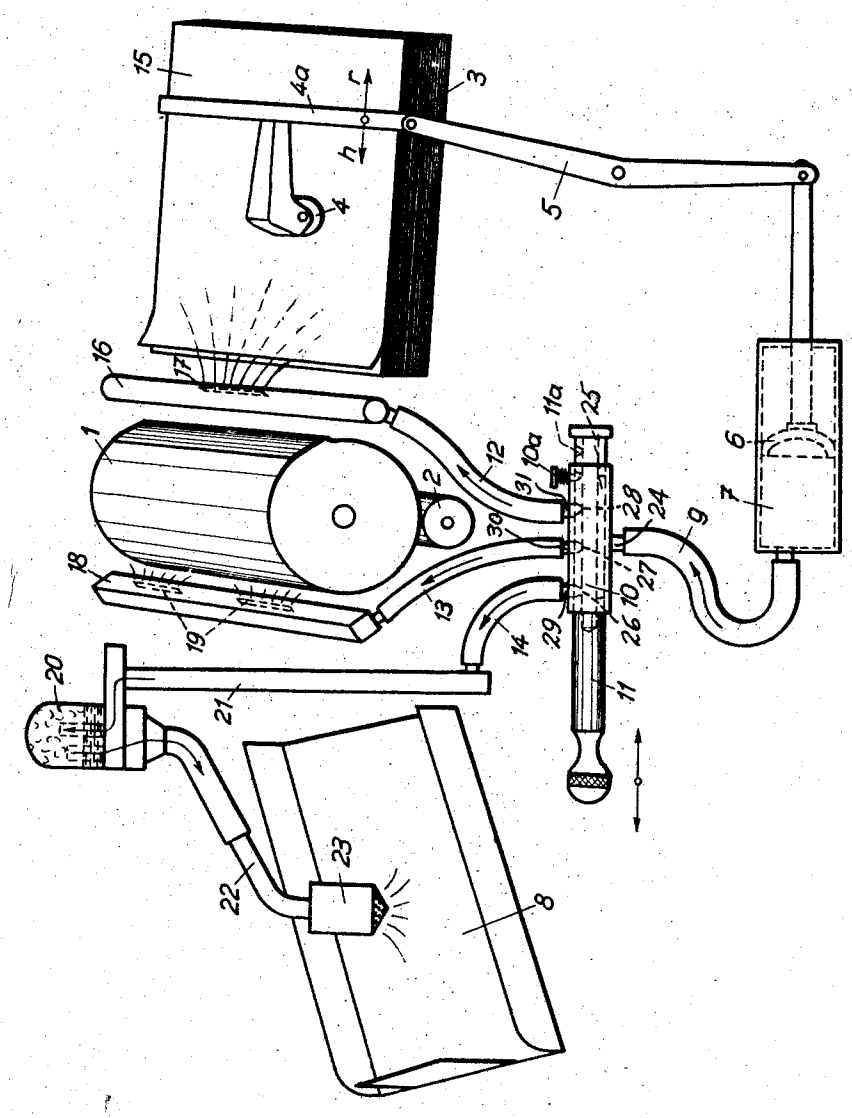
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DUPLICATING MACHINE

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DUPLICATING MACHINE

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The present invention relates to duplicating machines, and more particularly to a duplicating machine of the rotary drum type equipped with auxiliary devices actuated by compressed air.

An object of the invention is the provision of air-actuated dust removal means for removing dust from the paper sheets and the like on which an imprint is to be made.

Another object is to provide means for removing dust from the stencil from which the imprint is to be transferred to the sheet material.

An additional object is the provision of air-operated dusting means for depositing a layer of powdery absorbent material on a printed sheet so as to prevent ink transfer from the sheet to another sheet superimposed on the printed surface when the sheets discharged from the machine are stacked.

A further object of the invention is to provide means for separating individual sheets on a feed stack of sheets from each other so as to facilitate feeding of the sheet material.

Yet another object is the provision of means for assisting release of a sheet from the stencil and the drum to which the sheet may adhere because of mechanical adhesion or by attraction of opposite electric charges on the stencil or drum and the sheet material.

With these and other objects in view, the invention provides an air pump constituting a source of air under positive pressure. Motion transmitting means connect the air pump to one of the plurality of movable elements of a duplicating machine which move sheet material through the machine along a predetermined path. The air pump is thereby actuated when said movable element moves. A conduit communicates with the air pump, that is, the source of air under pressure, and with a nozzle arranged along the path of movement of the sheet material for discharging a stream of air against the sheet material.

According to an additional feature of the invention, there are provided several nozzles which may be connected to the source of air by a selector valve which permits the nozzles to be supplied with air either simultaneously or alternatively. One of the nozzles is preferably arranged adjacent the duplicating machine drum and directs a stream of air against the drum for removing dust from the stencil, and also for assisting in lifting a printed sheet from the stencil. Another nozzle may be arranged at the feeding station for removing dust from the topmost sheet as it is being fed from a stack of sheets towards the drum. A third nozzle may be arranged at the discharge station which receives the printed sheets from the drum, and may be equipped with a dusting device which deposits a layer of absorbent powder on the freshly printed sheet.

Other objects and features of this invention, and many of the attendant advantages will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a fragmentary perspective view of a duplicating machine equipped with a preferred embodiment of the invention.

Referring now to the drawing, there is shown the rotary drum 1 of a conventional rotary-drum type duplicating machine. The drum cooperates with a pressure roller 2 in a well-known manner. A stack 3 of blank sheets

of paper is provided at a feeding station ahead of the drum in the direction of movement of the sheet material through the machine. The blank sheets are individually fed to the drum by a feed roller 4 mounted on a support bracket 4*a* for reciprocating movement indicated by the arrows *h* and *r*. The movement of the bracket 4*a* is actuated by a linkage (not shown) connecting the bracket to the drum or to a common manual or automatic drive as is well-known. The drive causes the feed roll 4 to move towards and away from the drum 1, and causes the drum to rotate relative to the feed roll 4.

A lever 5 pivoted on the frame (not shown) of the duplicating machine has one end pivotally secured to the support bracket 4*a* and another end attached to the piston rod of a piston 6 which is reciprocally guided in a cylinder 7. The cylinder is suitably fastened on the machine frame and forms an air pump with the piston 6. The pump is also equipped with check valves (not shown) which may, for example, be arranged in the piston 6 and in the discharge end of the cylinder 7 respectively to permit flow of air through the piston into the cylinder and from the cylinder through the conduit 9 only.

The conduit 9 connects the cylinder with an intake nipple 24 on the cylindrical sleeve 10 of a selector valve. A hollow valve plug 11 is slidably arranged in the sleeve 10. One end of the plug extends outwardly from the sleeve, and is shaped to form a handle by means of which the valve may be operated. The plug is formed with a radially and axially extending slot 25 which provides communication between the conduit 9 and the central bore of the plug. A radial opening in the plug 11 opposite the slot, designated 26, 27, and 28, respectively, can be selectively aligned with three discharge nipples 29, 30, and 31, respectively, of the control valve by axially sliding the valve as indicated by double arrows. The radial openings 26, 27, and 28 form parts which are diametrically opposed to the slot 25. The plug may be secured in any one of the aligned positions by engagement of a spring biased pin 10*a*, which is radially slidable in the sleeve 10, with three corresponding notches 11*a* in the plug.

Communication between the conduit 9 and all three discharge nipples simultaneously can be established by rotating the plug through 180° from the illustrated position so that the slot communicates with the three nipples and the single radial opening is aligned with the intake nipple on the valve sleeve.

A flexible tube 12 is connected to one of the discharge nipples on the valve sleeve 10 to transmit air from the valve in the direction of the arrow to a perforated tube 16 arranged transversely of the path of movement of the paper sheets 15 from the feeding station to the duplicator drum 1. The tube 16 has several radial openings 17 which are arranged in such a manner as to direct streams of air over the surface of the sheet 15, and to blow off any dust which may have been deposited on the sheet. Removal of the dust is important for long runs from a single stencil. Dust tends to be transferred from the sheet material to the inked stencil and to blur the impressions made. Keeping the stencil free from dust permits to run a greater number of clear prints.

As clearly seen from the drawing, a portion of the air streams emanating from the openings 17 is directed against the facing cut edges of the sheets 15 on the stack 3 so as to separate the top sheets from each other and to facilitate feeding of the topmost sheet to the drum 1 by the feed roller 4.

The second discharge nipple on the sleeve 10 of the selector valve has a flexible tube 13 attached thereto. Air may flow from the valve in the direction of the arrow through the tube 13 to a rigid tube 18 of approximately square cross section which is equipped with longitudinal

rows of openings **19**. Jets of air released through the openings are directed against that portion of the surface of the drum **1** at which the sheet of paper is to be released from the stencil after the imprint has been made. The leading edge of the paper sheet forms a very small, funnel-shaped slot with the stencil face since the edge never completely adheres to the stencil. The jets of air from the openings **19** are directed into this slot and facilitate release of the paper from the stencil. At the same time, the air moving rapidly over the freshly exposed stencil surface tends to carry away particles of dust which may have been deposited on the stencil and which may not yet be held very tenaciously by the stencil surface.

The third discharge nipple of the valve sleeve **10** is connected with a flexible tube **14** leading air in the direction of the arrows through an upright hollow support **21** to a container **20** in which an absorbent powdery material such as very finely ground chalk or the like is held. The air passing through the container **20** in turbulent flow causes a portion of the powdery material to be suspended in the air and to be entrained thereby. The air with the powder suspended therein passes from the container **20** into a discharge duct **22** which terminates in a nozzle **23** arranged above the chute **8** which forms the discharge station of the duplicating machine. The nozzle distributes a fine layer of chalk and the like on each freshly printed sheet as it is discharged from the drum **1** with its printed face up. It will be understood that the sheets may accumulate in the chute **8** to form a stack similar to the stack **3**, or that they may continuously slide from the chute toward a point of storage.

The distribution of duplicator ink over the face of the printed sheet varies according to the nature of the printed material. To permit adjustment of the size of the area dusted by the nozzle **23** with absorbent powder, two obliquely downwardly extending portions of the duct **22** are arranged to telescope inside each other so that the vertical position of the nozzle **23** can be adjusted. This changes the area covered by the dusting powder. The discharge duct **22** is also rotatably connected to the container **20** so that the nozzle **23** can be moved arcuately to concentrate the discharged powdery material in any desired portion of the printed sheet discharged on the chute **8**.

The device illustrated is arranged for manual control of the valve plug **11** so that it may at any one time connect only one of the air operated auxiliary devices to the air pump during the entire operating cycle or during any portion thereof, or be reversed to connect all the devices simultaneously for continuous operation during each power stroke of the pump. It will be understood though that the valve may be linked with the moving members of the duplicating machine in such a manner that the valve sequentially opens and closes each discharge nipple once during the printing cycle. This may be accomplished, for example, by providing an axial extension member on the valve plug **11** which connects with the lever **5** in such a manner that the plug is axially reciprocated once during eah reciprocating movement of the feed roller **4**.

The plug **11** may also be replaced by a rotary selector valve having a single intake and several discharge nipples which are sequentially connected with the intake nipple during each turn of the rotary valve member. The rotary member may be mounted coaxially on the drum **1** or on a shaft carrying the drum so that each air-operated auxiliary device is actuated once during each turn of the drum. If it s desired to open the conduits leading to the auxiliary devices more than once during each turn of the drum or during each reciprocating movement of the feed roller **4**, this is readily accomplished by providing a plurality of discharge nipples on the valves each communicating with the same conduit leading to the device under consideration.

Instead of actuating the piston **6** by a lever **5** connected to the feed roller **4**, the invention also contemplates connecting the piston to the drum **1** by any device known to convert rotary movement into reciprocating movement. The air pump may be placed in such a manner that it reciprocates in a plane which is radial relative to the axis of the drum **1** and the piston **6** may be driven by a connecting rod eccentrically secured to the radial drum face.

While the single-acting piston pump **6**, **7** has been found very satisfactory for a duplicating machine of the type illustrated, a continuous supply of air under pressure to the auxiliary devices of the invention may be desirable. This may be obtained by making the air pump double acting so that both strokes of the piston **6** are power strokes. The necessary arrangement of check valves and piping is too well known to require any detailed discussion. It is also contemplated to replace the piston pump illustrated by a rotary pump or a centrifugal pump actuated by the drum **1** or the shaft of the drum **1** (not shown). Depending on the desired volume and pressure of air, the pump may be mounted on the machine frame and the rotary member connected to the drum **1** for joint movement at equal or at higher speed, for example by a belt or gear transmission.

The piston pump **6**, **7** which constitutes a source of air under pressure may also be replaced by an electrically driven centrifugal pump without departing from the scope of this invention.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention, and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What is claimed and desired to be protected by Letters Patent of the United States is:

1. In a duplicating machine having a rotated drum adapted to carry a stencil for marking successive sheets as the latter are fed by a reciprocated sheet feeding member from a stack of the sheets at a feeding station along a path that includes a portion of the surface of the drum to a discharge station; the combination of air pumping means operative to supply air under pressure, mechanical linkage means connecting said sheet feeding member with said air pumping means for operating the latter in response to reciprocation of the sheet feeding member, selector valve means having an inlet connected with said air pumping means for receiving air under pressure from the latter and a plurality of outlets, said valve means being actuable to selectively communicate said outlets with said inlet, first, second and third nozzle means located to direct streams of air against the successive sheets at said feeding station, at said portion of the surface of the drum and at said discharge station, respectively, conduit means connecting said first, second and third nozzle means with respective outlets of said selector valve means, and a container for powdery material interposed in the conduit means between said valve means and said third nozzle means so that air streaming from the latter entrains powdery material from said container.

2. In a duplicating machine, the combination as in claim 1; wherein said valve means includes a cylindrical casing having said inlet at one side thereof and said outlets spaced apart in the direction of the longitudinal axis of the cylindrical casing at the opposite side of the latter, and a hollow plug slidable axially and rotatable in said casing, said plug having an axially elongated slot and at least one diametrically opposed port, so that, when said plug is turned to align said slot with said inlet of the casing, axial movement of said plug selectively registers said port with said outlets, and, when said plug is turned to align said port with said inlet, said slot simultaneously registers with all of said outlets.

3. In a duplicating machine having a rotated drum adapted to carry a stencil for marking successive sheets as the latter are fed by a reciprocated sheet feeding member

from a stack of the sheets at a feeding station along a path that includes a portion of the surface of the drum to a discharge station; the combination of air pumping means operative to supply air under pressure, mechanical linkage means connecting said sheet feeding member with said air pumping means for operating the latter in response to reciprocation of the sheet feeding member, selector valve means having an inlet connected with said air pumping means for receiving air under pressure from the latter and at least two outlets, said valve means being actuable to selectively communicate said outlets with said inlet, at least two nozzle means arranged at spaced apart locations to direct streams of air against the successive sheets as they move along said path, conduit means connecting each of said nozzle means with a respective one of said outlets, and a container for powdery material interposed in said conduit means between said valve means and one of said nozzle means so that air streaming from said one nozzle means entrains powdery material from said container.

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