

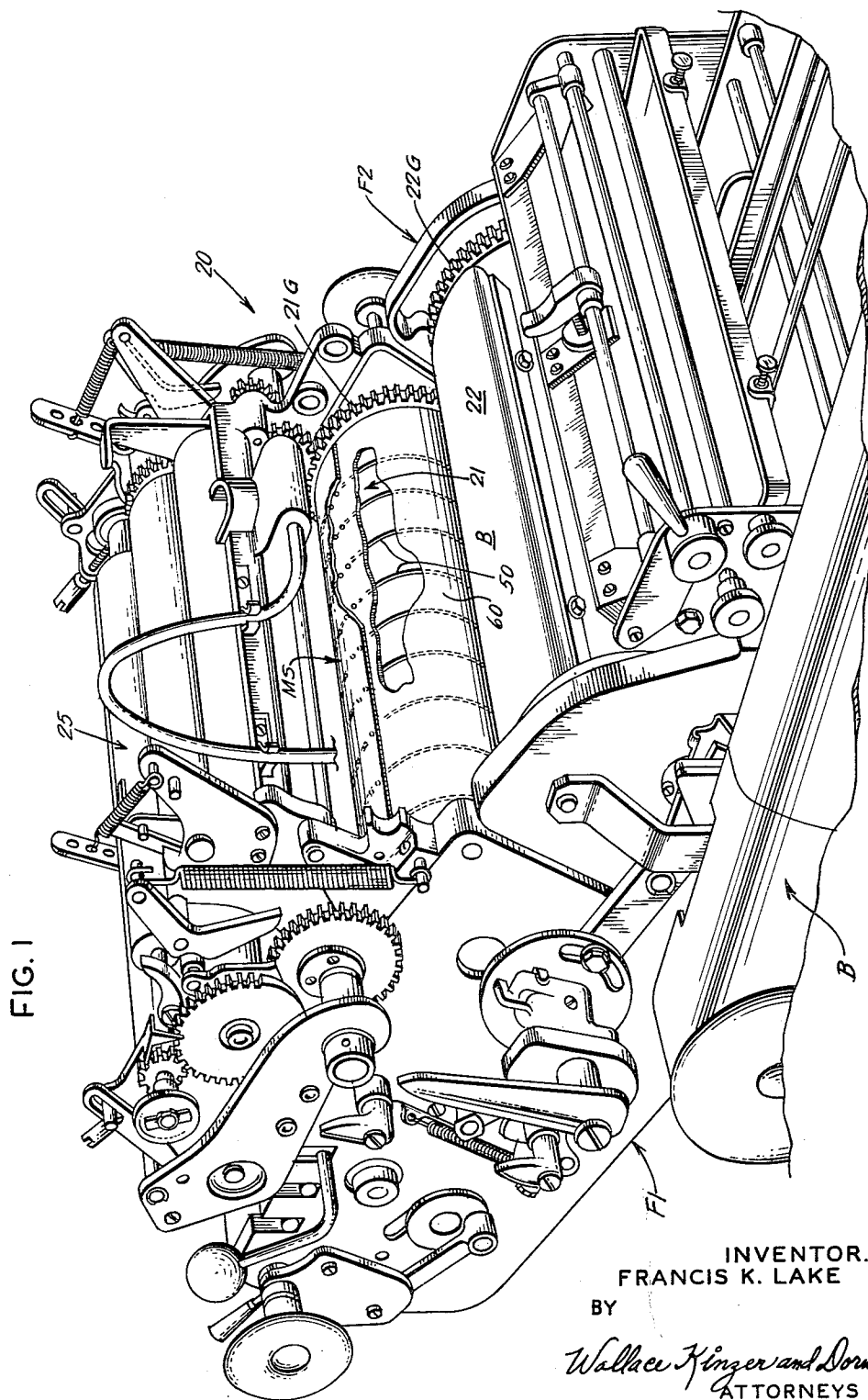
Dec. 3, 1963

F. K. LAKE
PRINTING MACHINES

3,112,698

Filed Jan. 3, 1961

5 Sheets-Sheet 1



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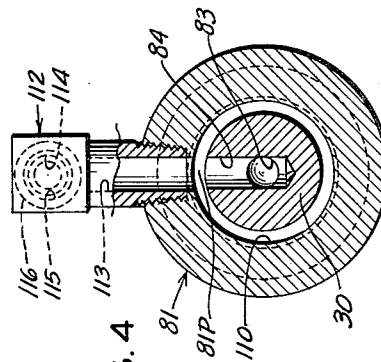
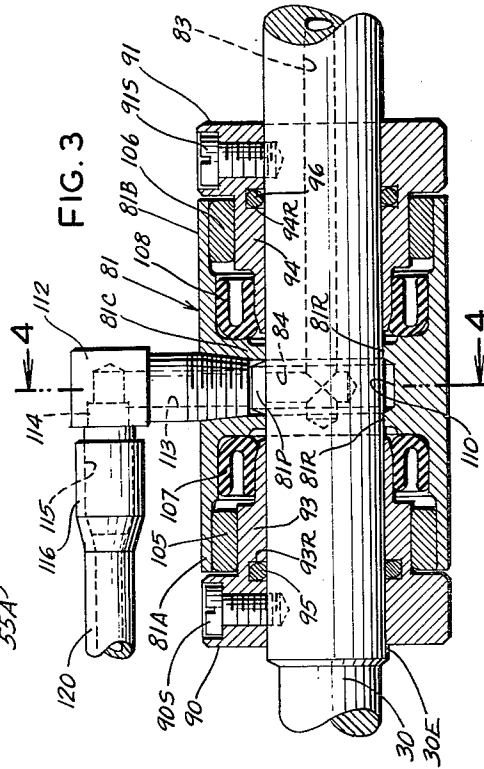
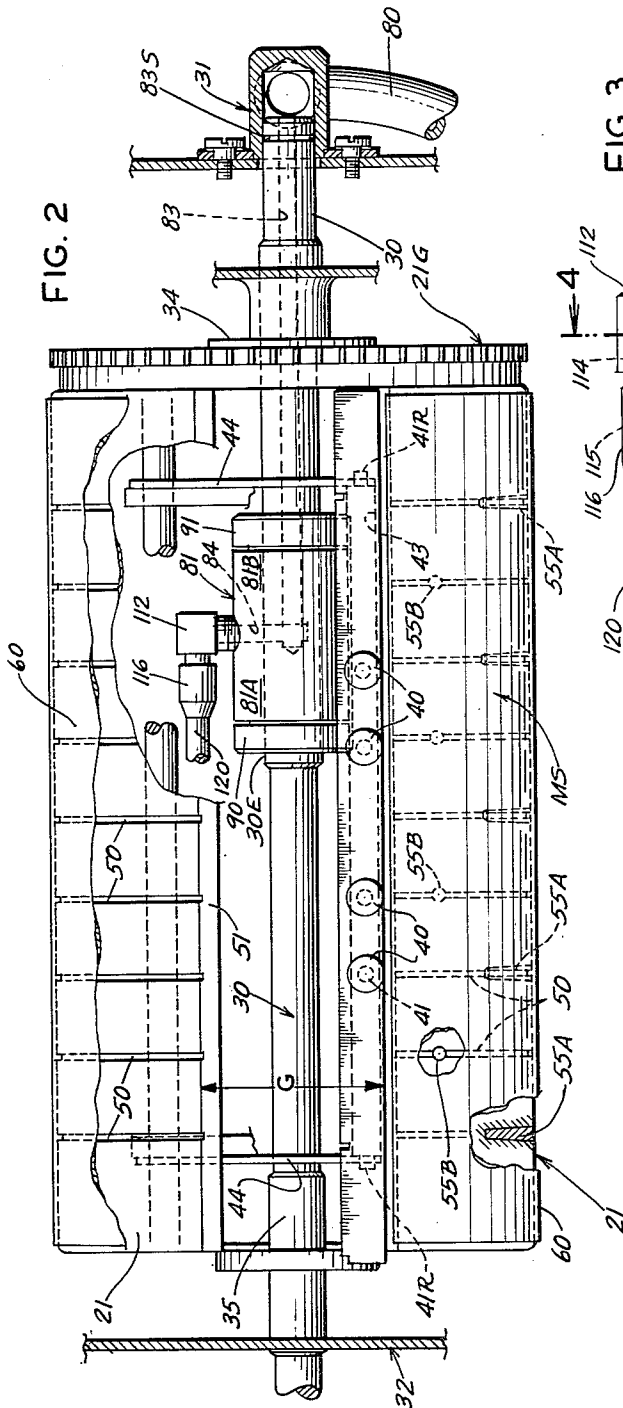


FIG. 4

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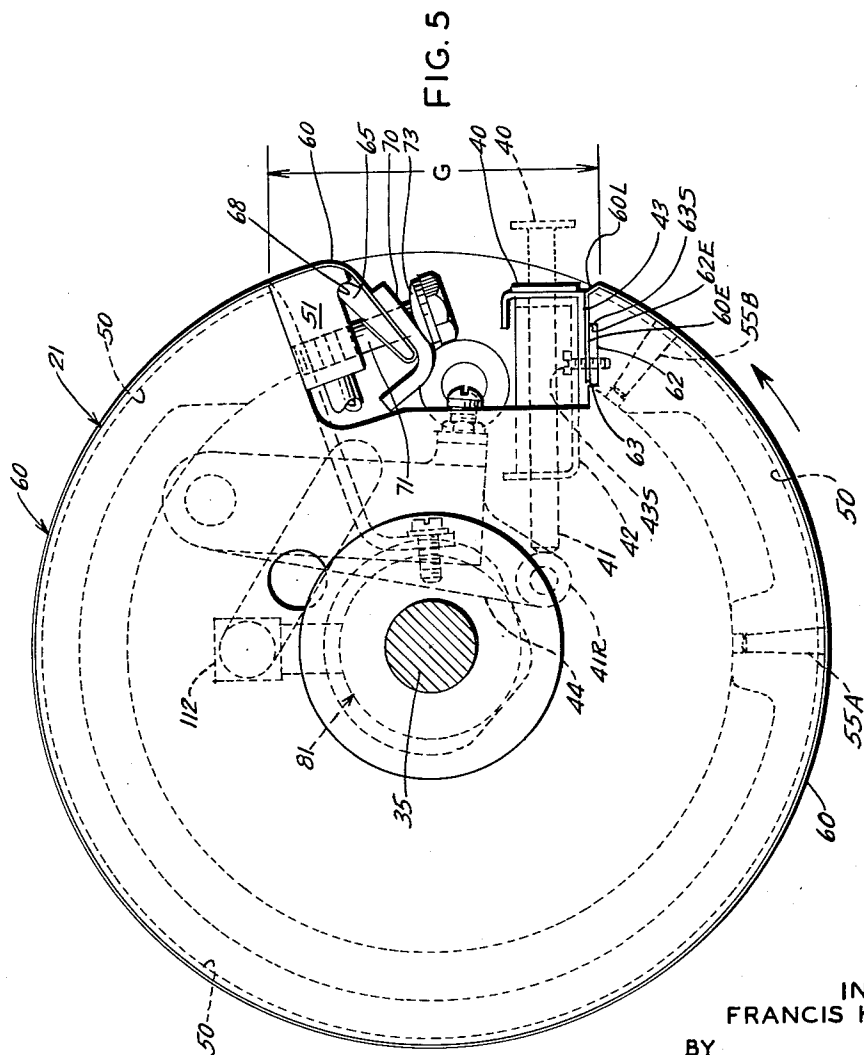
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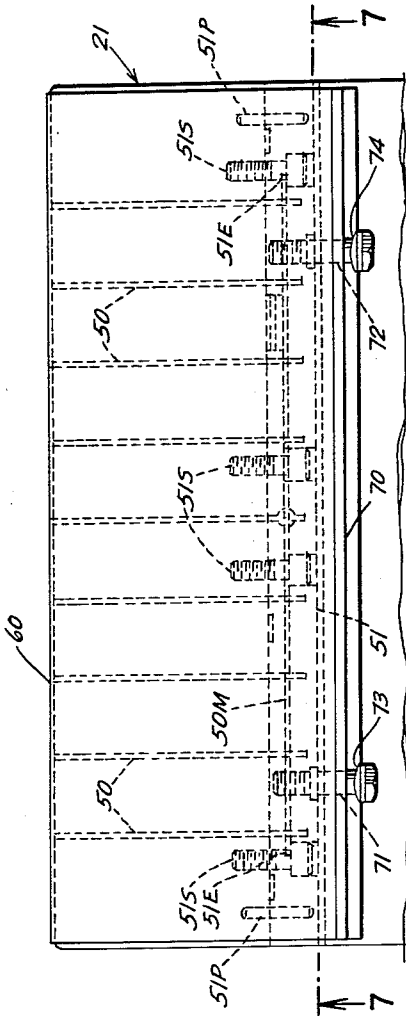


FIG. 6

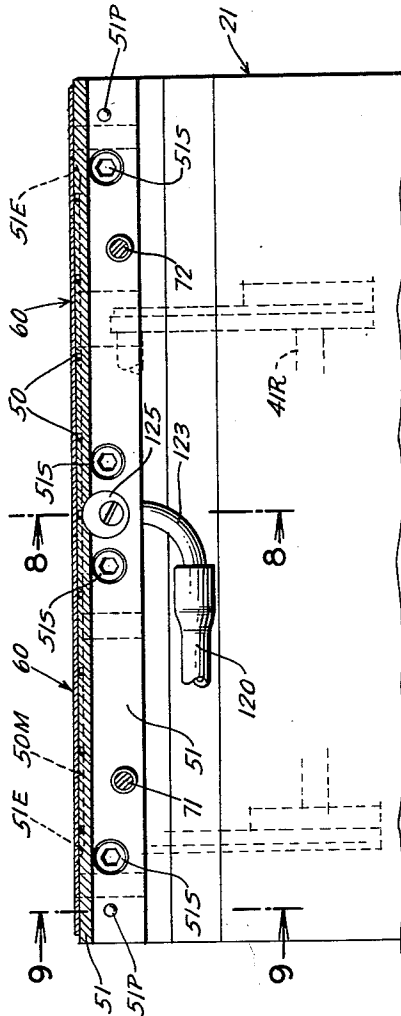


FIG. 7

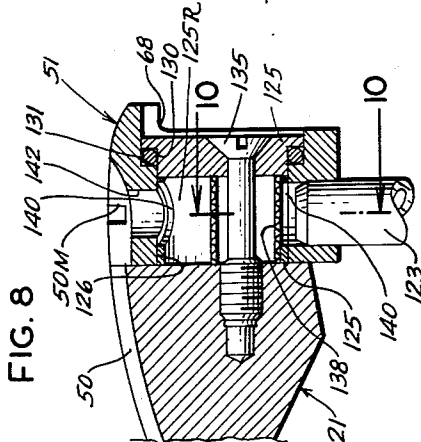


FIG. 8

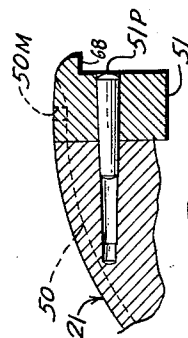


FIG. 9

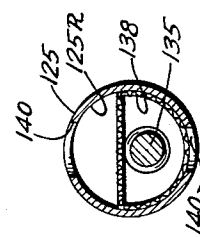


FIG. 10

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PRINTING MACHINES

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6 Claims. (Cl. 101-415.1)

This invention relates to office duplicating machines and in particular to a printing machine in the form of a rotary off-set duplicator.

In a rotary off-set duplicator, a flexible master, bearing the image to be repeatedly reproduced lithographically on individual copy sheets, is conventionally clamped at both the leading and trailing edges to the master cylinder. To this end, the master cylinder is formed with an axial gap in the circumference thereof wherein are located mechanically operable clamps effective to grip the leading and trailing edges of the master as aforesaid. Such clamping action of necessity must be positive in nature and accurately oriented in order that the master will be held tightly in place, since otherwise the master would flop or wrinkle during the course of transfer of the ink image thereon to the blanket on the blanket cylinder. Consequently, distorted images would appear on the blanket, and the same distortion would be carried over to the copy.

Master sheets are furnished in different sizes, which is to say that the commercial master sheets vary, let us say, from ordinary letter size to legal size. This requires, based on standard structure, that the master cylinders themselves be custom built so that the gaps, wherein the clamps are located, will afford the correct clamp locations for a master sheet of given size. As a consequence, the user of the machine sometimes has to change the master cylinder when changing from a previous run, where a master of one size was used, to the prevailing run where a different size master is required.

The primary object of the present invention is to eliminate the need for changing a master cylinder to accommodate different sized masters, and specifically to do this by having resort to suction for effectively holding one edge of the master in place on the master cylinder in such a machine. In other words, under the present invention, only one edge of the master is to be gripped by a positive, mechanically applied holding force, and the other edge is to be held in place by suction, thereby dispensing with the need for custom-built clamps so spaced on the master cylinder as to be allocable to a master of given length only.

As will be explained in detail hereinafter, the present invention is manifest in a mask which is to be tightly clamped to the master cylinder. The mask will be perforated to enable suction to be effective on a master of a given size. If a master of a different size is to be used, it is merely necessary to select a related mask and make the necessary mask substitution without changing the master cylinder to accommodate the different master, and such constitutes another object of the present invention.

Under and in accordance with the present invention, the master cylinder of a duplicating machine is constructed to have circumferential grooves formed in axially spaced rows about the outer surface thereof. These grooves are so arranged as to communicate with a manifold slot in the master cylinder which in turn communicates with a source of suction. The grooves are dead-ended as will be explained hereinafter, and a flexible mask of thin sheet, stainless steel or the like is tightly clamped about the master so that the negative pressure afforded by the suction means is confined to the aforesaid grooves. This is accomplished in such a manner

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that the mask per se constitutes an ideal seal without the necessity of resorting to a gasket or sealing compound which might represent the source of foreign matter interfering with the delicate surface conditions required in effecting good lithographic prints. Further, the mask is provided with perforations so oriented as to communicate with the aforesaid grooves in which negative pressure is established, and the lithographic master is placed over the mask in such a manner that a portion of the underside thereof overlies the perforate portion of the mask whereby, upon establishment of negative pressure, this portion of the master is held firmly on the master cylinder mask without the need for applying a positive mechanical grip to the corresponding edge of the master. This specific arrangement makes possible a surface on the image side of the master which is as true as the cylindrical surface of the master cylinder itself. The specific construction thus described represents a specific object of the present invention.

Other objects of the present invention are to so construct the mask as to enable the same to be effective as its own seal; to interpose a filter or screen in the suction system so that foreign matter will not be entrained therein; and to have resort to a novel rotary seal which will permit effective suction to be established in spite of the rotation of the master cylinder.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a perspective view of an off-set duplicating machine provided with a mask (broken away in part) in accordance with the present invention;

FIG. 2 is a plan view of a master cylinder constructed under the present invention, certain related parts being shown in section, and the master cylinder in part being broken away;

FIG. 3 is a sectional view on an enlarged scale in comparison to FIG. 2, showing details of the rotary seal in the suction system;

FIG. 4 is a sectional view taken on the line 4-4 of FIG. 3;

FIG. 5 is an elevation at one end of the master cylinder shown in FIG. 2;

FIG. 6 is a partial plan view of the master cylinder adjacent one edge of the gap therein;

FIG. 7 is a sectional view taken on the line 7-7 of FIG. 6;

FIGS. 8 and 9 are sectional views on an enlarged scale taken on the lines 8-8 and 9-9 of FIG. 7, but with the mask removed;

FIG. 10 is a sectional view taken substantially on the line 10-10 of FIG. 8;

FIG. 11 is a plan view of the mask;

FIG. 12 is a side elevation of the mask taken on the line 12-12 of FIG. 11;

FIG. 13 is a diagrammatic view illustrating the manner in which the mask is to be tensioned; and

FIGS. 14 and 15 are views of the tensioning bar.

In FIG. 1 of the drawings there is illustrated a typical lithographic printing machine 20 having a master cylinder 21 and a blanket cylinder 22 arranged for rotation

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between supporting frames F1 and F2 which in turn are supported by the bed B of the machine. The master cylinder has a positive drive imparted thereto during normal operation, and the master cylinder is provided with a gear 21G which is meshed with a gear 22G on the blanket cylinder whereby the latter is driven synchronously with and by the master cylinder.

As is well known in the art, the master cylinder is to be provided with a master sheet of rectangular form bearing an oleophilic lithographic image representing that which is to be reproduced on numerous copies. In accordance with the principles of lithography, ink and moisture in the proper condition are transferred to the master from a train of rollers 25, FIG. 1. Fresh supplies of ink are applied to the image on the master and are restricted thereto by the surrounding moisture which is confined to the hydrophilic background areas on the master plate surrounding the oleophilic (hydrophobic) master image appearing thereon. Consequently, ink is transferred in image form from the master to the blanket B on the blanket cylinder 22, and this image on the blanket in turn is off-set therefrom on to a copy sheet which is run between the blanket cylinder and a cooperating impression cylinder (not shown). This process is repeated for each revolution of the master cylinder, and a fresh image is transferred to the blanket and from thence to a copy sheet in each cycle of the machine.

It is of course necessary that the master be held tightly in place on the master cylinder, since otherwise distorted images will be transferred to the blanket B. Conventionally this is assured by constructing the master cylinder with a relatively large gap in the periphery thereof, and clamps are located in the gap at the opposite sides thereof in position to clamp, respectively, the leading and trailing edges of the master. Such an arrangement is exemplified by the clamps disclosed in United States Patent No. 2,813,482, to which more detailed reference will be hereinafter made.

As explained above, it is sometimes necessary to change the master cylinder to accommodate masters of different sizes. Under the present invention, the necessity for this is eliminated in a manner that will now be set forth in detail.

Referring to FIG. 2, it will be noted that the master cylinder 21 includes an axial support shaft 30 which, at the opposite ends, is supported in a bushing 31 and a support plate 32 associated with the frame structure referred to above. Gear 21G, which is driven, is secured to one end of the master cylinder to enable rotation to be imparted thereto, and the master cylinder is provided with bearing elements 34 and 35 which enable the master cylinder to rotate freely relative to the axle 30.

Under the present invention, only one edge of a master sheet MS, FIG. 1 is to be mechanically secured to the master cylinder. This edge is preferably the leading edge of the master in the present instance, and in this connection it will be noted that the master cylinder as shown in FIGS. 2 and 5 is formed with a gap G in the periphery thereof which extends for the full axial length of the master cylinder. A plurality of releasable clamp pins having enlarged heads 40, FIGS. 2 and 5, are provided at what constitutes the leading edge of the gap G as will be apparent from the arrow in FIG. 5 which indicates the normal direction of rotation of the master cylinder 21. The clamp pins having the heads 40 are in the nature of those disclosed in United States Patent No. 2,813,482, and the operating principle thereof is similar so that it is unnecessary to explain the details of this clamp structure with respect to master sheet securement other than to point out that when a lithographic master as MS, FIG. 1, is to be placed over the mask to be described hereinafter, the clamp under consideration is moved to its released position manifest in the heads 40 being disposed in the dotted line position

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shown in FIG. 5 thereof, and under this circumstance, the leading edge of the master sheet, configured in accordance with the clamp structure under consideration, is inserted into the released clamp and accurately oriented with respect thereto, whereafter the clamp is closed to thereby secure the leading edge of the master in place as described in the aforesaid Patent No. 2,813,482. In this connection it should be noted that the clamp pins having the heads 40 include shanks 41, FIG. 5 guided in a channel-like support 42 which in turn is secured by screws 43S to the master cylinder along with a clamp plate 43. The inner ends of shanks 41, in the clamping position thereof, normally bear against a clamp releasing rod 41R in turn supported by a bracket structure 44 with the master cylinder as shown in FIG. 2. The arrangement is further such, as described in Patent No. 2,813,482, that when the master cylinder is turned in a clockwise direction as viewed in FIG. 5 hereof, cam means (not shown herein) are effective ultimately to move the clamp releasing rod 43R in a right-hand direction as viewed in FIG. 5 to move the clamp pins to their released position.

Under the present invention, the edge of the master sheet which is not mechanically clamped as aforesaid, which for purposes of disclosure herein will be the trailing edge, is held firmly in place by suction. The arrangement including conduits and other elements of the system for creating the necessary negative pressure will be described following the description of the surface characteristics of the master cylinder and the mask that is related thereto as will now be set forth.

Referring to FIGS. 2 and 6 to 8, the machined metallic surface of the master cylinder is formed with a plurality of narrow grooves or recesses 50 which extend circumferentially thereabout. When negative pressure is established in the manner hereinafter described, this will be communicated to the grooves 50. These grooves are quite narrow in width of the master cylinder as will be noted in FIGS. 2 and 6. Each such groove is extended to and opens into an axially extending manifold slot 50M, FIGS. 7 and 8, which is milled in the radial outer face of a block 51 secured in an exposed position to one side of the gap G in the master cylinder by means including screws 51S and stress-relieving taper pins 51P. As will be noted in FIG. 7, the manifold slot 50M has dead-ends 51E in the block 51, and the outer face of block 51 is in the plane of and has the curvature of the outer surface of the master cylinder.

In actual manufacture, the grooves 50 as first formed are continuous about the exposed periphery of the master cylinder, which is to say that the grooves 50 extend from ends in communication with slot 50M about the periphery of the master cylinder and terminate at the other side of the gap G as will be evident in FIG. 2. However, the grooves 50 are dead-ended adjacent the side of the gap G where the mechanical clamp elements 40 are located. This is achieved by driving taper pins 55A and 55B, FIG. 2, radially into what can be viewed as the end portions of the grooves 50 which are near the clamp heads 40. The heads of the taper pins 55A and 55B are finished off to be flush with the outer arcuate surface of the master cylinder, and as shown in FIG. 2, these taper pins are staggered to minimize stresses in the master cylinder, which is to say that the taper pins 55A and 55B are offset relative one to another among the alternate rows of grooves 50. It should be pointed out in this connection that the row of taper pins 55A which are farthest removed from the mechanical clamps 40 are located within what will be the area covered by the shortest practical master that can be used, or in other words the taper pins 55A which block off the ends of the corresponding grooves 50 opposite the manifold slot 50M are so located that the trailing marginal portion of such a short master will extend slightly beyond the taper pins 55A in the direction of the manifold slot 50M.

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Under the present invention, a flexible, metallic mask 60 is wrapped about the grooved surface of the master cylinder and over the outer milled face of block 51 to cover the manifold slot. The mask includes a rectangular stainless steel band 61, FIG. 11, which is so tightly wrapped on the master cylinder that it serves as its own seal in preventing any significant loss of negative pressure in the grooves 50 and manifold slot 50M. The mask 60 is of a width but slightly less than that of the master cylinder itself.

Thus, in accordance with the present invention, the mask band is preferably of a thin stainless steel gauge that will have the innate flexibility sufficient to enable the mask 60 to conform easily to the periphery of the master cylinder. The mask band 61 at one end, FIGS. 11 and 12, is angularly formed first to provide a ledge 60L complementary to a correspondingly sloped ledge on the master cylinder, FIG. 5, which is located at the side of the gap G which leads into the mechanical clamp structure referred to above. Again referring to FIG. 12, this same end portion of the mask 60 is then bent at a 90° angle relative to the ledge 60L thereof to afford an inwardly directed extension 60E which, as shown in FIG. 5, is adapted to fit in behind the clamp plate 43. This is accomplished by loosening the screws 43S associated with the clamp plate 43 and moving the latter to a position where the mask band extension 60E can be slipped into an interposed position between the clamp plate 43 and the opposed wall surface of the master cylinder.

Again with reference to FIGS. 11 and 12, the extension 60E of the mask 60 is provided with a holding cross bar 62 of rectangular shape which is spot welded to the inner face thereof, and this cross bar is notched at 62N, FIG. 11, so as to embrace the aforesaid screws 43S which serve to secure the clamp plate 43 to the master cylinder.

The cross bar 62 is configured as to fit into a corresponding groove 63, FIG. 5, which is formed in the associated wall of the master cylinder behind the clamp plate 43. The groove 63 is so formed as to afford a shoulder 63S, and this shoulder will be engaged by the edge 62E, FIG. 12, of the cross bar 62 that is secured to the mask 60.

After the foregoing disposition of parts has been achieved, the screws referred to above as associated with the clamp plate 43 are then tightened, and consequently the end of the mask 60 having the cross bar 62 is firmly secured to the master cylinder.

As shown in FIGS. 11 and 13, the end portion of the mask 60 opposite the holding bar 62 is bent substantially in a permanent V-form at a bend 60B. The free leg of the bend is disposed in the same side of the mask as the holding bar 62. A wedge shaped leverage applying bar 65 is disposed within the bend and is secured to the mask by appropriate spot welding. As will be evident in FIGS. 11 and 13, the bar 65 includes a rounded projecting portion 66 which is opposite the end of the wedge element 65 which is embraced by the bend 60B in the mask 60. This projecting nose portion or force applying element of the wedge 65 is adapted to be disposed in a notch 68, FIGS. 5 and 13, which is provided in the free face of block 51 which is secured to the master cylinder as above described.

The wedge or lever element 65 of the mask 60, when disposed and pivoted in the notch 68, enables the mask to be tightly secured about the periphery of the master cylinder so that negative pressure will be effective in the grooves 50. Thus, since the grooves 50 are bottomed in the cylindrical body that affords the master cylinder, and are blocked adjacent the ends thereof opposite the manifold slot, the mask when tightened will seal the open sides of the grooves at the peripheral surface of the master cylinder.

To this end, means are afforded to apply a force or moment on the bar 65, FIG. 13, so that the same may be pivoted in the notch 68 as a fulcrum to a selected progressive clockwise position as viewed in FIG. 13 which posi-

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tion, it will be appreciated, determines the degree of tension exerted on the mask 60. Thus, in accordance with the present invention means already described are afforded to fixedly secure one end of the mask to the master cylinder, and additional means to be described below are afforded to enable a progressive tightening action to be applied to the mask at the opposite end thereof so as to bring the under-surface of the mask into sealing contact with the solid portions of the master cylinder which border the circumferential grooves therein. Specifically, such additional means includes a force or tensioning bar 70 of substantially right-angle shape, FIGS. 5, 14 and 15, adapted to bear against the mask at the end thereof having the lever element 65. The necessary forces applied to the lever 65 by the bar 70 are established by a pair of screws as 71 and 72, FIGS. 5 and 6. The threaded ends of these screws are extended into tapped openings in the block 51 as will be evident in FIG. 5, with the heads thereof in position to exert a force on the outer face of the tensioning bar 70. Thus, the screws 71 and 72 project normal to the plane of the outer face of the block 51 and are located below or radially inward of the notch 68 which represents the fulcrum for the wedge or mask lever 65. The mask 60 is notched at 60C—60D, FIG. 11, to embrace the screws 71 and 72.

One leg of the force bar 70, as shown in FIG. 14, is formed with a pair of elongated notches 70N through which the shanks of the screws 71 and 72 are passed. Washers 73 and 74 are seated on the shanks of the screws 71 and 72 just inward of the heads thereof. The washers 73 and 74 have rounded inner faces which are adapted to bear against the outer face of the force bar 70 as particularly shown in FIG. 5. This enables the washers to seat properly on the outer face of the force bar, and thereby forces are properly directed against the bar 70 when the screws 71 and 72 are turned in to exert more and more leverage on the wedge element 65 as will be evident from FIGS. 5 and 13. In order to give an appreciation of the forces involved in effecting the seal with the mask, as much as 27,000 pounds tension per lineal inch of the mask may be exerted thereon.

The suction system now to be described includes a hose 80, FIG. 2, connected to a pump (not shown) associated with the machine, and the negative pressure or suction established in hose 80 by the pump is directed down a bore in the shaft 30 as will be described, from thence into a rotating joint or housing 81, and from thence by a conduit system to the manifold slot 50M referred to above and into which the grooves 50 open. Thus, as shown in FIG. 2, the end of the hose 80 opposite that which communicates with the suction pump is sealably connected to the bushing 31 and communicates with the interior thereof. The shaft 30, FIGS. 2 and 3, is provided with an axially extending bore 83 which at one end opens into the boss 31, and an O-ring seal 83S is afforded between the shaft 30 and the interior of the boss 31 so as to prevent any substantial loss in suction established in the shaft bore 83.

Bore 83 extends axially inward of the shaft 30 to a point where it communicates with a drilled transverse passage 84 in the shaft 30, FIGS. 3 and 4. The housing 81 is arranged concentrically about shaft 30, as will be evident in FIGS. 2, 3 and 4, and is rotatable with respect thereto as will be explained.

As will be evident in FIG. 3, the housing 81 is associated with an enlarged axial portion 30E of the shaft 30 in which the transverse passage 84 is formed, and the position of the housing 81 is determined by a pair of retainer collars 90 and 91 each of which is provided with a tapped opening to receive a set screw as 90S and 91S, respectively, which serve to secure the collars 90 and 91 in fixed axial positions on the enlarged portion 30E of shaft 30. The collars 90 and 91 are machined to provide inwardly directed sleeves 93 and 94 having inside diameters which embrace the shaft enlargement 30E. The sleeves 93 and 94 are formed with annular recesses 93R

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and 94R, FIG. 3, inward of the set screws, and respective O-ring seals 95 and 96 are seated therein.

The housing 81 includes end portions 81A and 81B which extend concentrically about the collar sleeves 93 and 94 in spaced relation thereto. The opposed annular surfaces of the sleeves 93 and 94 and the end portions of the housing 81 related thereto are shaped to afford seats for a pair of porous, lubricated bronze bearings 105 and 106, and a pair of resilient flange-type seals 107 and 108 inward of the bearings 105 and 106. Thus, the bearings 105 and 106 rotatably support the housing 81, and the seals 107 and 108 effect a seal between the housing 81 and the sleeves 93 and 94. The housing 81 has one end of a drive dog 109, secured thereto, FIG. 5, and the other end of this dog is extended to engage an internal web of the master cylinder in order that the housing 81 will be rotated with the master cylinder. The housing 81 is ported to communicate low pressure to the manifold 50M as will now be described.

The rotatable housing or joint 81 is formed with an internal collar 81C in the medial portion thereof, which collar, it will be noted in FIG. 3, is disposed between the inner ends of the sleeves 93 and 94 associated with the retainer collars 90 and 91. The inside diameter of the collar 81C is defined by a pair of spaced ribs 81R which neatly embrace the outside diameter of the shaft enlargement 30E. The collar portion 81C of the housing 81 between the ribs 81R is recessed at 110, and this recess in effect provides a chamber surrounding the portion of the shaft enlargement 30E that is co-extensive with the transverse passage 84 therein. Accordingly, the chamber 110 is exposed to the suction effect established in the hose 80 irrespective of the rotative position of housing 81. The collar 81C is formed with a port 81P which opens into chamber 110. The port is tapped to enable the leg of an elbow 112 to be threaded therein. This elbow extends outward of the housing 81 as will be evident in FIGS. 2 and 3, and internal passages 113 and 114, FIG. 3, formed therein enable suction in the chamber 110 to be communicated to an internal passage 115 in a stub element 116 which is part of the elbow 112.

A hose 120 is fitted on the free end of the stub element 116, and the opposite end of the hose 120, FIG. 7, is tightly fitted onto the corresponding end of an elbow 123. The other end of the elbow 123 is extended into an opening at the bottom or radial inner face of block 51 as viewed in FIG. 8.

Referring to FIGS. 7 and 10, a circular plug 125 is fitted into a receiving opening formed in the medial portion of the free face of block 51. The plug 125 is formed in the inner face thereof with an annular recess 126, FIG. 8, and this recess cooperates with an annular shouldered portion 130 at the outer face of the block 51 to afford a seat for an O-ring seal 131.

The plug 125 is secured in place by a retainer screw 135 which is passed through an opening in the plug 125 and with the threaded end thereof disposed in a tapped opening in the adjacent wall of the master cylinder. When the screw 135 is tightened, the seal 131 will be effectively compressed between the block 51 and the plug 125.

A chamber is afforded between the plug 125 and the adjacent wall of the master cylinder afforded by recessing the plug at 125R inward from the face thereof opposite that in which the head of the screw 135 is seated. It will further be noted that a half-round screen or filter 138, FIGS. 8 and 9, is disposed in the recess 125R in the plug 125 with the shank of the screw 135 encompassed thereby.

A filter 138, as will be noted in FIG. 10, has an arcuate surface complementary to the rounded chamber 125R in the plug 125. During assembly, precautions are taken to assure that the filter 138 is in the position shown in FIG. 10 and effectively located over a transverse passage 140 that is formed through the plug 125 to be in communication with the elbow 123 as shown in FIG. 8. This opening 140 in the plug 125 is also oriented to com-

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municate with a passage 142, FIG. 8, that is formed through the outer face of the block 51 and which communicates the manifold slot 50M with the recess 125R in the plug 125. It will be appreciated that the filter screen 138 prevents foreign matter from being entrained in the suction system.

It will be recognized from the foregoing that the above described suction system enables the pressure differential established by the pump connected to the hose 80 to be communicated to the manifold slot 50M in the block 51, and such pressure differential will then be established in an equalized manner in the grooves 50 formed in the outer peripheral portion of the master cylinder.

The master sheet as MS, FIG. 1, which will have one edge associated with the clamp heads 40 will be trained back over the mask 60 so that the lower or unimaged surface thereof will be disposed in contact with the outer arcuate surface of the mask 60. Referring to FIG. 11, the mask 60 is provided with, in this instance, three rows R of perforations as 60P1, 60P2 and 60P3, that is, rows axially of the mask or across the shorter dimension thereof. The perforations in the mask are also arranged in spaced circumferential columns C that extend parallel to the long dimension of the mask. The spacing between columns of perforations corresponds to and registers with the spacing between the grooves 50 in the master cylinder.

Thus, three such perforations in column-wise alignment in the mask will overlie each such groove as 50 in the periphery of the master cylinder as shown in FIG. 1. Accordingly, negative pressure in the grooves in the master cylinder will be communicated to the perforations in the mask, and these in turn are in communication with the underside of the trailing end of the overlying master sheet as MS so that the latter will in effect be suction-gripped and retained on the master cylinder.

It will be recognized that for optimum effect, the perforations in the mask should be substantially co-extensive with merely the trailing portion of the master sheet, and should of course be sufficiently small in diameter as to prevent the master sheet from being puckered by the suction. For example, I have found that for a mask approximately 13½" in length (corresponding to the effective circumference of the related master cylinder) and having a width of approximately 9¾" so as to extend from one side of the master cylinder to the other, the perforations as 60P1 should be approximately 0.042" in diameter with the rows thereof spaced approximately 0.125" apart. Advantageously, the columns of perforations are approximately one inch apart. This represents an operative condition under circumstances where the vacuum is represented by 24" mercury, negative, although I have found that a master sheet can be effectively held in place by 18" of mercury, negative.

As noted above, the perforations in the mask are in a pattern that will lie under the trailing portion of the master sheet. Master sheets vary in size and therefore masks having perforation patterns located with respect to the expected master sheet sizes are contemplated under the present invention, bearing in mind that the size of the mask perforations and the spacing therebetween need not be varied for masters of different size. This aspect of the present invention is illustrated in FIG. 11 with particular regard to the dimension DA which locates the row of perforations 60P3 farthest removed from the end of the mask which is to be fixedly anchored to the master cylinder at what will correspond to the leading end of the master sheet. The entire mask perforation pattern is located within the dimension DA, and by having this dimension variant for different masks and related to the sizes of different master sheets, a mask can be selected which will have a perforation pattern properly oriented to efficiently hold the trailing end of the selected master sheet to be used in a particular run of the machine.

It will be seen from the foregoing that under the present invention, it is possible to dispense with the need for

two sets of mechanical clamps conventionally used to secure both the leading and the trailing edge of a master sheet to a master cylinder in an off-set duplicating machine. This is made possible in part by restrictively recessing the surface of the master cylinder, tightening a mask of flexible metal or like tir-tight material thereabout so that the areas of the master cylinder surrounding the recessed portion thereof are sealed by the under-surface of the mask, and thereafter communicating negative pressure to the recessed portion of the master cylinder. The mask is perforated with a limited number of perforations in communication with the recessed part of the master cylinder so that, as a practical matter, a suction pump will be effective to establish sufficient negative pressure in the perforations to hold down an edge of a master sheet overlying the perforations. For master sheets of different length, it is merely necessary to select a mask having a dimension DA, FIG. 11, which will in effect dispose the corresponding perforations at the trailing edge of the master sheet of a given length.

Effective suction under the present invention is also made possible by arranging associated parts so that there will be no appreciable loss in the suction line in spite of the continuous rotation of the master cylinder when the machine is in operation. The aforesaid mask is self-sealing, that is, the leverage or tensioning means associated with one end thereof is so constructed as to enable the mask to be sufficiently tensioned as to prevent any substantial loss of pressure at the edges of the mask.

Hence, while a preferred embodiment of the invention has been illustrated and described, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a duplicating machine, a master cylinder comprising a cylindrical body having an arcuate outer surface adapted to serve as a support for a master sheet, means affording a stationary axis of rotation for said cylinder, the outer surface of said cylindrical body having a plurality of axially spaced grooves extended about the periphery thereof, said grooves being bottomed within the body of the cylinder but opening at the outer surface thereof, said grooves having ends that are blocked and ends that communicate with a manifold in the master cylinder, means for establishing negative pressure in said manifold to be communicated to said grooves and including a suction line through said axis means, a ported housing rotatable with the master cylinder and rotatably supported on said axis with the port thereof in communication with the suction line at all rotative positions of said housing, a conduit extended from said port to said manifold, a flexible metallic mask extended about the grooved portion of the cylindrical body, means carried by the master cylinder for tightening the mask about the outer surface of the cylindrical body sufficiently to effectively seal the grooved surface of the cylindrical body against substantial loss of negative pressure established in said grooves, and said mask being formed with openings therethrough that communicate with said grooves to enable an end portion of a master sheet overlying said openings to be held to the master cylinder by pressure differential, and means carried by said master cylinder for clamping the other end of said master sheet.

2. A machine according to claim 1 wherein the means for tightening the mask include: an anchor element affixed to one end of the mask and secured to the master cylinder in a fixed position, a lever bar secured to the mask at the opposite end thereof and having an end portion thereof fulcrummed on a fixed surface of the master cylinder, and screw means carried by the master cylinder for exerting a moment on said lever.

3. In a duplicating machine, a master cylinder com-

prising a cylindrical body having an arcuate outer surface, the outer surface of said cylindrical body being formed with a plurality of spaced recesses that are bottomed within the body of the cylinder but which open at the outer surface thereof, means for establishing negative pressure in said recesses, a flexible metallic mask extended about the recessed portion of the cylindrical body and adapted to seal the recessed portion of the cylindrical body against substantial loss of negative pressure established in said recesses, said mask being formed with openings therethrough that communicate with said recesses to enable an end portion of a master sheet overlying said openings to be held to the master cylinder by pressure differential, means carried by the master cylinder for clamping the other end portion of said master sheet, and means carried by the master cylinder for tightening the mask about the outer surface of said cylindrical body including an anchor element affixed to one end of the mask and secured to the master cylinder in a fixed position, a lever bar secured to the mask at the opposite end thereof and having an end portion thereof fulcrummed on a fixed surface of the master cylinder, and means carried by the master cylinder for exerting a moment on said lever.

4. In a duplicating machine wherein successive copies are to be obtained from a master image carried by a master sheet, a rotatable master cylinder adapted to support the master sheet, the outer surface of said cylinder being formed with recesses extended inward therefrom and bottomed within the body of the cylinder, means for creating negative pressure in said recesses and including passage means substantially coaxial with the axis of rotation of said cylinder and adapted to be connected to a suction pump, a sealed housing rotatably related to said passage means and rotatable with the master cylinder, said housing being ported to be in communication with said passage means, conduit means connected to the port of said housing and adapted to communicate said recesses with the suction created by said pump, a flexible metallic mask extended about the recessed portion of the master cylinder, means carried by the master cylinder for tightening the mask about the outer surface of said cylinder sufficiently to effectively seal the recessed surface thereof against substantial loss of negative pressure established in said recesses, said mask being formed with openings therethrough that communicate with said recesses to enable an end portion of a master sheet overlying said openings to be held to the master cylinder by pressure differential, and means carried by said master cylinder for clamping the other end of said master sheet.

5. In a duplicating machine wherein successive copies are to be obtained from a master image carried by a master sheet, a rotatable master cylinder adapted to support the master sheet, the outer surface of said cylinder being formed with axially spaced grooves formed inward therefrom and bottomed within the body of the cylinder, said grooves having dead-ends and other ends in communication with a common manifold in the master cylinder, means for creating negative pressure in said manifold and including passage means substantially coaxial with the axis of rotation of said cylinder and adapted to be connected to a suction pump, a sealed housing concentrically related to said passage means and rotatable with the master cylinder, said housing being ported to be in communication with said passage means, conduit means extended between the port of said housing and said manifold, a flexible metallic mask extended about the grooved portion of said master cylinder, means carried by the master cylinder for tightening the mask about the outer surface of the cylinder sufficiently to effectively seal the grooved surface thereof against substantial loss of negative pressure established in said grooves, said mask being formed with openings therethrough that communicate with said grooves to enable an end portion of a master sheet overlying said openings to be held to the master cylinder by pressure differential, and means carried by said

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master cylinder for clamping the other end of said master sheet.

6. A machine according to claim 5 wherein the manifold is an axially extending slot at the outer surface of the master cylinder and wherein said mask is extended thereover in a sealing relationship.

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