

May 28, 1946.

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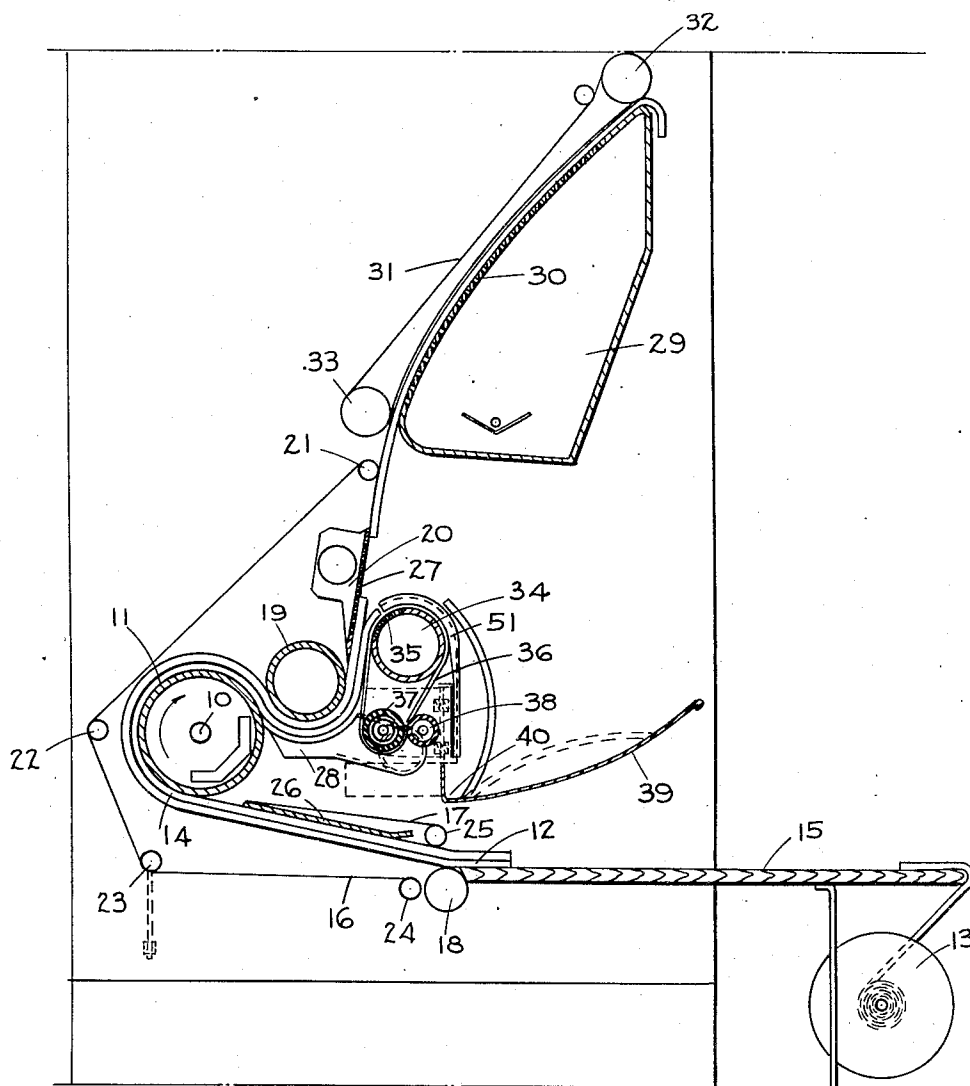
2,401,203

MATERIAL SEPARATING AND DELIVERY MEANS

Filed March 6, 1945

4 Sheets-Sheet 1

Fig. 1



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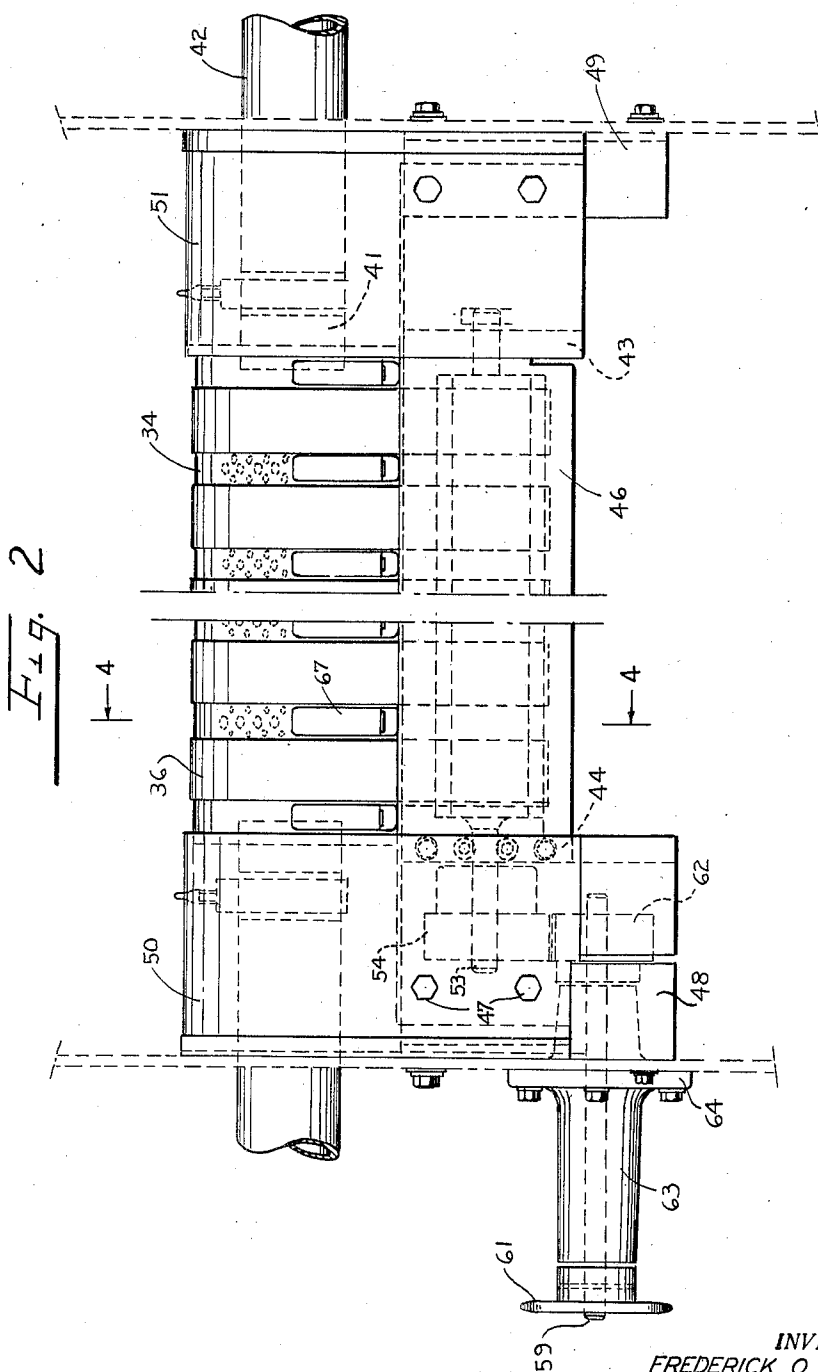
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4 Sheets-Sheet 2



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MATERIAL SEPARATING AND DELIVERY MEANS

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4 Sheets-Sheet 3

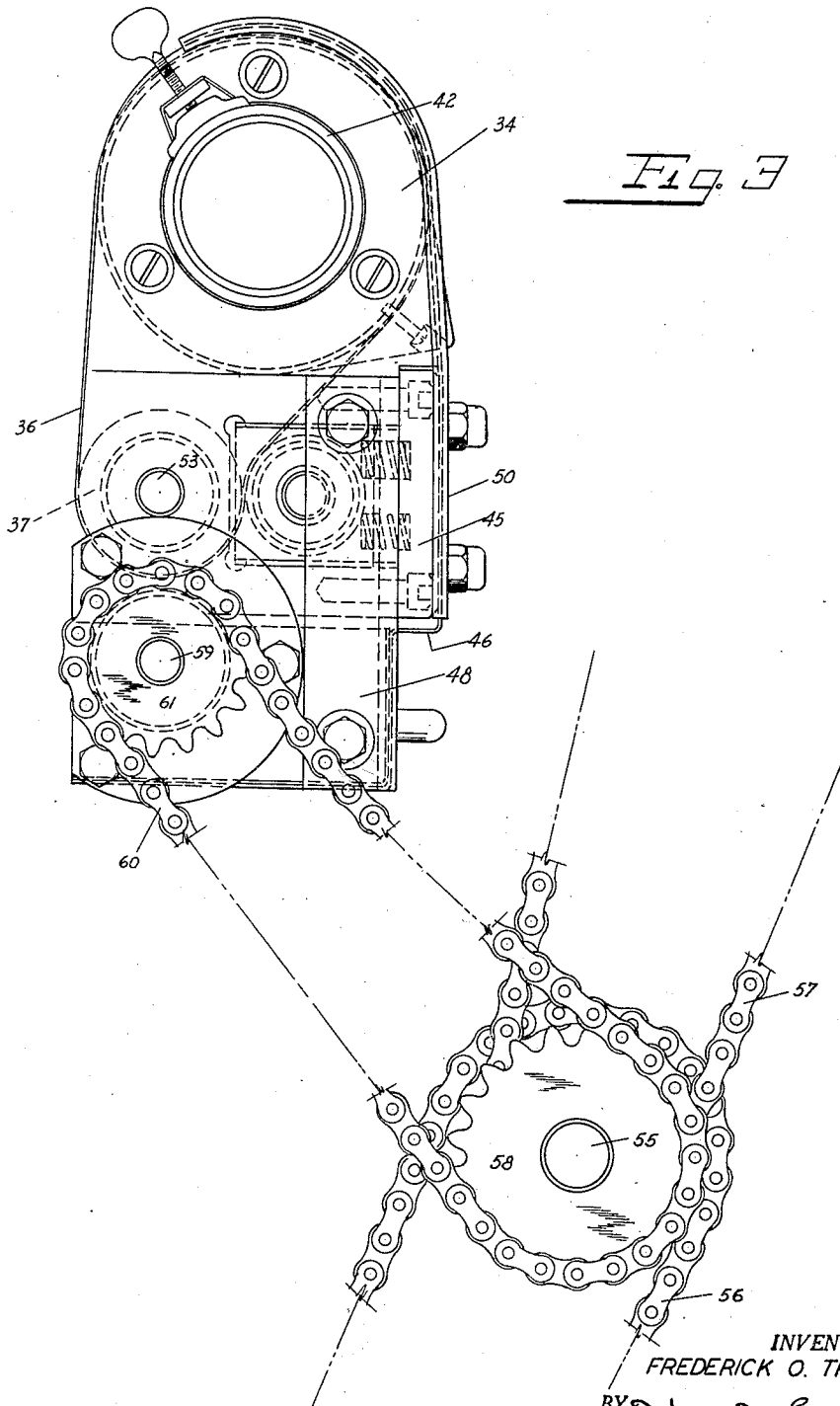


Fig. 3

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4 Sheets-Sheet 4

Fig. 6

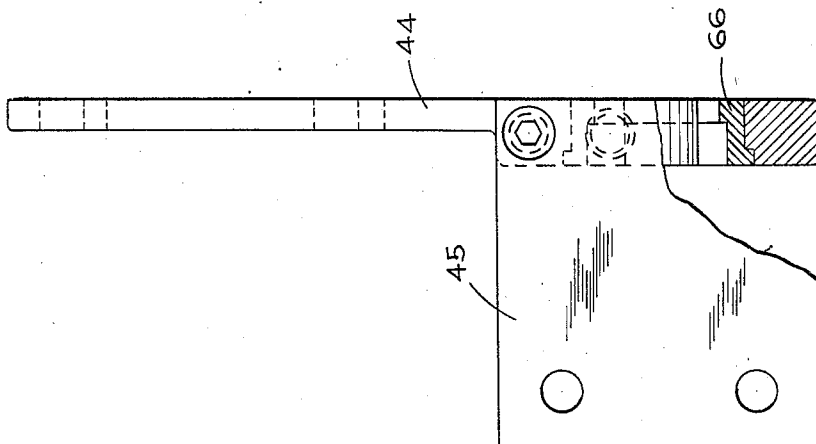


Fig. 5

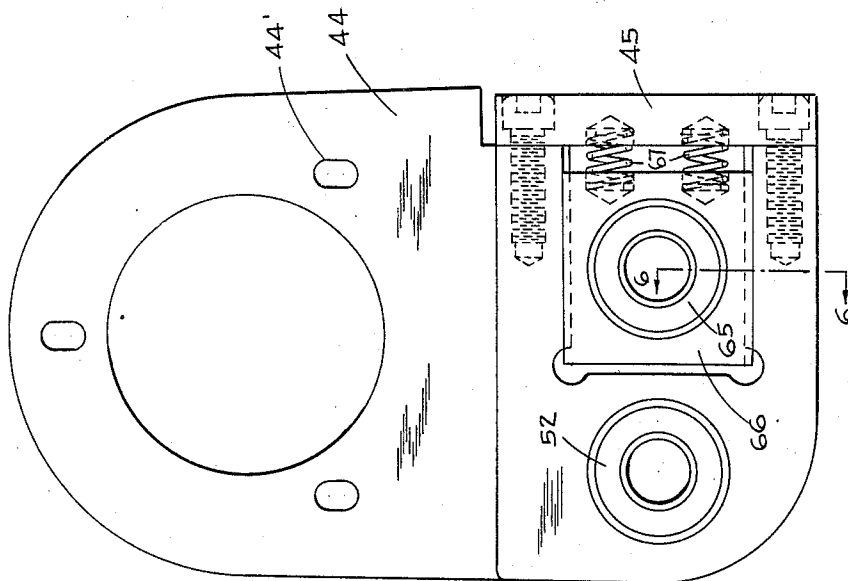
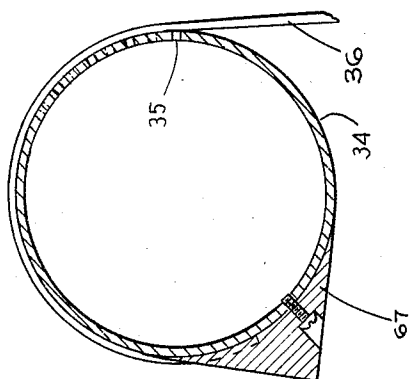


Fig. 4



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2,401,203

MATERIAL SEPARATING AND DELIVERY MEANS

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Application March 6, 1945, Serial No. 581,295

10 Claims. (Cl. 271-63)

This application pertains to printing and developing machines of the type adapted to make duplicates of originals on the diazo coated light sensitive materials. More specifically, the invention pertains to machines of that type in which an original and the sensitized material are conveyed past a light source for effecting exposure, after which the original is separated from the exposed sensitized material which continues on to be developed. It is with a mechanism for causing the original to be separated from the sensitized material and for discharging that original in a predetermined manner that the application is most concerned.

Among objects of the invention is that of positively effecting a separation of the original from the sensitized material without adversely affecting the progress of the latter through a predetermined path for development and subsequent delivery from the machine. It is a further object of the invention to control the pick-off of the original in such a manner that it is positively effected without injury to the original or to the accompanying sensitized material. It is a further object to control the pathway of the original and to provide for its reception at a convenient point at the machine and in such a manner that a series of originals shall be delivered from the machine in a particular order and in a particular relationship.

Another object of the invention is that of providing for effective separation of the original and control of it through suction applied at a definite point in the path of travel of the material and by the action of conveying means positively driven, but in which mechanism the only moving elements by which the material is contacted are the conveying means. A further object is that of so constructing a pick-off device that it may be applied to existing machines as an attachment or may be a part of machines as originally constructed.

The invention will be hereinafter described in detail by reference to one specific embodiment thereof as applied to a dry printing and developing machine of the Ozalid type. It is to be understood that this description is illustrative only and that the principles of the invention apply to other and similar mechanisms, and although described relatively to picking off and stacking originals during the printing operation, it is equally applicable to controlling the sensitized material if at some point in the machine, it is desired to perform a similar function on that material.

In the figures of drawings:

Fig. 1 is a section taken vertically through a machine of one type to which the invention may be applied, and in which the invention is shown as a part of the general combination.

Fig. 2 is a front elevation of the mechanism as applied to a typical dry printing and developing machine.

Fig. 3 is a detail showing mounting for the various shafts involved, also of certain of the driving elements by which power is taken from some convenient source at the machine and applied to the moving parts of the pick-off device.

Fig. 4 is a section taken at line 4-4, Fig. 2.

Fig. 5 is a detail view of the end support or mounting for the mechanism.

Fig. 6 is an end elevation of Fig. 5, the lower part being broken away to show a section at line 6-6, Fig. 5.

Now referring to Fig. 1, part of a machine of the type to which the invention applies is shown for properly associating it with respect to the cooperating mechanism. The machine is shown more completely in U. S. Patent 2,308,130. It includes an exposure unit having a lamp 10 which is preferably a high-pressure, mercury vapor type lamp and which emits radiation of the proper spectral characteristics for the sensitized material employed. That lamp is centrally disposed with respect to a Pyrex or other heat resistant, rotatable cylinder 11. The cylinder 11 is, of course, transparent to permit the light to strike the coated surface of the sensitized material, a sheet of which is illustrated at 12 passing through the exposure unit. A supply of that material is carried in roll form at 13, although it is desirable at times, especially when printing smaller sized sheets, to use cut sensitized material of standard sizes. An original indicated by numeral 14 and the sensitized sheet 12 are pushed along a feeding table 15 until engaged by two series of moving belts, one of which is designated by numeral 16 and the other by numeral 17. The belts 16 pass about a driven roller 18, then about the Pyrex cylinder 11, around a roller 19, upwardly past a tank 20 and then back to the drive roller 18, being guided by a series of rolls 21, 22, 23 and 24. The roll 23 is adjustable for tensioning purposes.

The series of belts 17 pass about a roller 25 and around a guiding plate 26; this set of belts merely serves to allow gripping of the original and sensitized material as they are advanced toward the exposure unit. The belts 17 are relatively narrow and are perforated as illustrated in U. S.

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Patent 2,352,983. The tank 20 has a flat face 27 against which the belts 16 press as they pass upwardly toward guide roll 21, this face 27 of the tank also being perforated. Suction is developed within the tank 20 and that suction is applied to the sensitized material through the perforations in the face 27, some of which are always in registration with perforations in the belts. The lower end of tank 20 extends down close to the cylinder or roller 19 so as to apply suction to the exposed sensitized material shortly after it leaves the vicinity of that cylinder. Of course, it is guided by the belts 16 at that time. As can be seen, the original and sensitized material are conveyed between the outer surface of the rotatable Pyrex cylinder and the driven belts 16 through something over 180° of cylinder travel and then are picked from the surface of the cylinder 11 by jets of air from a pressure pick-off generally indicated by numeral 28. The top surface of this tank 28 is more or less concentric with the cylinder 19 and guides the original and sensitized material in a reverse curve so that they pass upwardly toward a developing tank 29 past the perforated side 30 of which the exposed latent image is developed as it is contacted by developing gases generated within the tank 29. A belt or blanket 31 is driven by the roller 32 and passes about a second roller 33 at the lower end of the tank 29, being maintained in contact with the back of the sensitized material. It is a function of this blanket 31 to advance the exposed material past the developing chamber at a predetermined speed and also to maintain it in contact with the perforated side of the tank so as to confine the gases and to insure even and complete development.

Somewhere between the point at which the original and sensitized material are picked from the cylinder 11 and the point at which the sensitized material is taken between blanket 31 and the surface of tank 29, it is necessary to separate the original from the exposed material and to deliver it from the machine so that the exposed print only shall pass through the developer. It is also very desirable that the original be delivered from the machine to a convenient place so that it may again be printed in the event several copies are desired, or may be otherwise disposed of. Several mechanisms have been employed for the purpose, but none has been entirely satisfactory for the many different types of material printed, for example, tracing paper, tracing cloth, paper of varying weight or thickness, also film or foil, all of these materials having different tendencies to be statically charged, different resiliency, tendency to curl, and the like. The device herein described employs suction and also a series of conveying and guiding belts by which the original is positively separated from the sensitized material without affecting the passage of that material through the developer. The original is also delivered in a predetermined relationship to a receptacle from which it, or a plurality of similar originals, may be taken in a stacked condition, the said plurality being stacked in a predetermined order, depending upon the order of their printing. In the event very large sheets are printed, they may be rolled as they are delivered from the pick-off device, that being something heretofore not possible of attainment without considerable effort on the part of the machine operator, and in a very awkward way.

The pick-off device includes among other elements a tank or tube 34 which is maintained

stationary and which is provided at one side with a series of perforations 35. These perforations 35 extend throughout an angular extent of about 45°, more or less, and are so arranged as to take effect upon the original after the sensitized sheet has become fully engaged by the suction within tank 20. To achieve this, it is necessary to apply the suction within tank 20 at a point considerably below a similar starting point in tank 34. Thus a tendency for the two sheets to stick together cannot possibly cause a delivery of both from the machine at that point. At the point of separation, that is at the point where the perforation of tank 34 starts, the original is pulled away from the sensitized material with a suction twice as great, more or less, as that of the one maintained in tank 20. The reason for this is that it takes considerable force to induce the original to a change of direction, in addition to the fact that the original may slightly overlap the sensitized material due to careless feeding by the operator. The suction exerted by tank 20 is distributed over a large area while the suction of tank 34 is applied to an area much smaller although the force per unit of area is greater in the case of the latter. By this arrangement of suction areas for the tanks and by the greater suction applied through tank 34, proper operation is realized even though the edge of the sensitized material may precede the edge of the original by a slight amount. The perforations of tank 34 maintain their suction on the original until it has been directed toward a stacking receptacle and cannot spring back again to pass along with the material to be developed. A series of belts 36 are driven by a rubber covered roll 37, being positively advanced since these belts are pinched between the surface of the roll 37 and adjacent roller 38. The roller 38 is preferably rubber covered, although that is not necessary. These belts pass upwardly over the tube 34, the surface of which is suitably polished so as to offer very little frictional resistance to their movement. They are also slack, or at least, are not under any tension such as would be necessary if they were driven by roller 37 without the assistance of the roll 38 which is spring pressed toward the first mentioned roller, as will hereinafter be described. These belts 36 are of about the same width as belts 16, although it is to be understood their width may vary within reasonable limits. They are spaced apart to provide for the perforations 35 which are so arranged as to occur only at the intervals between the belts. As shown in Fig. 2, the space between belts is approximately one-third the width of the belts, although that may be varied within limits.

The tube 34, rollers 37 and 38 and other parts of the pick-off device are mounted in brackets which are attached to the framework of the printing and developing machine in a manner hereinafter to be described. A tray or receptacle 39 is also attached to the front side of the pick-off mechanism, or to some other suitable part of the machine so that it is positioned in that general location. This tray functions, as shown in Fig. 1, to catch the originals as they are delivered from the pick-off device, the said originals falling and being guided so that the front end of each original slips down into the corner 40 of the receptacle whereupon it then falls as shown in the dotted line position, eventually lying at the bottom of the tray. The capacity of the tray is sufficient for all practical purposes. Of course, the stacking of the originals as just described applies to

those which are of reasonably small or intermediate size.

The machine may serve to print exceedingly large drawings or tracings, etc., in which event space at the front of the machine could not possibly provide for the originals to be received on a flat surface. The device functions very nicely, however, if the operator, when the original is delivered out at the front of the pick-off, starts rolling it so that it is discharged from the machine in rolled condition adapted to be printed again, or to be laid away for filing. The drawings or other originals are stacked in the tray right side up, but, of course, in the reverse order from that order in which they were printed. It is a simple matter for the operator to turn the stack over and to reprint each original, thereby following the original order. Of course, that inversion is not necessary unless the original order of printing is to be adhered to.

Now referring to Fig. 2, the general construction of the mechanism is illustrated, the tube or tank 34 being broken at the center since it may be of varying lengths, depending upon the width of the particular machine to which it is to be applied. The tank must be sealed at the ends and is attached to a suitable means for evacuating it, such means preferably being that with which the machine is equipped. It has been found that about 4" (water gage) of vacuum is sufficient, although the apparatus is not limited in its use to any definite degree of evacuation.

At both ends, the tank has welded thereto a circular plate, open at the center, within which is also welded or otherwise connected a projecting tube 41 to which attaches by a suitable hose clamp a line 42 extending to the vacuum line. Each end is similarly constructed and a description of one serves for both. In relatively narrow machines, it may be satisfactory to connect to the vacuum line at one end only, but in wider machines it is more satisfactory to evacuate the tank 34 from each end thereby maintaining a more even vacuum throughout its length. The projecting tubes 41 extend through openings in end brackets 43 and 44, shown in detail in Figs. 5 and 6. Each of these end brackets has attached thereto a plate 45 for the bracket 44. Of course, one of these brackets is a left and the other a right, therefore the plates differ to that extent. The support of the structure is tied in through a plate 46 bolted to the plate 45 by the bolts 47, Fig. 2, and by corresponding attachment at the opposite end to the plate which is attached at the front side of bracket 43. The elongated plate 46 is formed as an angle iron at the top and is also turned under at its center portion to cover the underside of the belts and their driving and contacting rolls. Connecting pieces 48 and 49 serve to attach plate 45 and its counterpart at the other end to the framework of the machine as shown in Fig. 2. The space between brackets 43 and 44 and the adjacent framework of the machine is enclosed within covers 50 and 51. The bolts 47 actually pass through the cover, plate 46, plate 45 and extend into the connecting pieces 48 or 49, as the case may be.

The roller 37 is positively driven, and roller 38 may be, although that is not necessary since it merely acts to press against the belts to assure positive driving contact of the belts with the driven roll as these belts are relatively slack. The roller 37 rotates within bearings 52 within the end brackets 43 and 44. These bearings are preferably anti-friction type, although that is not

entirely necessary. The roller has extending shaft 53 which projects at the left hand end, Fig. 2, and which has fixed thereto a gear 54. The drive for the roll is taken from any suitable rotating part of the machine, but, as herein illustrated, is taken from the end shaft of drive roller 18. That shaft is designated by numeral 55, Fig. 3. There are several sprockets on that shaft, one of which is driven by chain 56 from a source of power such as an electric motor, another of which drives the roller 32 for the developer blanket through a chain 57 and a third sprocket 58 which drives shaft 59 through a chain 60 and sprocket 61. The sprocket 61 is fixed to the end of the shaft 59 and rotation of the sprocket and shaft imparts rotary movement to the roller 37 through a pinion 62 which meshes with gear 54. Shaft 59 is freely rotatable within bearings in support 63 bolted to the frame of the machine through a flange 64.

The front roll 38 is rotatable in bearings 65 in the sliding blocks 66. These are illustrated in Figs. 3, 5 and 6, and while only one is to be described, they are identical except that they serve at opposite ends of the shaft and one is a right while the other is a left. These blocks are pressed in a direction to urge the roller 38 toward roller 37 by the spring 67. These springs and the blocks 66 are retained in place as the plate 45 is bolted against the front edge of the bracket 43 or 44 as the case may be. The block 66 is shouldered as shown in Fig. 6 at the sectioned part, and supports a ball bearing (not shown).

Now referring to Figs. 2 and 4, the perforations generally indicated by numeral 35 are more clearly illustrated. These perforations are arranged in three rows, but that number may be varied. The perforations extend from about the vertical center plane of the tank, through about 45 to 60°. The extent of these perforations is not carried farther than necessary since they are open to the atmosphere when no original is passing. In fact, the belts always separate the original from the surface of the tank 34 whereas in constructions previously employed, the perforated tank or tube has been rotated with the belts and the belts have been perforated so as to obtain effect of the suction on the material to be picked off. Here the perforated tank is maintained stationary, the number of perforations is relatively few, and it is not necessary or desirable to employ perforated belts. Such construction makes it unnecessary to cover the belts and also the rotating tube in those places where the material acted upon could never be contacted. With the present arrangement of parts and construction thereof, a relatively small amount of suction effects the desired result and it is not at all necessary to devise special elements for retaining vacuum within the rotating parts.

The belts are maintained in spaced relationship by the wedges 67 which also serve to guide the original and to separate it from the belts as they pass downwardly and rearwardly toward the driving roller 37. These wedges are attached at the lower front side of the tank, Figs. 2 and 4. The upper points of wedges 67 lie beneath the outer surfaces of the adjacent belts so that there is no difficulty encountered in stripping the original from the belts, otherwise, it would probably tend to adhere to and follow them rather than to drop into the tray as intended.

In place of the wedges 67, wires have been employed, extending from the upper edge of the cross plate 46 and around at least part of the

tank 34. Those wires are finer in diameter than the thickness of the belt and may be tapered and soldered to the top portion of the tank. They also serve to space the belts, or, if only one wire is to be employed between each pair of belts, then the belts may be maintained separately and evenly spaced in any other satisfactory manner. As before stated, the belts are relatively slack, or at least, have no tension in them so that they pass about the smooth surface of the tank with a minimum of friction. To adjust the belts to the proper slackness, suction tube 34 can be moved up or down in elongated holes, 44', Fig. 5. The outer surface of the belts is of such a nature that it cannot damage the originals, but should have sufficient frictional engagement with the originals to assure that they are positively advanced, although there is very little tractive effort required at that point. It has been found that a surface speed of the belts approximately 25% faster than that of printer belts 16, prevents "dog-ears" on tightly rolled tube tracings at the point where they first come into contact with belts 36 after leaving the printing cylinder. This faster speed of belts 36 is possible because there is approximately $\frac{1}{8}$ " clearance between them and belts 16.

In operation of the machine, originals and sensitized sheets are fed between the belts 16 and 17 and if the original is in registration with the sensitized sheet as they enter the machine, they will automatically be carried about the exposure unit, will be picked from the Pyrex cylinder by the jets of air from pressure chamber 28 and will follow upwardly between belts 36 and 16. The exposed sensitized sheet is held flatly against belt 16 by suction within tank 20 while the original, affected by suction within tank 34, is picked off the sensitized material and continues around over the top of tank 34 to be delivered to the stacking tray 39 as illustrated in Fig. 1. Once the mechanism has been properly assembled and the requisite amount of suction applied within both tanks 20 and 34, no further adjustment is necessary and the mechanism will serve to separate and deliver all types of material, that being something not attainable with certain previously used systems, except by special adjustment of the elements for the particular material being printed.

The invention has been described as applied to picking off and delivering originals during printing. It is to be understood that it is equally applicable to other material and may be employed, for example, in picking off and delivering sensitized sheets after they have been developed or at any other point in printing or developing apparatus at which a similar problem is to be found. While the particular machine described is one for functioning upon diazo type printing materials, the invention may be used for picking off and delivering materials of all types for which it is applicable. The invention is defined in the appending claims.

I claim:

1. A pick-off device for machines of the type described having in combination a stationary vacuum chamber of tubular form, a plurality of spaced belts passing about and having their pathways defined by said tubular chamber at one end of their travel, means for positively driving said belts including a driven roller about which the belts pass and are guided at the other end of their travel, a second roller resiliently pressed against the belts at one side of the first mentioned roller for assuring positive driving thereof while the belts pass around the driven roller

and chamber in a relatively slack condition, said chamber having openings, said openings being confined to areas between adjacent belts and to a relatively small circumferential extent of the area of the chamber over which the belts pass.

2. A pick-off and stacking device for machines of the type described including in combination a stationary vacuum chamber of tubular form, a plurality of belts passing about and having their pathways defined by said tubular chamber at one end of their travel, means for positively driving said belts as they pass about the chamber in a relatively slack condition, said chamber having a plurality of openings confined to those areas between adjacent belts, a tray for the reception of material picked off by suction acting through said openings and delivered by the said belts, said tray being positioned so as to receive the delivered material in predetermined sequence.

3. A pick-off and stacking device for machines of the type described having in combination a stationary vacuum chamber, a plurality of spaced belts passing about said chamber and means for positively driving said belts while they pass about the chamber in a relatively slack condition, said belts being confined to a closed pathway defined by the chamber at one end and the means for driving them at the other, said chamber having a plurality of openings confined to areas between adjacent belts and to a relatively small extent of the area of the chamber over which the belts pass, a stacking tray positioned at the delivery side of said pick-off device and adapted to receive delivered material in a predetermined sequence, and means for stripping the material from the belts and for guiding it toward the tray.

4. A pick-off device for machines of the type described having in combination a stationary vacuum chamber, a plurality of spaced belts passing about said chamber, said belts being confined to a closed pathway defined by the chamber at one end and a means for driving them at the other, said means for positively driving said belts including a driven roller about which the belts pass and a resiliently pressed roller for engaging the belts and pressing them against the driven roller to assure driving engagement, the said chamber having a plurality of openings confined to areas between adjacent belts and to that extent of the area of the chamber between that point at which the pick-off function starts to a point to which the picked off material has been carried far enough to assure positive delivery, and means for stripping the delivered material from the belts.

5. A pick-off device for machines of the type described having in combination a stationary vacuum chamber, a plurality of spaced belts passing about said chamber, means for positively driving said belts including a driven roller about which the belts pass and a resiliently pressed roller for engaging the belts and pressing them against the driven roller to assure driving engagement, said chamber having a plurality of openings, said openings being confined to areas between adjacent belts, and means for stripping the delivered material from the belts including wedges secured to the chamber and being of a width substantially equal to the space between belts so as to maintain the belts in properly spaced relationship.

6. A pick-off and stacking device for machines of the type described having in combination a stationary vacuum chamber formed as a circular tube, a plurality of spaced belts passing about

said chamber and about a driving roller, means for rotating said roller, a second roller freely rotatable and engageable with the belts as they pass about the first mentioned roller and spring means for resiliently urging said second roller in a direction to press the belts into firm driving engagement with that first mentioned roller, said circular tube having a plurality of openings between the spaced belts and confined to a relatively small extent of the area of the chamber, wedges between the belts for maintaining them in spaced relationship and for stripping material picked off by the action of suction within the chamber and conveyed by the belts passing over the chamber, a tray for receiving the delivered material positioned beneath the pick-off device and in such position that the delivered material is received by the tray in a stack in which the delivered material is arranged in predetermined sequence.

7. A pick-off device for machines of the type described having in combination a stationary vacuum chamber, a plurality of spaced belts and a driving means for said belts, said belts having a pathway of travel defined at one end by said chamber and at the other end by said driving means, means for assuring frictional driving engagement between the belts and driving means while they extend loosely between the chamber and said driving means, said chamber having

openings therein, said openings being confined to areas between adjacent belts and to a relatively small angular extent of that part of the chamber over which the belts pass.

8. A pick-off device for machines of the type described having in combination a stationary vacuum chamber, a plurality of spaced belts and a driving means for said belts, said belts having a pathway of travel defined at one end by the said chamber and at the other end by said driving means, a presser roller resiliently urged into contact with said belts and toward the said driving means for assuring positive driving engagement of the said belts while they extend loosely between the chamber and said driving means, said chamber being provided with a plurality of openings confined to areas between adjacent belts and to a relatively small angular extent of that part of the chamber over which the belts pass.

9. Mechanism as defined in claim 8 in which the said chamber is a tube having a smooth external surface over which the said belts pass.

10. Mechanism as defined in claim 8 wherein said chamber is a tube having a smooth external surface over which said belts pass and further having a plurality of stripping means attached to said tubular chamber and located between certain of the belts to maintain them in spaced relationship.

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