

Nov. 23, 1948.

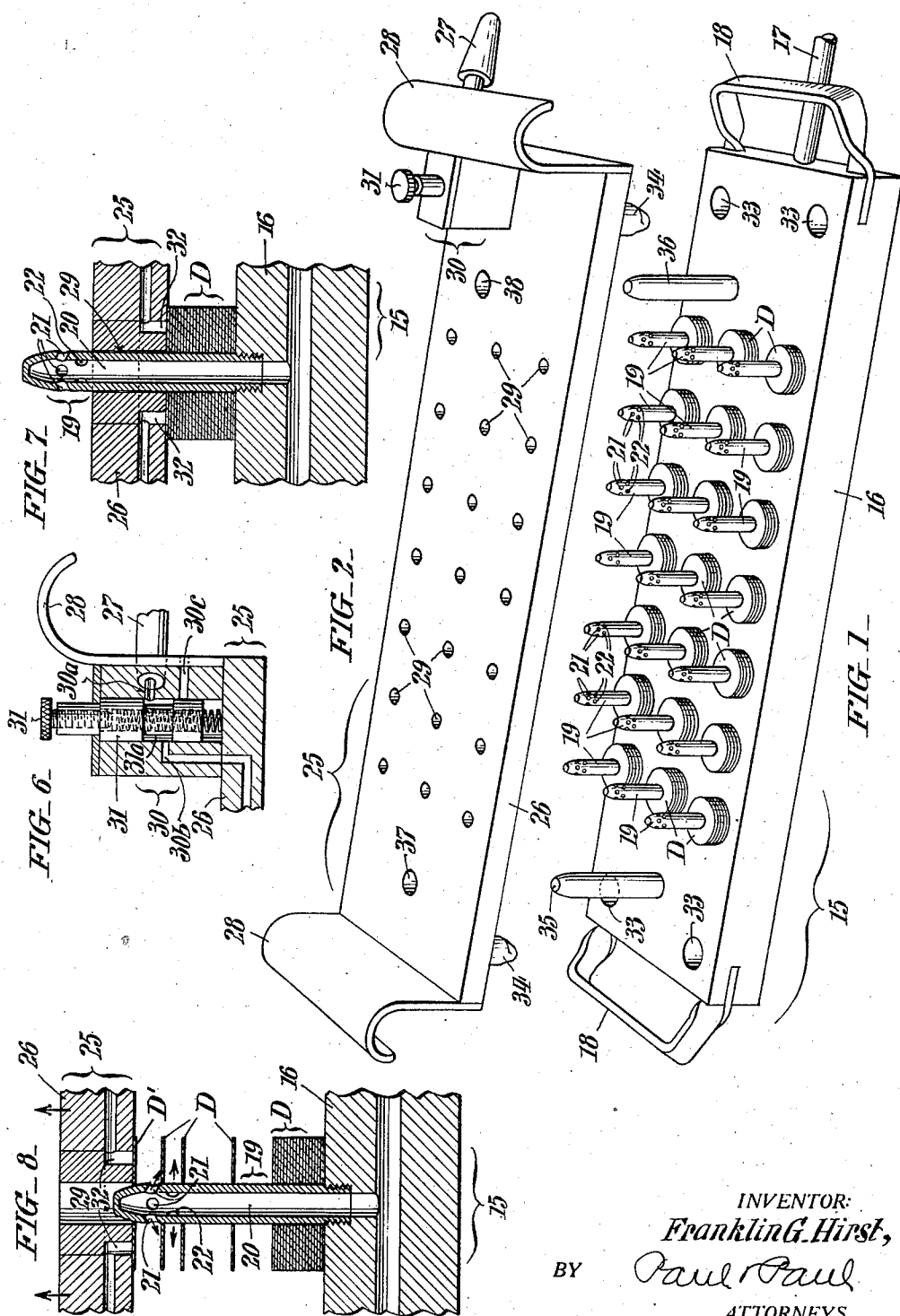
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2,454,556

DISK HANDLING APPARATUS

Filed Dec. 28, 1946

4 Sheets-Sheet 1



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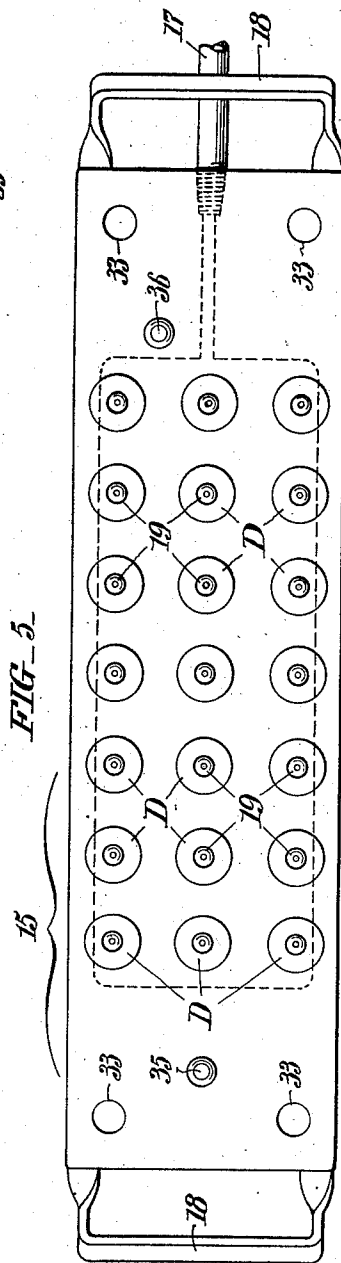
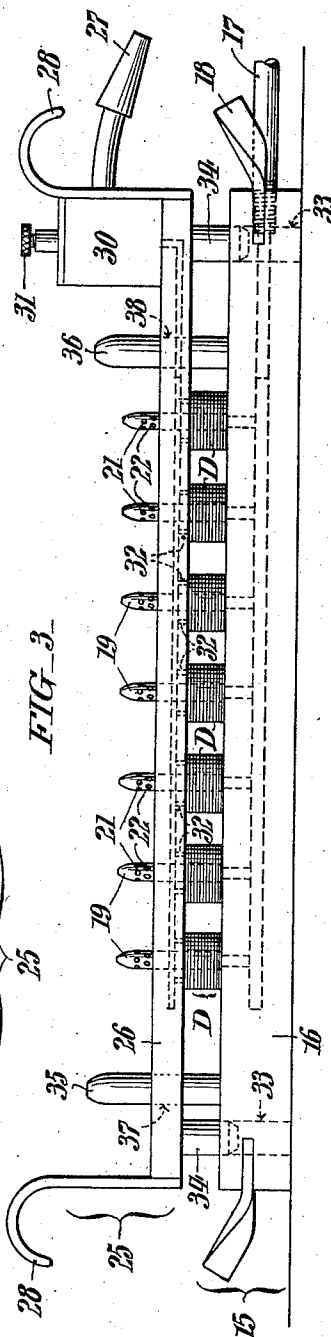
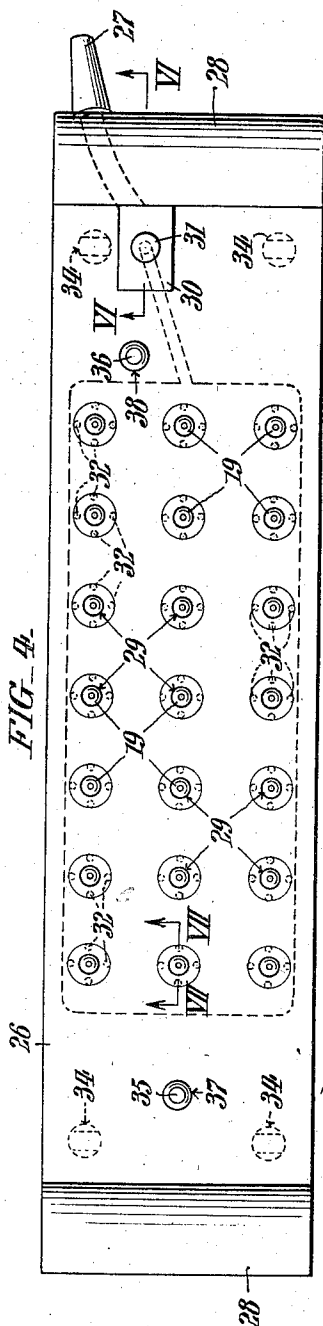
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4 Sheets-Sheet 2



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DISK HANDLING APPARATUS

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4 Sheets-Sheet 3

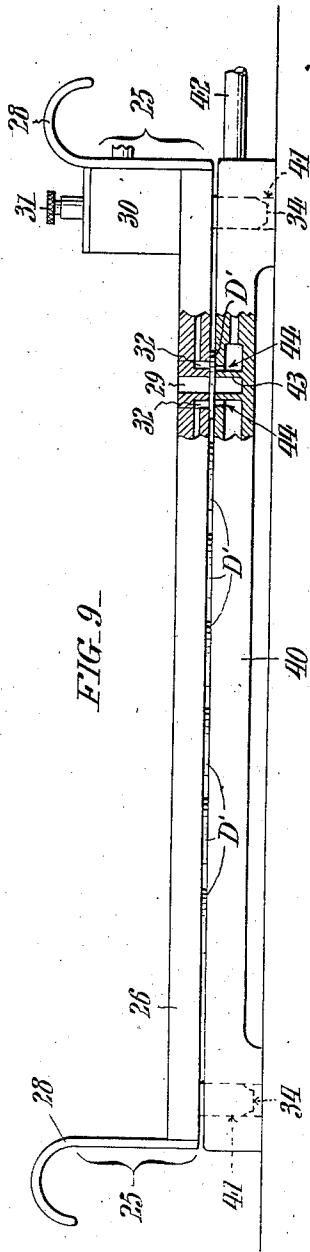


FIG. 9

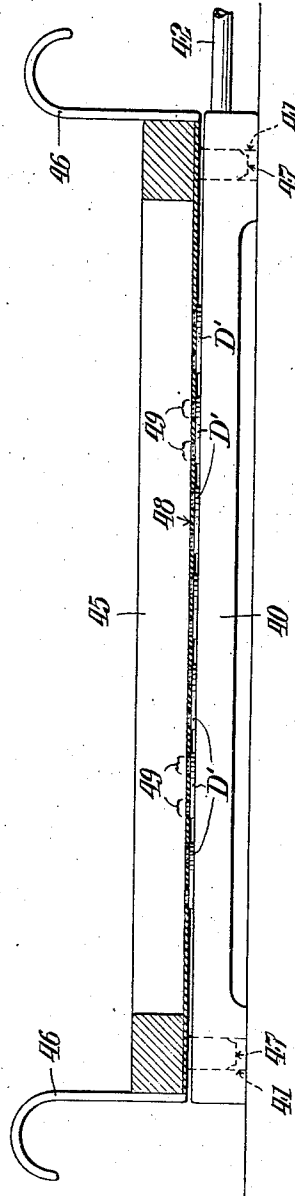


FIG. 10

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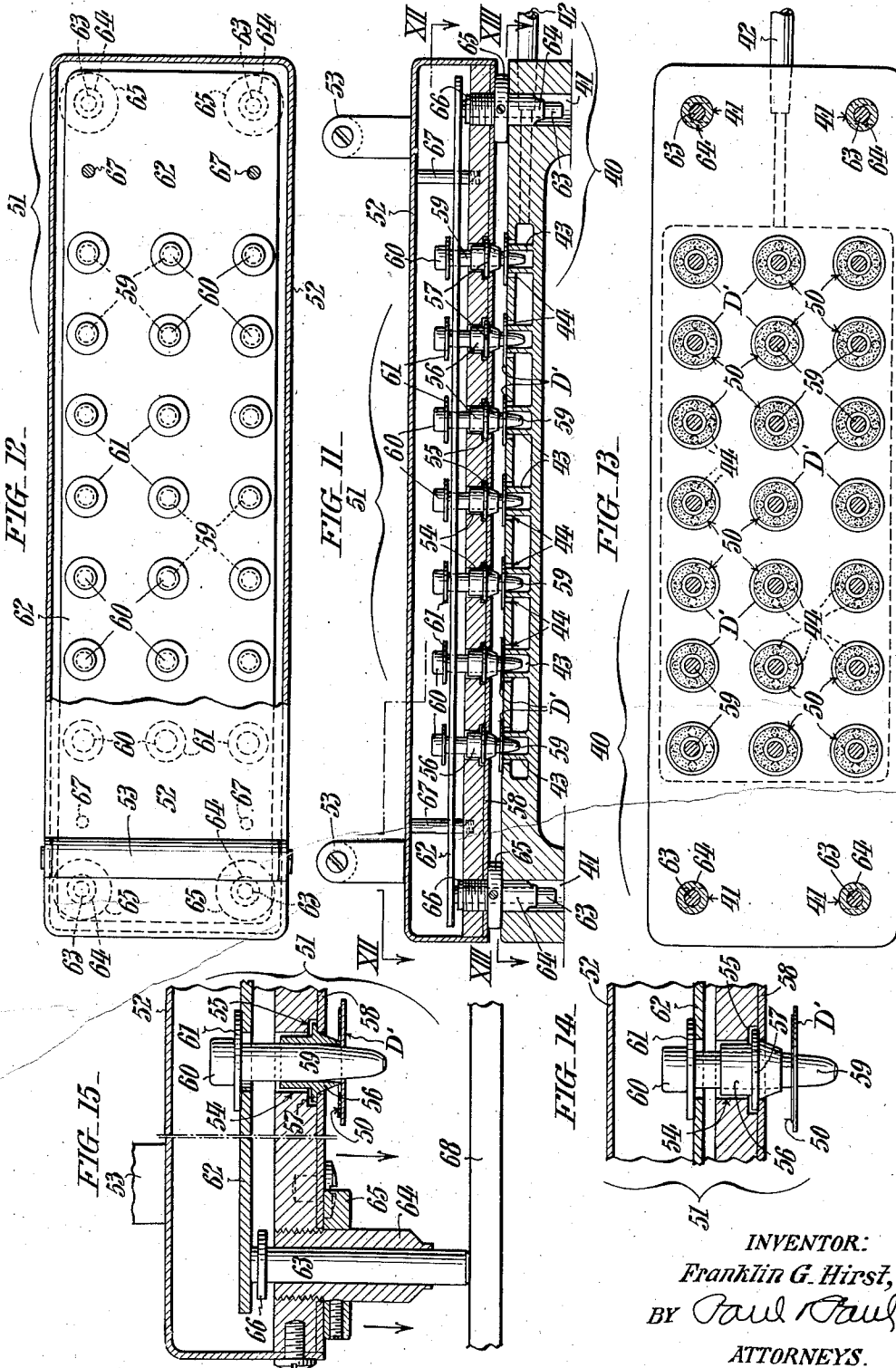
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DISK HANDLING APPARATUS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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DISK HANDLING APPARATUS

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Application December 28, 1946, Serial No. 718,965

10 Claims. (Cl. 271-1)

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This invention relates to apparatus useful in handling small disks of thin sheet material incident to carrying out printing or other operations upon them. More specifically, it is concerned with the handling of delicate and fragile apertured disks of mica or other dielectric material such as are employed in the manufacture of small capacity condensers to which imprints of metal in solution are to be applied in lieu of the usual metallic foil.

The chief aim of my invention is to provide apparatus of the kind referred to which can be relied upon to maintain multiple disks in definite separation incident to deposit upon and subsequent removal from a printing platen and so preclude overlapping between them during the printing as well as afterwards while drying, and thereby obviate smearing.

Briefly described, the apparatus of my invention comprises a support in the form of a tray for multiple piles of apertured disks; a primary transfer element which, at each operation, removes the uppermost disks from the piles on the support and which deposits them upon the platen of the printing means without change in their spaced relation; and a second transfer element for removing the disks from the platen after printing and deposits them onto a surface such as a moving belt for drying, likewise without change in their original spacing.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein

Fig. 1 is a perspective view of one of the disk pile supporting or tray element of my improved apparatus.

Fig. 2 is a similar view of the primary transfer element of the apparatus.

Fig. 3 is a view in side elevation showing how the primary transfer element of Fig. 2 is applied to the tray element of Fig. 1 in preparation for the removal of the uppermost disks from the piles on the latter.

Fig. 4 shows the top plan view of the assemblage of Fig. 3.

Fig. 5 shows the top plan view of the tray element.

Figs. 6 and 7 are fragmentary views in section drawn to a larger scale and taken as indicated respectively by the angled arrows VI—VI and VII—VII in Fig. 4.

Fig. 8 is a view like Fig. 7 showing how the uppermost disks are removed from the piles on the tray element by the primary transfer element.

Fig. 9 is a view partly in side elevation and

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partly in longitudinal section showing how the disks are deposited upon the printing platen.

Fig. 10 is a similar view showing a stencil frame applied over the disks on the platen in readiness for the printing.

Fig. 11 is a view in turn like Fig. 9, showing the secondary transfer element of my improved apparatus in position on the printing platen in readiness to remove the newly printed disks.

Fig. 12 is a view partly in top plan and partly in horizontal section taken as indicated by the angled arrows XII—XII in Fig. 11.

Fig. 13 is a horizontal section taken as indicated by the angled arrows XIII—XIII in Fig. 11.

Fig. 14 is a fragmentary view in vertical section of the secondary transfer element showing how the wet printed disks are retained by the latter upon being lifted from the printing platen; and

Fig. 15 is a view like Fig. 14 showing how the newly printed wet disks are subsequently released from the secondary transfer element incident to deposit upon a supporting surface for drying.

In Figs. 1-8 of these illustrations, the tray element of my improved disk handling apparatus is comprehensively designated by the numeral 15 and shown as having the form of a flat rectangular plate 16 which is hollow and provided at one end with a nipple 17 for connection by means of a hose (not shown) to a source of compressed air. The tray element 15 is moreover provided at opposite ends with grasp handles 18. Upstanding from the plate 16 at definitely spaced intervals studs 19 each having an axial duct 20 in communication with the hollow of said plate, and lateral air discharge orifices 21 and 22 at different levels adjacent its upper end, the axes of the uppermost apertures being inclined downwardly as best shown in Fig. 8. The studs 19 serve as posts for impalement of piles of thin apertured mica disks D to which imprints of metallic paint or the like to be applied as later on explained.

The primary transfer element of the apparatus is generally designated 25 in Fig. 2, and, as shown, like the element 15, is in the form of a hollow plate 26 which, see Fig. 4, is provided at one end with a nipple 27 for connection by means of a flexible hose (not illustrated) to a source of suction, and at opposite ends with grasp handles 28. The plate 26 is moreover provided with holes 29 arranged to correspond with the spacing of the studs 19 on the element 15. Suction to the plate 26 of the transfer element 25 is controllable by means of a spring-biased valve which is indicated at 30 and which is operable by pressure upon the upper end.

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of its plunger 31, see Fig. 6. Extending through the bottom wall of the plate 26 from the hollow of the latter and arranged circumferentially about each hole 29 within the area of a disk D is a group of suction orifices 32 see Figs. 4, 7 and 8, the purpose of which will be presently explained. From Fig. 6 it will be observed that the plunger 31 of valve 30 has an annular groove 31a by way of which communication is normally established between a port 30a with which the nipple 27 connects and a port 30b which leads to the hollow of the plate 25. Thus when the plunger 31 is depressed, the port 30a is closed and communication established between the port 30b and a third port 30c which leads to the atmosphere. Under the latter condition, the tension within the hollow of the plate 25 is completely relieved to insure release of the disks incident to deposit onto a printing platen also as hereinafter more clearly set forth.

In use, the primary transfer element 25 is lowered over the tray element 15 and its holes 29 incidentally registered with the studs 19 of the latter element until the plate 26 rests upon the disks on said tray element. In order to facilitate the step just described, the tray element 15 is provided at corners with apertures 33 to receive pendant dowel pins 34 on the primary transfer element 25. Moreover, to insure against improper placement of the transfer element 25 on the tray element 15, the latter is provided with a pair of dowel pins 35 and 36 and the former with receiving apertures 37 and 38 for them. The pin 35, it will be noted, is on the longitudinal center line of the tray plate 16, while the pin 36 is disposed off center, the same being true with regard to the arrangement of the corresponding apertures 37 and 38 in the plate of the transfer element to prevent improper placement of the tray. With the suction on, the transfer element 25 is withdrawn upwardly with the result that, by action of the suction through the orifices 32 in the bottom of the plate 26, the uppermost disks D' are lifted from the several piles on the tray elements 15 each after the manner shown in Fig. 8, carrying along of adjacent disks from the piles being precluded by action of the air blasts discharged downwardly through the lateral orifices 21 of the studs 19, thereby counteracting adhesion due to static electric charges or other causes. By this blasting, the disks are moreover cleaned of any adhering dust particles such as would be likely to interfere with the subsequent application of the printing material and result in rejects.

The loaded transfer element 25 with its charge of disks D' is next superposed upon the platen 40 of a printing means as shown in Fig. 9 which platen is rectangular and hollow like the plate 26 of the primary transfer element 25 and provided with apertures 41 to receive the pendant dowel pins 34 of said element. The printing platen 40 is further provided at one end with a nipple 42, for hose connection to a source of suction which latter may be the same as that utilized for transfer element 25. Extending between the top and bottom of the platen 40 within its hollow, are bosses 43 which are spaced and centered to correspond with the spacing of the holes in the primary transfer element; and in said top wall around the bosses within the areas of the disks D' are suction apertures 44. Incident to application of the transfer element 25 to the platen 40, the valve of the latter is left open as shown in Fig. 6 to permit the suction to act upon

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the transferred disks and hold them against displacement while the transfer element is subsequently removed which operation is effected after closure of the valve 30 for elimination of all restraint upon the disks from above. The blank disks D' being now ready for printing on the platen 40, a frame 45 with handles 46 and dowel pins 47 to match with the apertures 41 in the printing platen 40 and with a stencil screen 48 at the bottom is superposed upon the platen 40 as shown in Fig. 10, said screen 48 having permeable areas 49 which may be annular or otherwise configured and which are spaced to correspond with the positioning of the disks. Through the permeable areas 49 in the screen, metallic solution within the frame 45 is forced by means of a squeegee to form imprints 50 upon the top faces of the disks as shown in Fig. 13. From Figs. 13, 14, and 15 it is to be observed that, in the printing, a narrow blank margin is left around the apertures in the disks D'. With the suction still on to hold the disks D' to the platen 40 the stencil diaphragm 45 is withdrawn after the printing is accomplished.

The secondary transfer element of the apparatus which I have devised for removing the wet newly-printed disks from the platen 40 is shown in Figs. 11-15 and there generally designated by the numeral 51. As illustrated, it has the form of a rectangular box 52 with a pair of lift handles 53 secured to its top.

The lower wall of the box 52 is provided with holes 54 which are arranged to correspond with the spacing of the disks on the printing platen 40 and which are counterbored at the bottom as at 55. Disposed within the holes 54 with freedom for a limited amount of lateral movement, are bushings 56 with circumferential flanges 57 occupying the recesses formed by the counter boring, said bushings being held in place by an apertured retaining plate 58 on the underside of the lower wall of the box 52 with their coned bottom ends extending through said plate. It is to be noted that the holes 54 are so dimensioned as to permit the bushings 56 to move both vertically and laterally slightly relative to the box bottom. Slidable axially within the bushings 56 are pins 59 which are provided with stop heads 60 and collars 61 at the top, and which are somewhat tapered at their bottom protruding ends. Normally, all of the pins 59 occupy the position in which one of them is shown in Fig. 14 with its stop collar 61 resting on a lifting plate 62, the latter being apertured for free passage of the pin shanks through it, and in turn normally rests on supporting pins 63 which are axially slidable in tubular locating dowels 64 threaded into the box bottom at the corners and adapted to engage downwardly into the corner apertures 41 of the printing platen 40. As shown, the dowels 64 are provided medially with collars 65 which determine the rest position of the transfer element 51 on the platen 40 and the pins 63 with collars 66 that act as stops to prevent them from falling through. The lifting plate 62 is confined to vertical movement within the box 52 by guides indicated at 67.

To remove the wet newly printed disks D' from the printing platen 40 the secondary transfer element 51 is placed over platen 40 as shown in Fig. 11. This operation is facilitated through engagement of the dowels 64 with the holes 41 in the platen 40 whereby exact registry of the pins 59 with the apertures in the disks D' is assured the final position of the transfer element

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51 in relation to the platen 40 from the standpoint of elevation being determined by the collars 65 on said dowels. As the transfer element 51 is lowered, the tapered bottom ends of the pins 59 enter the apertures in the disks D', their movement being arrested before said element 51 comes to bear fully on the platen 40 as shown in Fig. 11. Accordingly the pins 59 are now sustained solely by the disks D' with their tapered ends wedgedly engaged in the disk apertures and with their stops 61 elevated above the plate 62. In this connection it is to be noted that by reason of the free play of the bushings 56 in the bottom of the transfer element 51, the tapered lower ends of the pins 59 can more readily find the apertures of the disks D' in case the latter should be somewhat off center without attendant binding of said pins in said bushings. With the immediately foregoing accomplished, the suction to the platen 40 is cut off and the supplemental transfer element 51 withdrawn. As the transfer element 51 is elevated, the pins 59 are eventually lifted out of the bosses 43 of platen 40 upon engagement of their stops 61 from beneath by the plate 62 with the disks D' frictionally held upon them by the wedge action of their tapered bottom ends within the disk apertures after the manner illustrated in Fig. 14.

Finally, the now loaded secondary transfer element 51 is lowered over a surface 68 onto which the wet disks D' are to be deposited for drying. This surface may for example be the moving conveyor belt of a drying machine. In this step, the pins 63 are the first to engage the surface 68 and are thereby arrested so that as the box 51 continues downward, the plate 62 is lifted as in Fig. 15 carrying with it the pins 59. Eventually the sharp bottom conical ends of the bushings 56 engage the disks D' at the blank margins around their apertures, thereby stripping said disks from the lower ends of said pins after the manner shown in Fig. 15. Upon being so released, the disks simply drop in definitely spaced relation onto the surface 68 after which the transfer element 51 is withdrawn and the whole procedure repeated.

Having thus described my invention, I claim:

1. Disk handling apparatus useful in connection with printing means or the like, comprising an element with upstanding impaling stud projections for supporting multiple piles of apertured disks or the like of thin sheet material in definitely spaced relation; a primary transfer element with holes to clear the studs of the supporting element, operative at each actuation when applied from above to remove the topmost disks from the piles and deposit them likewise in definitely spaced relation upon a printing platen to receive an imprint upon their upper faces; and a secondary transfer element operative at each actuation to remove the disks from the printing platen in definite separation as before and to deposit them in the same relation upon a surface for drying without incidentally contacting the wet printed surfaces of said disks.

2. Apparatus according to claim 1, for handling apertured disks or the like, wherein the disk pile supporting element is in the form of a hollow plate provided with means for connection to a source of compressed air, wherein the studs have axial ducts in communication with the hollow of the plate and terminate in lateral air discharge orifices adjacent their tops; and wherein the primary transfer means is likewise in the form of a hollow plate having means with an

interposed control for connection to a source of suction, and suction apertures through its bottom around the respective holes within the areas of the disks.

3. Apparatus according to claim 1, useful in connection with means for printing apertured disks or the like of thin sheet material, wherein the secondary transfer element includes a plate like element which is adapted to be applied over the disks on the platen after the printing, pick up pins arranged in the plate to correspond with the spacing of the disks placed on the platen, the lower ends of the pins being tapered to enter into and to wedgedly engage within the apertures of the disks and so hold them during subsequent transfer, and means automatically operative upon superimposition of the loaded plate upon a surface whereon the wet printed disks are to be supported for drying, to strip the disks from the pins without contacting the printed areas of the disk faces.

4. A support for multiple piles of apertured disks or the like of thin sheet material, comprising a hollow plate with spaced upstanding studs for impalement of the separate piles, said studs having axial ducts in communication with the hollow of the plate and having lateral air discharge orifices adjacent their tops whereby the uppermost disks in the pile are separated to facilitate individual removal; and means connecting the plate to a source of compressed air.

5. The invention according to claim 4, wherein the lateral air discharge orifices are arranged at different levels adjacent the tops of the studs and wherein the orifices at the uppermost level direct the air downwardly at an angle.

6. A transfer element for removing individual apertured disks or the like of thin sheet material from multiple supply piles impaled on spaced upstanding studs of a support, said element comprising a hollow plate with holes corresponding in position to the studs adapted to be applied from above onto the disk piles; suction apertures in the bottom of the plate surrounding the respective holes within the areas of the disks; and means with an interposed control for connection of the plate to a source of suction.

7. The invention according to claim 6, wherein the control is in the form of a valve through which communication between the plate hollow and the suction source is normally maintained, but which, upon actuation, establishes communication of the plate hollow with the atmosphere.

8. A transfer element for removing spacedly arranged apertured disks or the like from a printing platen after printing, comprising a carrier plate for application over the disks on the platen after the printing; pick up pins in the plate arranged to correspond with the spacing of the disks on the platen, the lower ends of the pins being tapered to enter into and to engage within the apertures of the disks and so hold them during subsequent transfer; means automatically operative upon superimposition of the loaded carrier plate upon a surface whereon the wet newly printed disks are to be supported to lift the pins relative to the carrier plate; and stripper elements individually associated with the pins automatically operative as the pins are lifted to strip the disks from the pins without contacting the printed areas of the disks.

9. The invention according to claim 8, wherein the stripper elements are in the form of sleeves which surround the pins, which are loosely retained by the plate, and which protrude through

the plate at the bottom to engage unprinted margins around the disk apertures.

10. The invention according to claim 8, wherein the pin lifting means includes a perforated plate which normally rests on the carrier plate and engages beneath stop heads on the pins, and plungers axially free in the carrier plate and protruding through it at the bottom beyond the pins for raising said lift plate upon contact with the surface upon which the disks are deposited for drying.

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