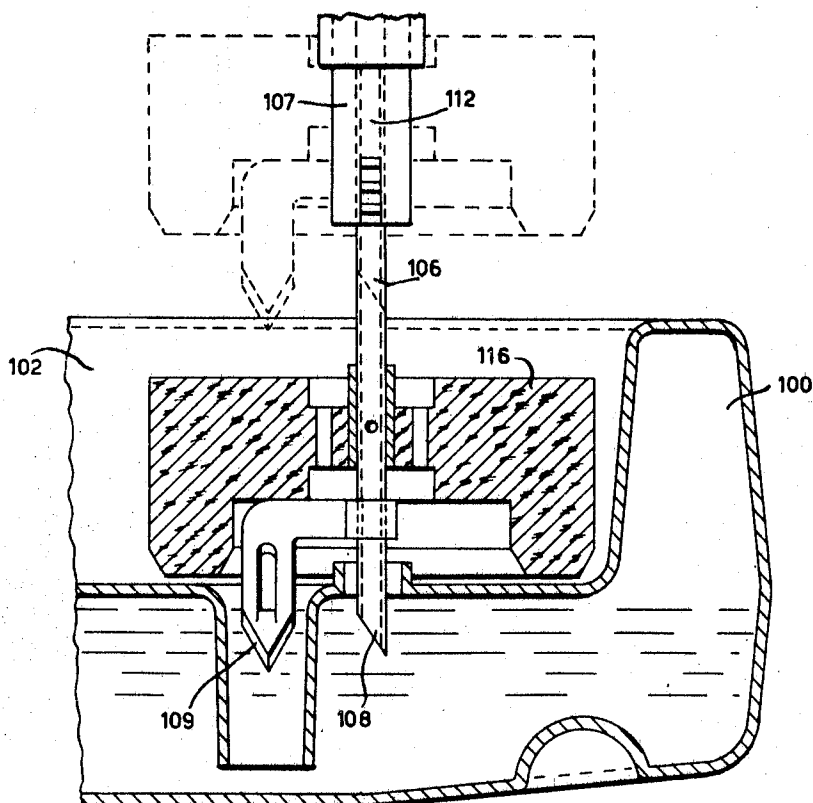


Fig. 6

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7 Sheets-Sheet 7

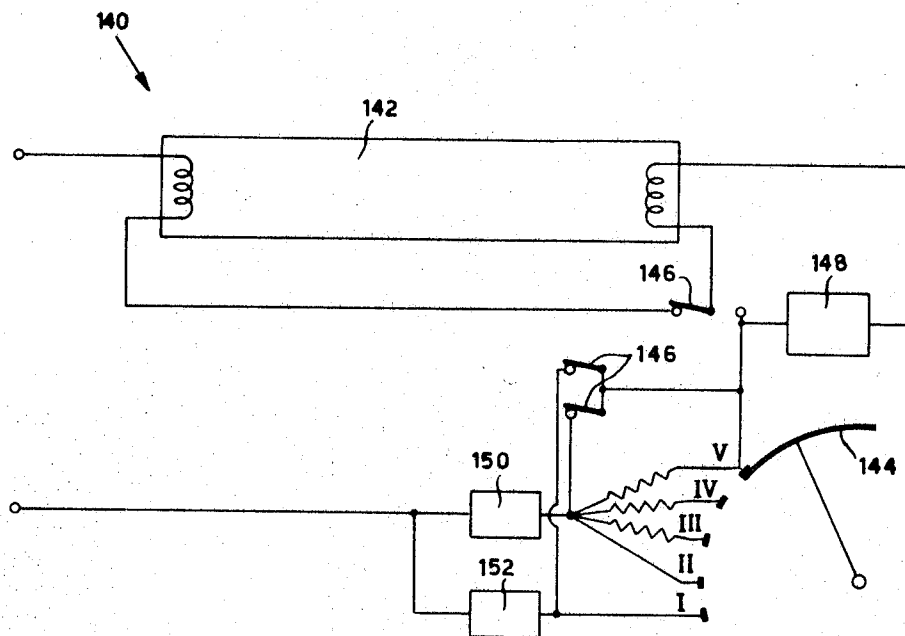


Fig.7

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2

3,498,709

DESK TOP ELECTROSTATIC COPYING MACHINE
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Filed Apr. 12, 1967, Ser. No. 630,308

Int. Cl. G03d 3/00; G03b 27/30, 27/04

U.S. Cl. 355—10

12 Claims

ABSTRACT OF THE DISCLOSURE

A desk top electrostatic copying machine in which the document to be copied and the copy sheet are in contact during the imaging and exposing steps. The path of the document and copy sheet slopes downwardly from the inlet opening of the machine through the imaging and exposing stations. A removable container holds the toner supply and also forms the developing tray in a portion of its exterior surface. The toner container is sealed when originally inserted into the machine and the seal must be broken before toner can be delivered to the developing tray. Multisectional pads lie opposite the illuminating means so as to maintain the document and copy sheet in position.

This invention relates in general to improvements in an electrostatic copying machine, and more particularly to a desk top type copier specifically arranged to reduce the size of the machine and to facilitate the handling of the toner.

The use of electrostatic copying machines has increased considerably in recent years. Most of the early electrostatic copying machines have been of the console type used as a central copying station for an entire office or department. While such machines are undoubtedly valuable and useful they require a secretary to leave her desk anytime it is necessary to make copies. If a secretary makes a great number of copies during the day considerable time is spent going between her desk and the copy machine and additional time is consumed in waiting for the machine to become available, particularly if a number of people use one machine. For this reason it is advantageous to provide an electrostatic copying machine which can be integrated as a part of a secretary's desk equipment. It is particularly important that the copier be small, efficient and easily operable by a secretary at her desk without requiring undue movement or stretching.

Desk top copiers are valuable not only in making miscellaneous copies of the papers which pass over a secretary's desk but also in providing additional copies of typed letters. In preparing letters having multiple copies a secretary spends considerable time in arranging the typing and carbon paper and in subsequently separating the carbon paper from the copies. Further if a typographical error occurs not only must the original be corrected but also each of the copies. Such a procedure is time consuming and has a tendency to cause a misalignment of the copy sheets each time a correction is made. With a desk top copier it is possible to make any copies required after typing the original, consuming for a normal letter having to be copied not more than an additional minute.

In a desk top copier because of the size limitations liquid toner affords the more efficient means for developing the copy sheets. When using liquid toner it is important that it be easily replaceable and also that the possibility of spilling and soiling the hands and clothing of a secretary be avoided. Additionally, it is important to provide a relatively inexpensive toner container which is main-

tained in a sealed condition prior to use to avoid spilling and which is easily inserted into position and placed in operation. Moreover, it is important in a compact type machine to combine elements where it is possible to do so, the toner container and the developer tray are an example of such a combination.

It is, therefore, a primary object to present invention to provide a desk top electrostatic copying machine which is simple in construction, efficient in operation and compact in size.

A further object of the invention is to provide in toner apparatus which is sealed prior to insertion in the machine and which can be easily inserted and removed.

A still further object is to provide a toner container which forms its own developing tray reducing the number of separate elements required in the machine.

Another object is to provide easily operated means for placing the sealed toner container in operating position and for puncturing the seals in the container for flowing toner into the developing tray.

A further object to the invention is to provide means for properly positioning the copy sheet and the document to be copied before the exposure lamp to avoid any wrinkling or other distortion in the copy sheet.

Still another object is to afford a simple electrical circuit for varying the illumination intensity of the exposing lamp and for preheating the lamp.

This and other advantages, objects and features of the invention will be apparent from the following description of a preferred embodiment thereof, made by way of example but not in a limiting sense, with reference to the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a desk top electrostatic copying machine embodying the present invention,

FIGURE 2 is a cross sectional view of the machine shown in FIGURE 1 with the cover removed,

FIGURE 3 is a top plan view of the machine shown in FIGURE 2,

FIGURES 4a and 4b are enlarged detailed views of the exposing station, of the charging station and of the pressure pad structure utilized in the present embodiment,

FIGURE 5 is a detailed view of the toner shelf unit and the handle means employed in the present arrangement,

FIGURE 6 is a detailed showing of the toner container and associated puncture means used in the present invention, and

FIGURE 7 is a diagrammatic showing of the electrical circuit for the lamp in the machine.

The present invention is an improvement of the electrostatic copying machine disclosed in U.S. patent application Ser. No. 538,443 filed Feb. 28, 1966 by Bernard Kaminstein and Henry G. Joel. Additionally the toner container used in the present invention is similar to the container disclosed in the U.S. patent application Ser. No. 566,512 filed July 20, 1966 by Bernard Kaminstein and Henry G. Joel.

In FIGURE 1 a desk top electrostatic copying machine or copier 10 is shown having a cover 12. The cover is formed by a lower center section 13A, a right side section 13B, a left side section 13C and an upper or top section 13D. Side sections 13B and 13C are removable to gain access to the sides of the copier and upper section 13D swings upwardly for access to the top of the machine. The cover 12 is arranged to prevent any light from entering the machine and causing deterioration of the charge placed on the copy sheet. In front of the machine 10 there is an inlet opening 14 for inserting a document D to be copied and a copy sheet C; a shelf 15 having an edge guide 15A to the cover at the inlet opening 14 to sup-

port the document and copy paper. The shelf extends horizontally when in use and folds down into a vertical position against the cover when the copier is not in use. Below the inlet opening 14 is an outlet opening 16 for the copy sheet after it has completed its passage through the machine. In the top rear of the machine there is another outlet opening 18 for discharging the document after it has been copied and completed its passage through the machine.

In the inlet opening 14 there is a divider member 20 which acts as a guide for the insertion of the document to be copied and the copy sheet. When a copy is made the document is fed into the machine above the divider member 20 while the copy sheet is fed in below the divider. The copy sheet has a photosensitive coating, such as zinc oxide, on one of its surfaces. When fed into the inlet opening 14 the photosensitive surface of the copy sheet is faced downwardly as is the face of the document to be copied.

The copier is powered by a small electric motor 21 shown in dotted lines in FIGURE 2 and an off-on switch 22 is mounted on the front of the lower section 13A of the cover for providing power to the motor. In addition, located on the lower section below the switch 22 is a selector switch 24 to permit the operator to select the proper intensity of illumination required by the document being copied.

In FIGURE 2 the internals of the copying machine 10 are shown and are divided into a number of stations, i.e. an inlet station 26, a charging station 28, an exposing station 30, a separating station 32, a developing station 34, and a copy sheet outlet station 36. In the copier a frame 37 comprising two spaced members is attached to and supports the cover 12 and various internal parts. Each frame member has an upper section 37A pivotably connected to a lower section 37B. The upper section 37A is secured to the upper section 13D of the cover. At the inlet station 26 a horizontally disposed shelf 38 extends transversely of the machine and is secured to the frame, it is coplanar with the hinged shelf 15 and acts as a support for the document and copy sheet at the inlet opening 14. Spaced closely above the shelf 38 and inwardly from the front of the machine is the divider member 20. As can be seen in FIGURES 1 and 3 the leading edge of the divider member 20 is angularly disposed relative to the front of the copier for facilitating the feed of materials into the copier. Above the divider member and extending transversely across the inlet of the copying machine is a guide plate 40, which is formed by a portion of the upper section 13D of the cover 12; the plate acts as a guide for the materials inserted into the copier.

When a copy is to be made the document or item to be reproduced is placed face down on top of the divider member 20 and the copy sheet is positioned below it on the shelf 38 with its photosensitive surface also directly downwardly. The operator arranges the document and copy sheet so that the leading edges of both are aligned as they are fed from the inlet station 26 into drive rollers 42, 44 only one-sided translucent documents can be copied. The rollers are mounted in the copier one in the upper frame section 37A above the other in the lower frame section 37B to receive the document and copy sheet in the nip of their cooperating surface and to pass them through the charging station 28 and the exposing station 30 in a downwardly sloping path. The plane through the centerline of the rollers is at a slight angle to the vertical. The lower or driving roller 42 has a sprocket 46 at its right end and is located in the lower frame section 37B while the upper or driven roller 44 has its ends positioned in slotted openings 48 in the upper frame section 37A. Spring means 49 hold the upper roller 44 downwardly against the lower roller 42 and permit the upper roller to move in an upward direction to accommodate various thicknesses of the document and copy sheet combination passing through the copier. While the copy sheet is gen-

erally of a uniform thickness the document may vary in thickness, accordingly certain tolerances are required to permit the passage of documents of different thicknesses between the rollers 42, 44.

Rearwardly of the drive rollers 42, 44, in the charging station 28, a pair of oppositely disposed charging housings 50 are located, one in the upper frame section 37A and the other in the lower frame section 37B. The housings are positioned at a slight angle to the horizontal so that the document and copy sheet pass into a downwardly sloping path from the inlet station 26 into the charging station 28. The charging housings 50 extend transversely across the copier and each contains a number of corona discharge wires 52, preferably of tungsten. The document and copy sheet pass between the charging housings 50 and thin nylon wires 54 stretched across the width of the open ends of the housings prevent any fouling or snagging the sheets as they pass therebetween. The leading and trailing edges of the housings 50 are disposed in diverging relationship to guide the sheets along the path.

In the exposing station 30 a lamp housing 56 is located above a pressure pad assembly 58 and these parts also are arranged at an angle to the horizontal, similar to the charging housings 50, to continue the document and copy sheet in their downwardly sloping path. Within the lamp housing 56 mounted in sockets 59 supported in the frame 37 is a lamp 60 and a reflector 62. For economy reasons a fluorescent lamp 60 is used to shine light through the document which to produce legible copies must be made of a translucent material. A plate 64 is arranged across the lower opening of the lamp housing, the plate 64 formed of glass, lucite or similar material affords a rigid surface to support the document and copy sheet in the charging station. The pressure pad assembly 58 comprises a transverse shaft 66 also fitted in slotted openings in the lower frame section 37B of the machine to accept various thicknesses of documents and copy sheet combinations. Positioned on top of the shaft are a plurality of separately mounted pressure pad units 68. Each pressure pad unit 68 comprises a backing plate 70 having a pair of downwardly depending tabs 72 at the opposite ends of the plate slotted to fit on the shaft. At each end of the sections 72 spring means 74 secure the pad unit to the shaft. A pad 76 of resilient material, such as foam rubber or other foam material, is attached to the upper face of the backing plate 70. Over laying the pad 76 is a thin sheet 77 of light absorbing material. The forwardly directed edges of the lamp housing 56 and pressure pads 58 are in diverging relationship to lead the document and copy sheet between the plate 64 and the individual pressure pad units 68.

Each of the individual pressure pad units 68 is resiliently mounted to deflect independently of the adjoining units. By this construction any local variations in the relative dispositions of the copy sheet and document as they travel past the plate 64 can be adjusted to avoid any distortion in the exposing operation.

Rearwardly of the exposing station 30 are a second pair of drive rollers 78 and 80 arranged to continue feeding the sheets through the copier. The drive rollers 78 and 80 are similar to the first pair of drive rollers 42, 44, the lower or driving roller 78 is positioned in the lower frame section 37B and has a sprocket 79 on one end and the upper or driver roller 80 is resiliently mounted in slotted openings 77 in the upper frame section 37A. Spring means 81 secure the upper roller 80 to the frame permitting the upper roller to be urged upwardly within the slot in the frame under the influence of the document and copy sheet combination passing between the rollers.

A pair of oppositely curved plates 82, 84, secured to the lower frame section 37B act as separating guide means for the document and copy sheet fed into the separating station 32 by the rollers 78, 80. Attached at one end to a plate 86 located behind the plates 82, 84 is a pair of thin

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flat wires 88. These wires 88 extend forwardly from the point of juncture of the plates 82, 84 passing in turn between the roller 78, 80, the lamp housing 56 and the pressure pad assembly 58, the charging housings 50 and the rollers 42, 44 are secured to the rear of the divider element 20. Though the document and the copy sheet are in substantial contact as they pass through the charging and exposing stations the wires 88 are positioned between them and assist in the separation of the copy sheet and the document after they pass between the rollers 78, 80. Preferably the wires are formed of tungsten or a similar material and are arranged in converging relationships from the front to the rear of the copier.

In the separating station the document D rides upwardly directed by plate 84 and shaft 85 through the outlet opening 18 in the upper rear of the machine. At the same time the copy sheet C passes downwardly along the plate 82 into the developing station 34. Within the developing station 34 is a toner support shelf unit 90 comprising a pair of spaced rigid upper support members 92 and a lower shelf 94 hinged on a shaft 95 and movable between a lower loading and unloading position and an upper operating position. A generally L-shaped linkage member 96 is secured at its lower end to the shelf 94 and to a shaft 95 and at its upper end to a movable handle 98. A removable and disposable toner container 100 is positioned in the shelf unit 90. The container is made of a plastic material and is shaped to form a concave developing tray 102 in its top surface arranged to receive the copy sheet from the separating station 32. The toner container 100 is sealed when it is initially placed in the machine to prevent any spilling during both its storage period and the insertion operation. During insertion the shelf 94 is in its lower position permitting the container to be easily slid into place. Once in place by moving the handle 98 into its rearward position the shelf 94 swings upwardly and forces the toner container into contact with the support members 92 holding it securely in operating position. In this position the container is ready to deliver the toner into the tray 102.

Mounted on the lower frame section 37B of the copier is an air pump 104 and a conduit 106 leading from the pump to the toner container. A portion of the conduit 106 passes through a post 107 and its end 108 which is inserted into the container is formed of a rigid material having a beveled cutting edge to puncture the sealed opening in the container. Additionally a second puncturing member 109 depends from the post 107 alongside the end 108 of the conduit for opening a second sealed opening in the toner container so that the toner can pass into the developing tray 102.

The handle 98 in addition to positioning the shelf 94, also controls the position of the post 107 for moving the cutting edge end 108 of the conduit 106 and the puncturing member 109 downwardly through the sealed openings in the container. One end of the handle 98 has a partially curved section 110 having a number of gear teeth arranged to mesh with a toothed rack 112 formed on the post 107. At the same time that the toner container is secured in position the section 110 of the handle drives the rack 112 causing the conduit 106 and its beveled end 108 and the puncturing member 109 to move downwardly cutting through the sealed openings in the toner container. Conversely, when a container is to be replaced the handle 98 through linkage member 96 depresses the shelf 94 to its lower position releasing the container and relocating the post 107 upwardly withdrawing the conduit 106 and the puncturing member 109 from the container.

The pump 104 supplies air through the conduit 106 into the container 100 forcing toner through the opening punctured by member 109 into the tray 102. A float 116 is slidably mounted on the conduit 106 within the developing tray for regulating the level of toner within the

tray. When the toner reaches its operating level the float causes the air to bypass the container discontinuing any flow into the tray. When the level of toner drops, the float 116 again directs the passage of air through the conduit into the container replenishing the toner in the tray. When power is cut off to the copier, the toner in the tray will drain back into the container. For a more complete description of the construction and operation of the toner container reference should be made to the above mentioned application Ser. No. 566,512.

Disposed slightly above and forwardly of the developing station are a pair of squeegee rollers 118, 120 for receiving the copy sheet after its passage through the developing tray 102 and for passing the copy sheet along to its outlet 16. The upper or driving roller 118 has sprocket 119 mounted on its outer end. The outer surface of the rollers are of rubber or a similar material for removing excess toner liquid from the copy sheet. A drip plate 121 is hinged to the frame 37 for directing toner liquid from the rollers 118, 120 back into the tray.

Positioned on the left side of the machine near the front is a fan 122 which delivers air across the copy sheet as it passes from the squeegee roller to the outlet 16. Situated toward the rear on the left side of the copier is the motor 121 which is connected by a worm gear drive 125 to a main drive sprocket 126 mounted on the opposite end of the squeegees roller 118 from sprocket 119. Additionally the motor powers the fan 122. Chain or belt means 128 engage the sprockets 46, 79, and 119 on the end of rollers 42, 78, and 118 to provide the driving means for passing the document and copy sheet through the copier.

A first microswitch 130 is situated between the drive rollers 42, 44 and the charging housing 52 and a second microswitch is disposed in the separating station 32 for controlling power to the charging and exposing stations.

The upper frame section 37A is pivotably connected to the lower frame section 37B through a shaft 134. The roller 48, the upper charging housing 52, the lamp housing 56, and the roller 80 are all mounted in the upper frame section 37A. Accordingly the upper section 13D of the cover and the upper frame section 37A can be swung upwardly away from the remainder of the copier exposing the path of travel of the document and copy sheet. If either of the sheets passing through the copier become jammed or otherwise caught they can be easily freed by lifting the upper section 13D.

In making copies in the embodiment just described a document and copy sheet are aligned either side of the divider member 20 and are fed into the nip of the drive rollers 42, 44. When the power to the copier is turned on the drive rollers are constantly rotating. As the rollers 42, 44 feed the document and copy sheet rearwardly and downwardly the leading edge of the sheets trip the microswitch 130 activating the corona wires 52 in the charging housing 50 and the lamp in the lamp housing 56. The document has the face containing the material to be copied directly downwardly as the photosensitive coated face of the copy sheet. As the document and copy sheet pass through the charging housing 50 the oppositely disposed corona wires 52 impress an electrostatic charge on the photosensitive coating of the copy sheet. From the charging station 28 the document and copy sheet pass between the plate 64 of the lamp housing and the light absorbent sheet 77 of the pressure pads. The pressure pads hold the document and copy sheet in position against the plate 64 as the two sheets pass beneath the lamp 60 which directs light through the document to the photosensitive coating of the copy sheet. The light striking the characters or symbols on the document is absorbed and does not reach the copy sheet, while the light not intercepted by the characters, passes through the document to the copy sheet and discharges the corresponding surface of the copy sheet. As the copy

sheet passes through the exposing station 30 a latent image is impressed on it in exact reproduction of the material, i.e. characters or symbols, on the document. The electrostatic charge now retained on the copy sheet is in the form of a latent image of the document, the charge on the remainder of the copy sheet having been discharged by the light which passes through to it from the document.

From the exposing station 30 the document and copy sheet pass into the drive rollers 78, 80, and are fed rearwardly into the separating station 32 where the wires 88 in combination with the separator plates 82, 84 separate the document and the copy sheet, with the document passing upwardly to the outlet opening 18 and the copy sheet downwardly into the developing station 34. As the trailing edges of the document and copy sheet pass through the microswitch 132 power to the corona wires 52 and to the lamp is cut off and they become deactivated.

The copy sheet passes downwardly into the developing tray 102 and its photosensitive coating which was facing downwardly as it passed through the charging and exposing stations is now reversed and faces upwardly as it passes through the developing tray. In the tray the toner which has an opposite charge to that of the latent image on the copy sheet adheres to the latent image and provides and exact reproduction of the material on the document. The drive rollers 78 and 80 pass the copy sheet through the developing tray and into the nip of the squeegee rollers 118, 120. The squeegee rollers remove excess liquid from the copy sheet and direct the sheet to the outlet 16. As the sheet passes from the squeegee roller air from the fan 122 is directed across the sheet providing a final drying action before it reaches the outlet 16.

The background surfaces of the documents being copied may have various reflecting characteristics. For this reason it is necessary to provide means for varying the amount of illumination which is used in the exposing station. By experience the operator will be able to gauge the required setting for the various surface backgrounds of documents and achieve the optical exposure of the document on the copy sheet. The lamp circuit is arranged to afford five different levels of intensity of illumination and also to preheat the lamp when it is not being used so that it will be ready for operation when copies are being made. In FIGURE 7 there is a diagram of the lamp circuit 140 containing the lamp 142 and a five position progressive shorting switch 144. Off-on switch 146 provides power to the copier, however, even when this switch is in the off position the lamp 142 is being preheated, as long as the copier is plugged into a power source. Ballasts 148, 150, and 152 are situated in the circuit, all three are used in preheating the lamp while ballasts 148, 150 are used for illuminating the lamp. By selecting the proper switch setting the operator regulates the intensity of illumination of the lamp 142.

When toner must be replaced the right side section 13B which is hinged to center section 13A of the cover is removed and the handle is moved through an 180 degree arc from its rearward to its forward position and depresses the shelf, which releases the container, and removes the conduit 106 and the puncture member 109 from the container. The old container is removed and discarded, it is possible that the container could be re-used by refilling and resealing it. The new container is inserted on the shelf which is then returned to its upper position securing the container in place. The handle which moves the shelf also drives the conduit beveled end 108 and puncture member 109 through the seal in the container for pumping air into the container and flowing toner into the developing tray. When the operation is completed the cover section 13B is replaced.

In the event access to the electric motor 21 is needed

the left side section 13C of the cover may be removed. Additionally the upper cover section 13D may be pivoted slightly from the upper frame section 37A to permit removal of the fluorescent lamp.

Since compactness is an important feature of the machine the downwardly inclined feed path of the document and copy sheet permits a reduction in the depth of the machine. The multi-sectioned arrangement of pressure pads assures the proper position of the copy sheet relative to the document as it is being illuminated and also assures the contacting relationship of the document and copy sheet though the separator wires 88 are disposed between them. It will be noted that the separator wires are angularly disposed with relation to the path of travel of the document to keep to a minimum any interference with the formation of the image on the copy sheet. It should be appreciated that the multisectioned pressure pads are important to prevent any deflection or displacement of the copy sheet relative to the document during exposure which could result in a distorted image. The sealed toner container avoids any spillage of the toner. Its shelf arrangement permits ease in the insertion of the container and also affords structure for holding the container securely in place during operation.

While in accordance with the provisions of the statutes there is illustrated and described herein the best form and mode of operation of the invention now known to us, those skilled in the art will understand that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention covered by the claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of other features.

What is claimed is:

1. An electrostatic copying machine adapted to maintain the document being copied in substantially contacting relationship with a photosensitive copy sheet during the charging and exposing steps, the improvement comprising

- (A) a first frame member unit,
- (B) a second frame member unit attached to and movable relative to said first frame member unit,
- (C) a first charging housing mounted in said first frame member,
- (D) a second charging housing positioned in opposed relationship to said first charging housing and mounted in said second frame member unit,
- (E) illuminating means, for exposing the copy sheet to the document, mounted in said second frame member unit,
- (F) multi-sectioned pad means positioned in opposed relationship to said illuminating means and mounted in said first frame member unit, said pad means adapted to maintain said document and copy sheet in position as they pass said illuminating means, and
- (G) drive means for passing the document and copy sheet between said first and second charging housings and between said illuminating means and said pad means, whereby said second frame member unit with said second charging housing and said illuminating means mounted therein can be moved relative to said first frame member for gaining access to the space therebetween.

2. Electrostatic copying machine as set forth in claim 1, wherein said first and second charging housings, said illuminating means and pad means and said drive means are arranged at an angle to the horizontal whereby the document to be copied and the copy sheet pass in a downwardly sloped path through the charging and the exposing steps.

3. Electrostatic copying machine as set forth in claim 1, wherein said second frame member unit is mounted above and pivotably secured to said first frame member whereby said second frame member unit can be pivoted upwardly away from the first frame member unit.

4. Electrostatic copying machine as set forth in claim 3, wherein said pad means comprises

(A) a common support section mounted in said first frame member unit below said illuminating means,

(B) a plurality of pad sections separately mounted on said support section for individual movement of each of said pad sections distinct from its adjacent pad section, and

(C) resilient means for securing said pad sections to said common support section.

5. Electrostatic copying machine as set forth in claim 4, wherein each of said pad sections comprises a relatively rigid backing plate, a sheet of resilient material secured and superposed on said backing plate, and a thin sheet of light absorbent material overlaying said resilient material and located below and opposite said illuminating means.

6. Electrostatic copying machine as set forth in claim 1, wherein means are provided for separating the document to be copied and the copy sheet after they have completed the charging and exposing steps.

7. Electrostatic copying machine as set forth in claim 6, wherein said means for separating the document to be copied and the copy sheet include at least one thin wire-like member disposed between said document to be copied and said copy sheet for the extent of their passage through the charging and exposing steps.

8. Electrostatic copying machine as set forth in claim 1, wherein the copy sheet after passing through the exposing step enters a developing station comprising

(A) a support shelf,

(B) a toner container adapted to be positioned on and removed from said shelf, said container being shaped to form a developing tray in its exterior surface and adapted to receive toner from the container and to receive the copy sheet for passage through the tray in contact with the toner.

9. Electrostatic copying machine as set forth in claim 8 wherein said support shelf comprises

(A) a first member adapted to engage the top of said toner container,

(B) a movable second member positioned below and

adapted to contact the bottom of said toner container, said second member having a lower position for the insertion and removal of said toner container and an upper position for locating the toner container during the copying machine operation, and

(C) means for moving said second member of said shelf between its lower and upper positions.

10. Electrostatic copying machine as set forth in claim 9, wherein said means for moving said second member of said shelf comprises a handle and linkage means connected to said handle and to said second member.

11. Electrostatic copying machine as set forth in claim 8, wherein said toner container is sealed when initially inserted into said support shelf and movable means are mounted in said copying machine for puncturing said container to permit the flow of toner from the container into said developing tray in its exterior surface, and a control device positioned in said developing tray to regulate the level of toner therein.

12. In an electrostatic copying machine as set forth in claim 1 a lamp circuit comprising a lamp for illuminating the document to be copied, a multi-position switch means having a plurality of positions adapted to regulate the intensity of the lamp during the exposing step, and means for preheating the lamp when copies are not being made in the machine.

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