May 1, 1951 E. R. SABEL ET AL 2,550,724

APPARATUS FOR APPLYING POWDER TO AN ELECTROPHOTOGRAPHIC PLATE

Filed April 13, 1949 3 Sheets-Sheet 1

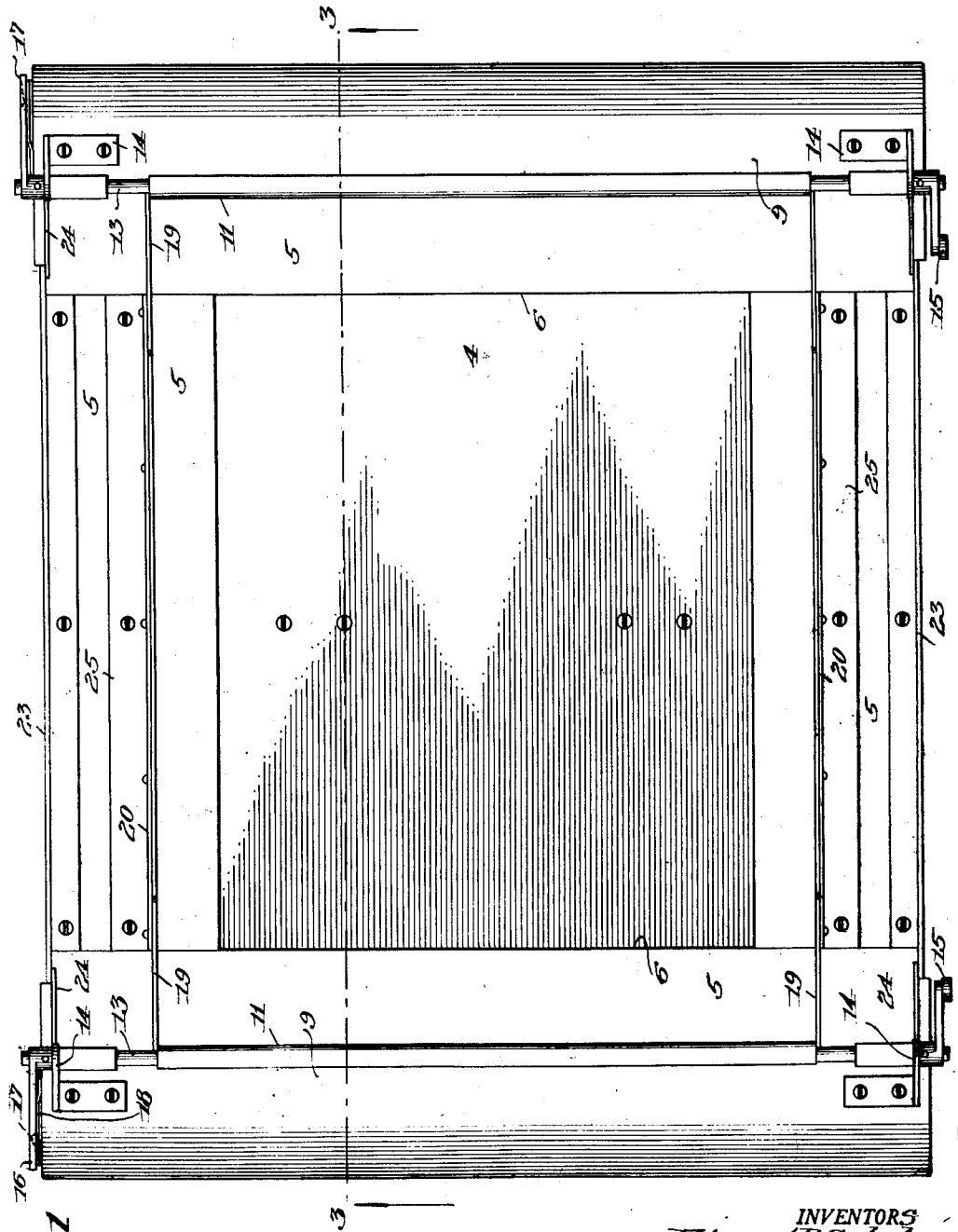


Fig. 1

INVENTORS
Edward R. Sabel
Frank I. Galbrecht
BY
Harold E. Stonebraker
their Attorney

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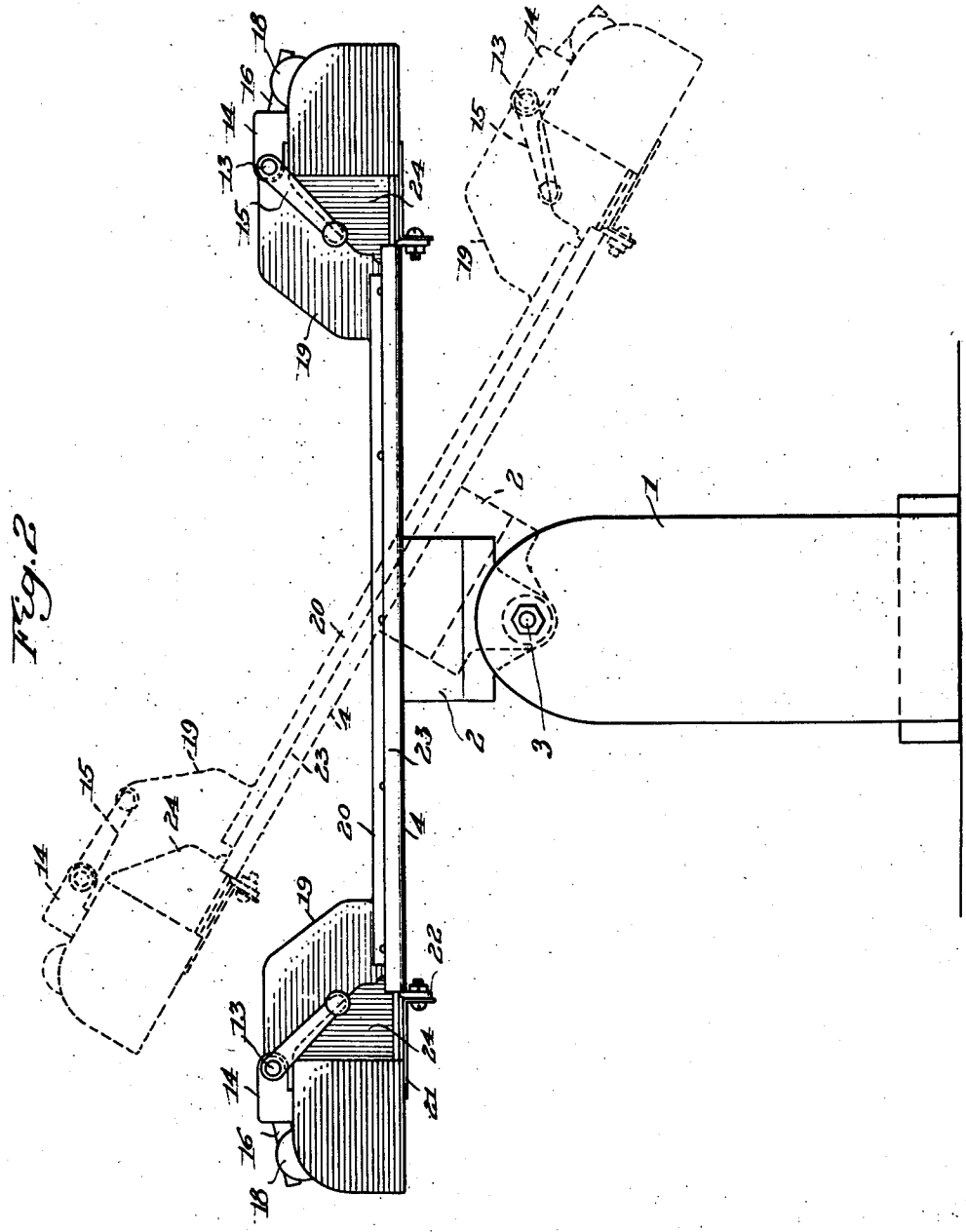


Fig. 2

INVENTORS
Edward R. Sabel
Frank I. Galbrecht
BY
Harold E. Stonebraker
their Attorney

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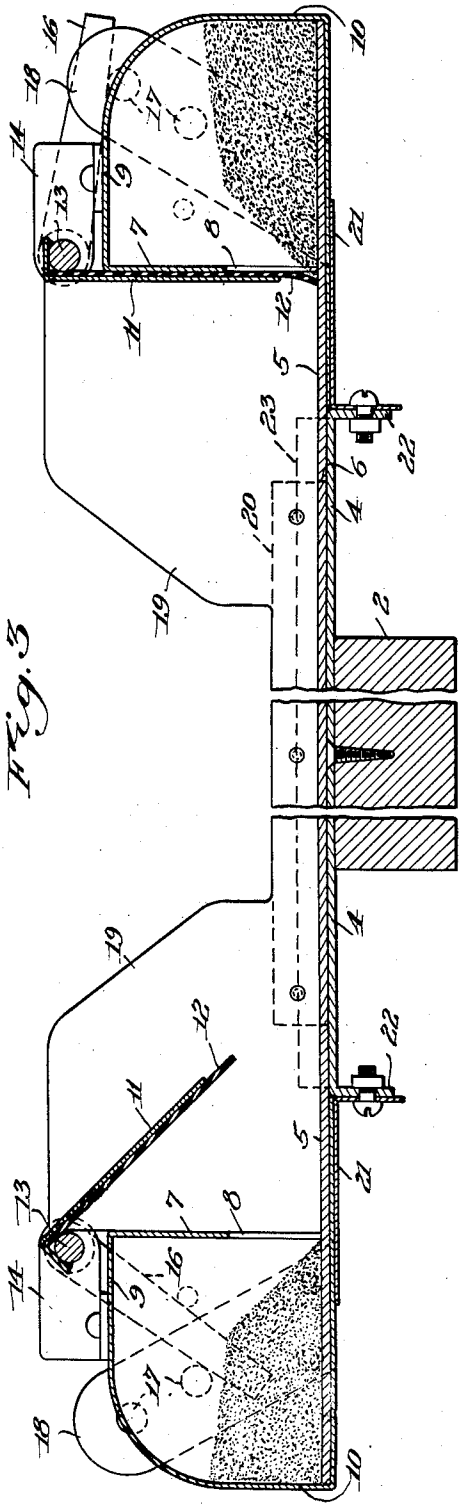


Fig. 3

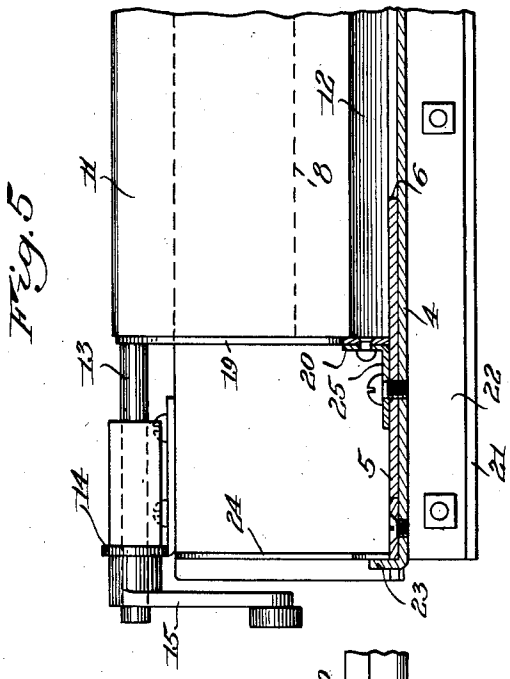


Fig. 5

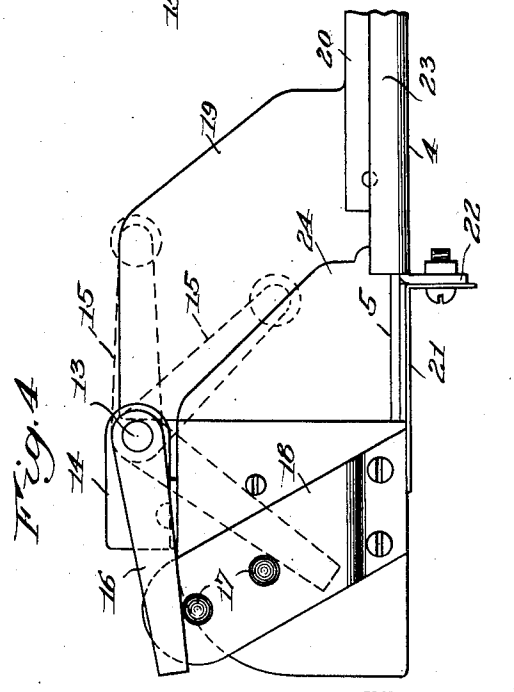


Fig. 4

INVENTORS
Edward R. Sabel
Frank I. Galbrecht
BY
Harold E. Stonebraker
their Attorney

Patented May 1, 1951

2,550,724

UNITED STATES PATENT OFFICE

2,550,724

APPARATUS FOR APPLYING POWDER TO AN ELECTROPHOTOGRAPHIC PLATE

Edward R. Sabel and Frank I. Galbrecht, Rochester, N. Y., assignors to The Haloid Company, Rochester, N. Y., a corporation of New York

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7 Claims. (Cl. 95—1.9)

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This invention relates to apparatus for applying powder to an electrophotographic plate, and has for its purpose to provide a simple, practical and economical means for receiving an electrophotographic plate and applying either developer powder or cleaning powder to the plate.

When making copies by electrophotography, the customary practice is to charge electrostatically a suitable sensitive plate such as one having a photoconductive layer on a conductive plate, then expose the plate to a light image to form an electrostatic image on the plate, dust the plate with electroscopic or developing powder to form a powder image thereon, and transfer the powder image to a paper or other sheet following which any electroscopic powder remaining on the plate is cleaned by means of suitable cleaning powder dusted over the plate, and the invention has for a more specific object to afford a conveniently operable apparatus in which the plate can be positioned after charging and exposing to receive the electroscopic powder that is cascaded over the plate to form the powder image from the electrostatic image, and also to receive the plate after the powder image has been transferred, to permit cascading over the plate a cleaning powder that acts to remove any adhering electroscopic powder from the plate to prepare it to receive another electrostatic charge.

More particularly the invention has its purpose to afford an oscillatory or rocking electrophotographic plate support provided with a powder receptacle at each end communicating with the surface of the support and of the electrophotographic plate positioned thereon, the powder receptacles each having a movable closure that is operable to permit movement of the powder from the selected receptacle over the plate upon oscillating the plate support.

Another object of the invention is to provide an apparatus of the character mentioned such that the receptacle at one end of the plate support may be supplied with electroscopic powder and the receptacle at the other end of the support supplied with cleaning powder, thus enabling the plate to be positioned in the support to have applied to it either electroscopic powder immediately after the charging operation, or cleaning powder after the powder image has been removed from the plate, the character of the powder operation depending on which receptacle closure is opened after the plate is positioned.

An additional object of the invention is to afford a structure in which the powder, either electroscopic or cleaning, is effectively confined within its receptacle except when being applied to the surface of the electrophotographic plate, the mechanism enabling the powder to be easily returned to its receptacle after the plate-dusting

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operation is completed and to be retained therewithin so as not to interfere with a subsequent operation when the alternative powder is applied to the plate.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims following the specification.

In the drawings:

Fig. 1 is a plan view of an apparatus constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a view in said elevation showing the plate support in the position assumed when oscillated to apply powder from one of the receptacles to the plate;

Fig. 3 is a longitudinal sectional view on the line 3—3 of Fig. 1 looking in the direction indicated, with parts broken away, and showing the closure to the receptacle at one end of the support open to permit movement of powder from the receptacle on to the support and electrophotographic plate, while the receptacle at the other end of the support is closed;

Fig. 4 is an enlarged detail view in side elevation showing the closure retaining means, and

Fig. 5 is an enlarged detail view in end elevation, partially in vertical section.

Referring more particularly to the drawings in which like reference numerals refer to the same parts throughout the several views, 1 designates a pedestal upon which is pivotally mounted a base portion 2 pivoted at 3 for rocking or oscillatory movement back and forth on the pedestal, and attached to the base portion 2 is a bottom plate 4 and a top plate 5 comprising the support for the electrophotographic plate, the top plate 5 being suitably fastened to the bottom plate 4 and having a recess 6 within which the electrophotographic plate can be positioned when it is to be subjected to a powder-dusting operation.

At each end, the plate support 5 extends within and forms the bottom of a powder receptacle which extends across the support, each of said receptacles comprising a front wall 7 having an opening 8 extending across the recess 6 at the bottom portion of the receptacle, a top wall 9, a back wall 10, and end walls, while 11 designates a door or closure for the opening in the front wall and having suitably attached and extending across its lower end a rubber or other yieldable portion 12 that flexes against the plate support 5 when the door is closed to retain powder within the receptacle when it is not being applied to an electrophotographic plate.

The closure or door 11 swings about a horizontal axis adjacent to the top of the front wall

7 and is fixedly mounted on a rock shaft 13, pivoted in bearings 14 suitably mounted on the top wall 9 of the receptacle, while 15 designates a handle or operating member at one end of the rock shaft 13, see Fig. 5, for turning the rock shaft to open or close the receptacle as the case may be. The closure is held in open or closed position by an arm 16 mounted at the opposite end of the rock shaft 13 and engageable alternately with abutments 17 on the yieldable spring plate 18 mounted on the support, as shown. 19 designates confining walls extending above the plate support 5 at opposite sides adjacent to the powder openings 8, said walls 19 being connected with walls 20 that extend endwise of the plate support at the sides thereof above the electrophotographic plate when the latter is positioned on the support so as to confine the powder to the area between the receptacles and between the side walls 19 and 20.

The walls 19 are suitably attached to the front walls of the receptacles, which are mounted in any convenient fashion on angle plates 21 fastened to flanges 22 formed on the bottom plate 4, the latter being provided with upturned flanges 23 to which are welded or otherwise fastened the plates 24 that in turn are secured to the receptacles as by welding, while 25 designate angle plates attached to the plate support 5 and to which the walls 19 and 20 are secured. It will be understood that the parts just described are mechanical details in the formation of the complete structure, which may be variously designed and connected without departing from the invention.

One receptacle at one end of the support may be filled with any suitable electroscopic or developing powder while the receptacle at the opposite end of the support may be filled with suitable cleaning powder, and after an electrophotographic plate is electrostatically charged and exposed to a light image to form an electrostatic image, it is placed within the recess 6 of the plate support 5, with the electrostatic image surface facing upwardly, and by manipulating the selected handle 15, the door or closure to the receptacle containing the electroscopic or developing powder is opened. The support can then be rocked or oscillated upwardly and downwardly several times, manually or otherwise, causing the developing powder to flow or cascade alternately in opposite directions over the exposed surface of the electrophotographic plate and resulting in a developing powder adhering to the electrostatic image on the plate. When the dusting operation for development of the image is completed, the surplus powder that is not retained by the electrostatic image on the plate is permitted to flow back into its receptacle by holding the support in inclined position with the open receptacle at the lower end, and after the powder is all returned within the receptacle, the door is closed and the plate is removed from the support. After the powder image is transferred from the plate to a paper or other support, it is desirable to clean the plate thoroughly before subjecting it to another charge and exposure, and this is accomplished by again placing the plate in the holder as already described and opening the closure to the receptacle at the other end of the support, permitting the cleaning powder contained within the receptacle to flow back and forth over the plate when the support is rocked or oscillated on the pedestal. After several such operations, the plate is clean and the cleaning

powder can be permitted to flow back into its receptacle, following which the door to the cleaning powder receptacle is closed and the plate can be removed from the support.

While the invention has been described with reference to the particular construction disclosed herein, it is not confined to the exact details set forth, and this application is intended to cover such modifications or departures as may come within the intended scope of the following claims.

We claim:

1. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at one end of the support extending thereacross, said support extending into and forming the bottom for said receptacle and having a recess spaced from said receptacle in which the electrophotographic plate can be positioned with its top surface flush with the top surface of the support, the receptacle having a closed top and an opening in its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, powder-confining means extending along the sides of the support, and a pivoted closure movable outwardly against said inner wall to close said opening and movable inwardly away from said wall to uncover the opening and permit movement of powder therethrough.

2. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening in its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, powder-confining means extending along the sides of the support, and a pivoted closure movable outwardly against each of said inner walls to close the opening therein and movable inwardly away from said wall to uncover the opening and permit movement of powder therethrough.

3. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening in its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, powder-confining means extending along the sides of the support, a pivoted closure movable outwardly against each of said inner walls to close the open-

ing therein and movable inwardly away from said wall to uncover the opening and permit movement of powder therethrough, and retaining means cooperating with the closure and acting to hold it in open or closed position.

4. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening in its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, powder-confining means extending along the sides of the support, a pivoted closure movable outwardly against each of said inner walls to close the opening therein and movable inwardly away from said wall to uncover the opening and permit movement of powder therethrough, the closure being mounted on a pivoted rock shaft, a handle carried by the rock shaft for moving the closure to open or closed position, a pair of yieldable abutments determining the position of the closure, and an arm carried by the rock shaft and engageable with one or the other of said abutments to hold the closure in open or closed position.

5. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrohotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening in its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, a pivoted closure for each of said openings positionable in either open or closed position, the closure having a flexible portion at its lower end engageable with the support to prevent movement of powder from the receptacle when the closure is in closed position, and vertical walls at opposite sides of the support extending above the electrophotographic plate when the latter is in position and operating to confine the powder within the side edges of the support and over the electrophotographic plate.

6. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening extending across the bottom of its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, a closure for each of said openings pivotally mounted to swing about a horizontal axis adjacent to the top of the inner wall, the closure having a flexible portion at its lower end engageable with the support to prevent movement of powder from the receptacle when the closure is in closed position, and vertical walls at opposite sides of the support extending above the electrophotographic plate when the latter is in position and operating to confine the powder within the side edges of the support and over the electrophotographic plate.

7. Apparatus for applying powder to an electrophotographic plate comprising an oscillatory support on which the electrophotographic plate can be mounted, a powder receptacle at each end of the support extending thereacross, said support extending into and forming the bottom for said receptacles and having a recess between said receptacles in which the electrophotographic plate can be positioned with its top surface flush with the top surface of said support, one of said receptacles being adapted to contain developing powder and the other of said receptacles being adapted to contain cleaning powder and each receptacle having a closed top and an opening extending across the bottom of its inner wall adjacent to said support permitting movement of powder from the receptacle over a plate positioned on the support, a closure for each of said openings pivotally mounted to swing about a horizontal axis adjacent to the top of the inner wall, the closure having a flexible portion at its lower end engageable with the support to prevent movement of powder from the receptacle when the closure is in closed position, vertical walls at opposite sides of the support extending above the electrophotographic plate when the latter is in position and operating to confine the powder within the side edges of the support and over the electrophotographic plate, a rock shaft on which the closure is mounted, a handle carried by the rock shaft for moving the closure to open or closed position, a pair of yieldable abutments determining the position of the closure, and an arm carried by the rock shaft and engageable with one or the other of said abutments to hold the closure in open or closed position.

EDWARD R. SABEL.
FRANK I. GALBRECHT.

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