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MEANS FOR REPRODUCTION OF DESIGNS

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2 SHEETS—SHEET 1

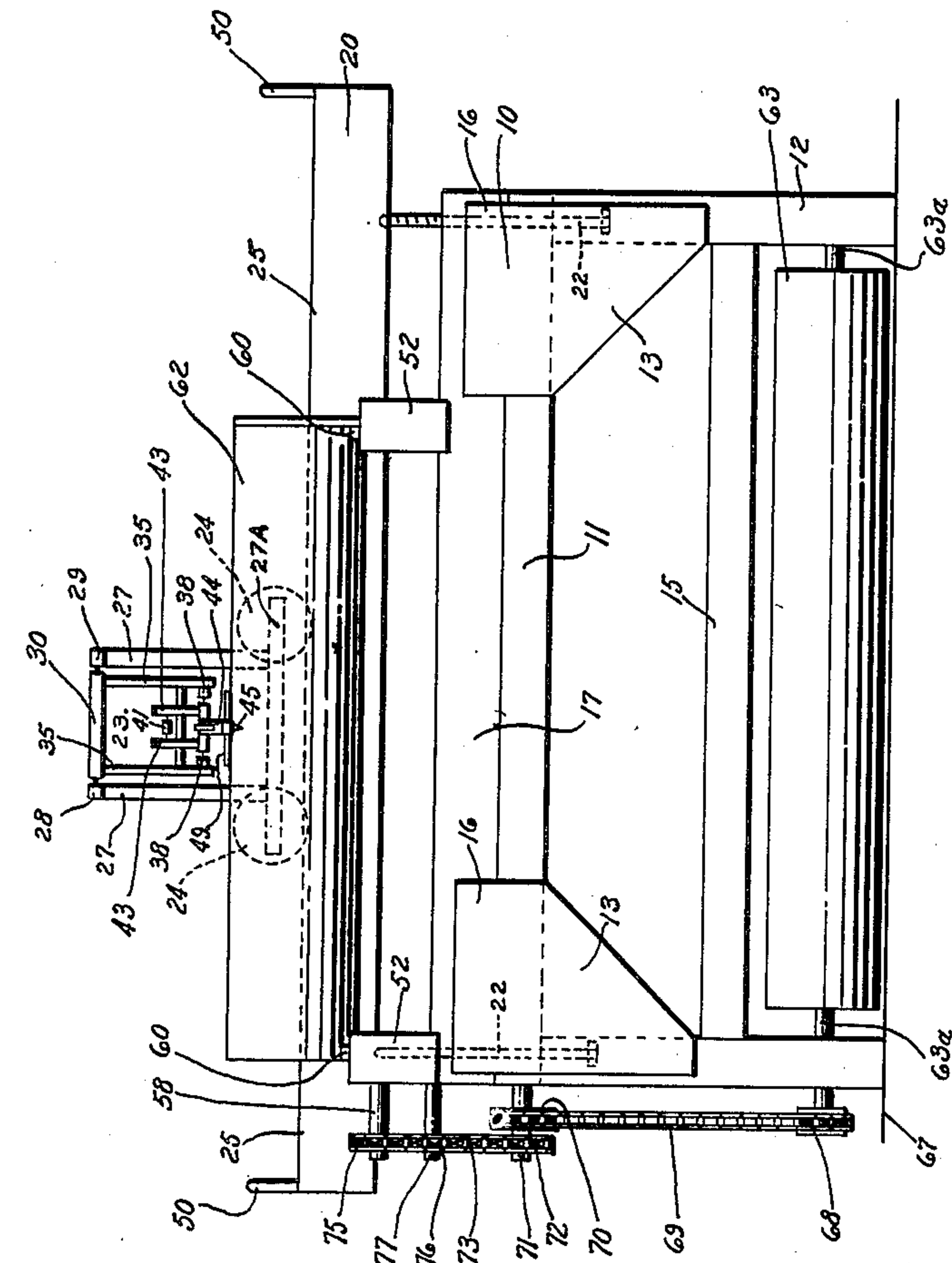


FIG. 3

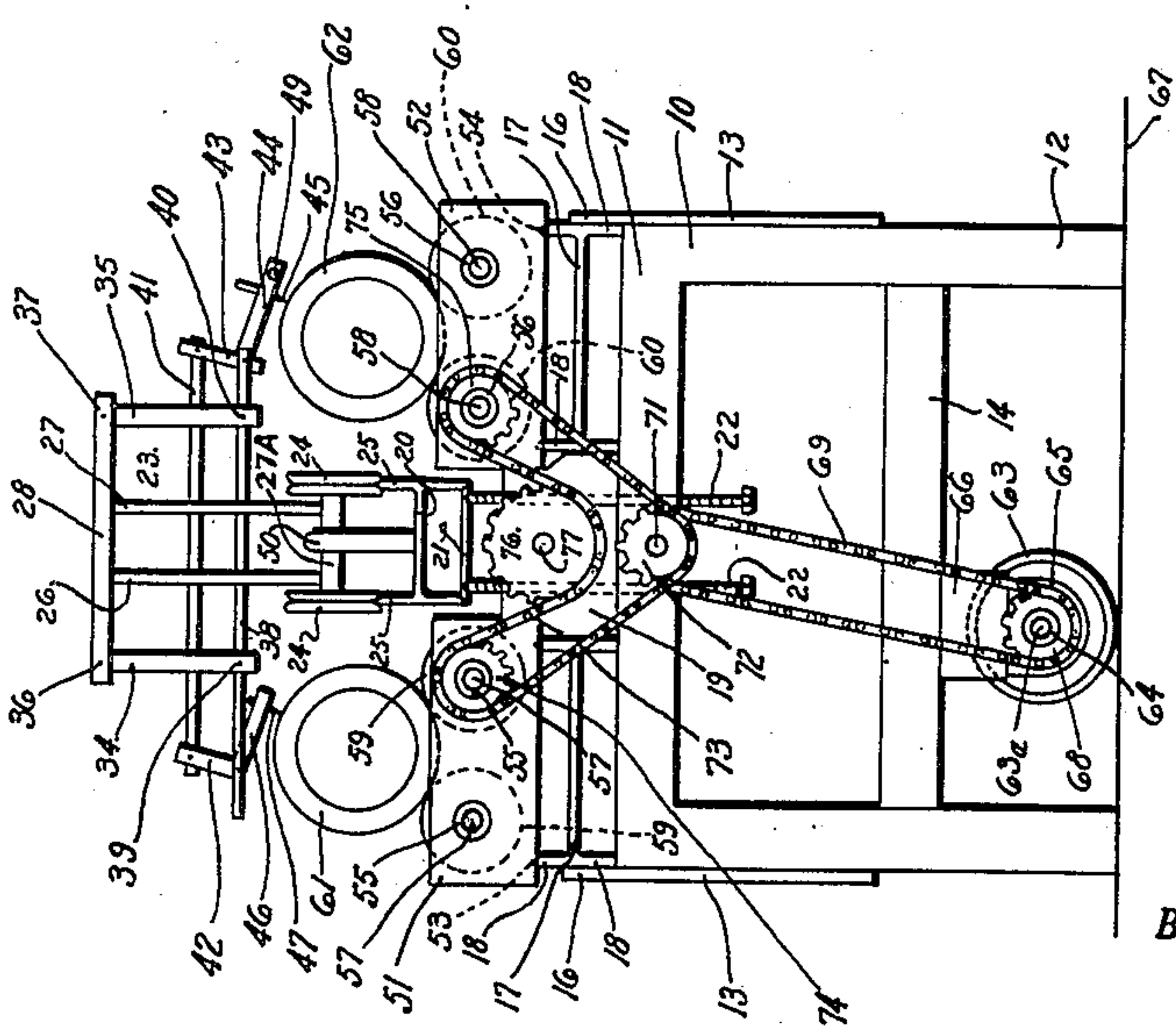


FIG. 1

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2 SHEETS—SHEET 2

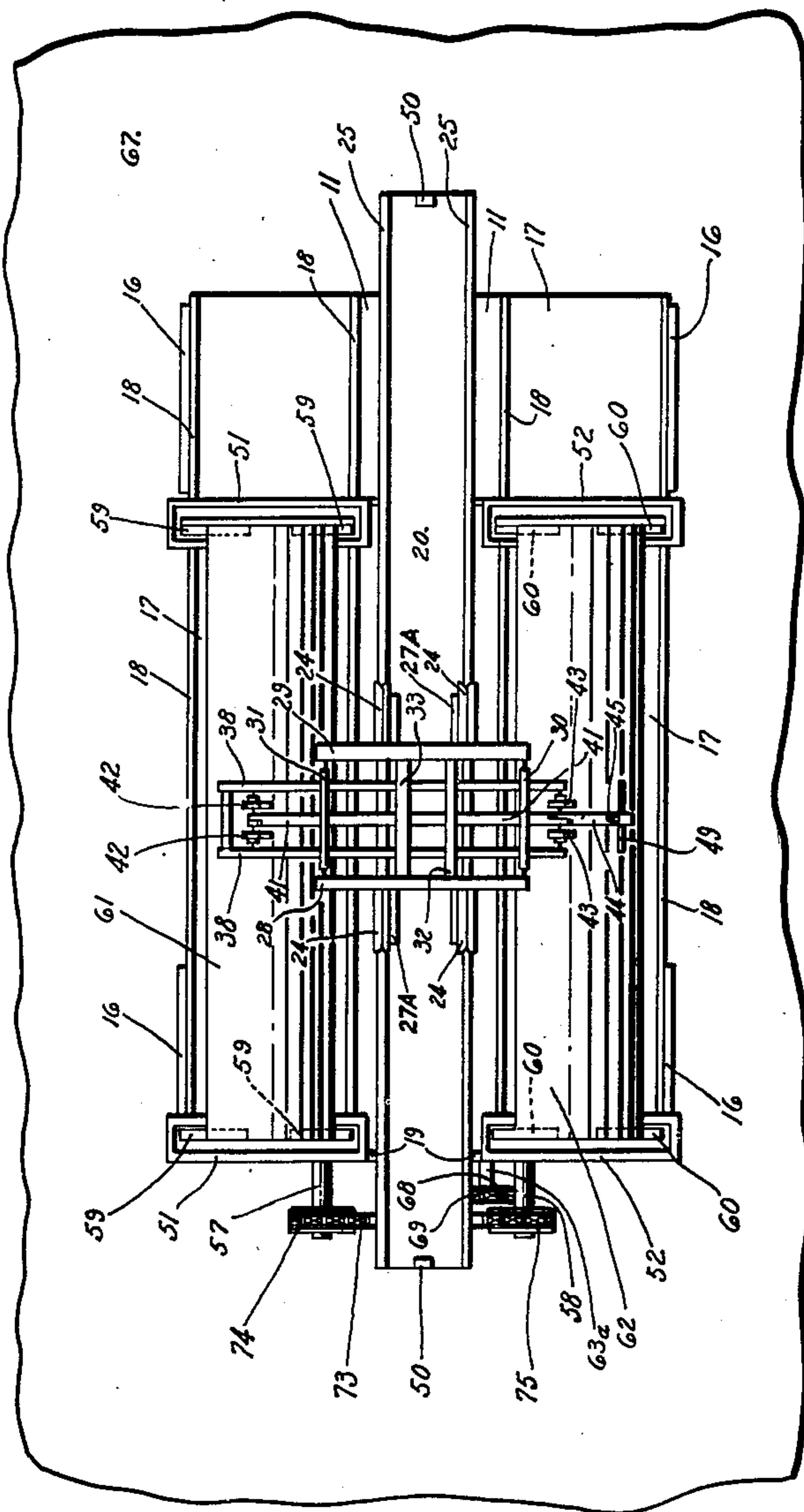


FIG. 2

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## UNITED STATES PATENT OFFICE

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## MEANS FOR REPRODUCTION OF DESIGNS

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1

The present invention relates to engraving apparatus or machines and more particularly to that type wherein a design is cut on the surface of a printing cylinder used in printing textiles, wall paper, oil cloth and similar material.

According to the invention, a controlling member guided in a desired path serves to determine the movement of a cutting tool by means of a device such as a pantograph or the like, one object being to enable a series of engraving operations to be carried out automatically.

Heretofore the engraving of copper rollers or rollers of other suitable material from which designs are copied or reproduced on the surface of fabrics or other sheet material has been done by a series of operations beginning with the production of a flat master plate carrying the design to be reproduced. Normally a pantograph is used for transferring or copying on a roller a design previously photographed and etched upon the flat master plate. The original design on the flat plate is usually about three times larger than is required for the curved surface of the copy roller. This type of conventional pantograph therefore may be said to work from an enlarged flat surface and traces in reduced scale on the curved surface of the roller to be engraved. In the present invention, however, a pantograph is employed to trace or cut a design on the curved surface of one roller from the curved surface of another roller already engraved without reduction in the size of the design thus reproduced.

One object of the present invention is to provide a means whereby printing rollers or cylinders may be engraved with a printing design or pattern without the use of any flat master plates. Another object is to accurately transfer a design from the curved surface of a pattern cylinder to the curved surface of a workpiece roller or cylinder. A further object of the present invention is to duplicate the engraving on copper print rollers when the original flat master plates have been destroyed or are otherwise unavailable or when they have been damaged to the extent that further use of such plates is undesirable.

Another object is to reproduce the engraving on one print roller of a set that will blend with and fit the overall design embodied in all the rollers of the set. Normally where a series of flat master plates is employed to engrave a whole set of printing cylinders used to print a multi-color overall design, if one cylinder of the set needs replacement, it is necessary or advisable to replace all the other printing cylinders

2

in the same set, especially where accurate and clear printing of the pattern is required in the finished article. One reason for this is the fact that engraving even a single new replacement roller from its matching master plate results in variations from the design as originally engraved on the old cylinder. However small these variations may be, they tend to prevent adequate and satisfactory printing of the design and a homogeneous blend of the designs engraved on all the printing cylinders. Where the present invention is used however, such variations are avoided and one or several rollers can readily be reproduced without the need of engraving an entire new set.

With the above and other objects in view, as will be apparent, the present invention consists in the construction, combination and arrangement of parts, all as hereinafter more fully described, claimed and illustrated in the accompanying drawings, wherein:

Fig. 1 is an end elevation of a pantograph embodying the present invention and showing both the pattern roller and workpiece roller in position for the engraving operation, and an articulated system of links suspended thereover for transferring a design from one of the cylinders to the other;

Fig. 2 is a top plan view of the apparatus showing the handle used by the operator to control universal movement of the cutting point on the workpiece roller in unison with movement of the tracing stylus; and

Fig. 3 is a side elevation of the device including a foot-operated drum used to control periodic and progressive rotation of the workpiece and pattern cylinder as the engraving proceeds.

The pantograph of the present invention includes a support or work table 10 of any suitable shape, size and material. In practice a rectangular metal table is preferred, having an overall length of approximately the length of the roller to be engraved and wide enough to conveniently support both the pattern roller and the workpiece roller or cylinder with the engraving apparatus or carriage assembly therebetween. The height of the machine may be determined by the requirements of the engraver, having regard to the fact that rotation of the rollers is controlled by foot movements of the operator, while the actual engraving on the workpiece is hand powered.

The work table 10 comprises a table top 11 secured to legs 12 by means of brackets 13. If desired, further reinforcement may be provided for the table 10 by means of bracers 14 connect-



3

ing each pair of adjacent leg standards 12 about midway of the length thereof; and by a pair of parallel longitudinal cross ties 15 similarly disposed about midway of the length of the legs 12 and having their opposed ends fixedly united therewith. The transverse bracers 14 may conveniently be employed to mount the rotatable drum whereby the workpiece and pattern rollers are moved during the engraving or cutting process, as indicated in Fig. 1 of the drawings and as will be described.

It will be noted that each of the four brackets 13 securing legs 12 to the table top 11 at the corners of the worktable 10 is provided with a lip or flange 16. To the inner surfaces of these flanges 16 a pair of H-shaped beams 17 of relatively heavy metal are secured in parallel and spaced relationship at opposite sides of the worktable 10 and running longitudinally thereof, the beams 17 having vertical side portions 18 resting on and bearing against the table top 11. The beams 17 are stationary and verticals 18 thereof provide means for mounting supports for the pattern and workpiece rollers. A pair of guards 19 mounted at either end of the table top 11 and medially thereof substantially completes the table 10 assembly.

The pantograph apparatus proper is movably mounted on or supported by table top 11 of worktable 10. The device includes a horizontal H-shaped beam 20 intermediate the beams 17 of similar design. Beam 20 is mounted on face plate 21 having depressions on its underside within which nest the shank ends of threaded bolts 22 which not only hold the weight of the pantograph superstructure, but also provide means for adjusting the relative position of the tracing stylus and engraving diamond with respect to the pattern and workpiece rollers. That is to say, by turning bolts 22 in one direction, the carriage assembly is raised. Reversely, by rotating the members 22 in the opposite direction, the assembly is lowered. By this means, cylinders of varying diameters may be accommodated in the pantograph.

The superstructure, including the carriage for an articulated linkage connecting the tracer element and the cutting implement of the present pantograph, as best shown in Fig. 1, is mounted on intermediate beam 20 and permits of universal motion in any direction of both the tracing stylus and the diamond cutter point. To that end, an overhead carriage 23 is mounted for lateral movement by means of wheels 24 riding on tracks 25 of intermediate beam 20 secured to the stationary face plate 21.

The movable carriage assembly 23 presents a more or less symmetrical framework of parallel vertical and horizontal bars connected to an articulated system of links and comprises two pairs of uprights 26—27 fixed at their lower ends to the plate 21A and secured at their upper ends to the horizontal cross members 28—29. The space between the members 28—29 is bridged at both ends by the pins 30—31, and intermediate of the pins 30—31 by fixed supports 32—33. The members 28—29 are each of a length considerably greater than the space between the uprights 26 and the uprights 27 beyond which they therefore extend. Suspended from opposed ends of the members 28—29 are two pairs of movable perpendicular hanging bars or depending links 34—35 respectively pivoted as at 36—37 to horizontals 28—29, to swing freely toward or from the operator while remaining always perpendic-

4

ular to pins 30—31. Bottom bars 38, spaced from and parallel with horizontals 28—29, are movably secured to the lower ends of the hanging bars 34—35 by pins 39—40; while intermediate bar 41, also spaced from and parallel with horizontals 28—29, is pivotally connected to bottom bars 38 by means of the links 42—43 parallel to each other. Arm 44 is fixedly united to the lower extremities of the links 43 and projects in a direction perpendicular to the plane of their axes, to clampingly engage stylus 45. Arm 46 is likewise fixedly attached to the lower extremities of the links 42 from which it projects in a perpendicular direction, at the same time parallel to the arm 44, to support the diamond cutter point 47. The effective length of the arm 44 equals the effective length of the arm 46. This arrangement and construction of carriage 23, including the uprights 26—27, the horizontals 28—29, pins 30—31, hanging perpendicular bars 34—35, intermediate and bottom bars 41 and 38 respectively, bell crank 43, 44 and bell crank 42, 46 is such that the carriage assembly 23 coacts as a unitary combination adapted to move both stylus 45 and cutter 47 simultaneously in any direction. That is to say, when the engraver or workman pulls handle 49 toward him in the horizontal plane, a forward motion is thereby transmitted to bottom bars 38 and intermediate bar 41 and hanging bars 34—35 swing about pivot pins 30—31. Conversely, when the operator pushes back on the handle 49, the hanging bars 34—35 swing in the reverse direction, and the diamond point moves backward an amount equal to the motion of the stylus. Similarly, if the operator moves the handle 49 upward in a vertical line, a slight backward motion is imparted to the bottom bars 38, while a much greater backward motion is imparted to the intermediate bar 41. This in turn rotates the links 42 and the arm 46 about their pivot point, and lifts the diamond point an amount equal to the amount which the stylus 45 was moved. Likewise a downward motion of or pressure on the stylus is transmitted equally or undiminished to the diamond point 47. Thus the tracing stylus 45 and diamond point 47 may be moved simultaneously and to the same extent or degree either forward, backward, upward or downward. Lateral movement of the carriage 23, including stylus 45 and diamond point 47 is effected by the application of manual pressure which causes the wheels 24 of carriage 23 to roll along the tracks 25 of intermediate beam 20 secured to face plate 21. Thus a universal motion may be imparted to simultaneously move both stylus 45 and point 47 in any desired direction. The extent of lateral motion of the carriage 23 is determined or limited by the stops 50 at either end of beam 20. Reciprocation of the stylus 45 and cutter 47 is controlled and restricted by the perpendicular bars 34—35, which move or swing in an arc about their respective pivot points.

As previously stated, the H-shaped outer beams 17 are fixed and include vertical arms 18 on which rest supports for the pattern and workpiece rollers. These supports may comprise two pairs of spaced and parallel open boxes 51—52 made of metal or other durable material. The boxes 51—52 are each provided with recesses 53—54 on their bottom surfaces to engage with the arms 18 of beams 17. By adjusting the distance between the boxes 51 or 52, workpiece and pattern cylinders of varying lengths may be accommodated. Furthermore, the end walls of



boxes 51—52 are provided with suitable openings containing bearings 55—56 to carry the shafts 57—58 of rollers 59—60 respectively. As shown in the drawings, the several pairs of rollers 59—60 are spaced apart sufficient to freely support the workpiece roller 61 and pattern roller 62. That is to say, the distance between the pair of rollers 59 is less than the outside diameter of workpiece roller 61 to be engraved, and in like manner, the space between the pair of rollers 60 is smaller than the outside diameter of pattern roller 62. Thus, after roller 61 and pattern roller 62 are placed in position to rest on the several pairs of rollers 59—60 respectively, they are free to rotate either clockwise or counterclockwise when, as and if shafts 57 and 58 of rollers 59—60 are rotated.

Rotation of rollers 59—60 whereby workpiece and pattern cylinders 61—62 are correspondingly moved to the same extent is controlled by an assembly of coacting sprocket wheels and chains connected to the foot operated drum 63 located underneath the top 11 of table 10. As drum 63 is rotated by the operator during the engraving operations, the movement thereof is transmitted to rollers 59—60 which in turn simultaneously adjust the relative position of the workpiece cylinder 61 and pattern cylinder 62 correspondingly. To that end, drum 63 is provided with a central shaft 63<sup>a</sup> resting in bearings 64 mounted in eccentric portions 65 of drop plates 66 secured approximately medially of bracers 14. As shown in the drawings, the drum 63 is suspended in bearings 64 slightly above and out of all contact with the flooring 67 so as to be rotatable without hindrance at the will of the operator engraving the workpiece roller 61. A sprocket wheel 68 is mounted on one end of shaft 63<sup>a</sup> and connected by means of chain 69 to sprocket 70 on shaft 71 projecting from the same end of table top 11 of table 10. Similarly, shaft 71 is provided with a second sprocket 72 carrying chain 73 which also rides over and coacts with sprockets 74—75 carried by shafts 57—58 of rollers 59—60 and under central sprocket wheel 76 on shaft 77 projecting from guard 19.

In operation the operator (not shown) of the engraving apparatus sits at the side of the machine nearest the handle 49 which is employed to simultaneously move both tracing stylus 45 and diamond cutter point 47 in any desired direction and to the same extent, as heretofore described. To present successive portions of the pattern cylinder 62 and workpiece cylinder 61 to the tracer 45 and cutter 47 respectively, the operator turns drum 63 at will and this motion is transmitted to the cylinders 61—62 by means of chains 69 and 73 coacting with sprocket wheels 68, 70, 72, 74, 75 and 76, also as previously described.

Although the specific embodiment of the present invention as described above includes the use of a single workpiece cylinder, manifestly the invention is equally applicable and adapted to copying a design on a plurality of workpiece cylinders. To that end the device may be modified by adding extension pieces to the bottom bars 38 and intermediate bar 41 and attaching duplicates or equivalents of links 42 and arms 46 thereto.

What is claimed is:

1. The combination in an apparatus for copying a design on one cylinder from another, of means for simultaneously rotating both cylinders, said means comprising rotatable support means for maintaining the cylinders in parallel and

spaced relation, sprocket means fixed on the support means to rotate therewith, a rotatable drum mounted adjacent the support means, sprocket means secured to the drum for rotation therewith, intermediate sprocket means constructed and arranged to rotate between the drum and the support means and chain means connecting the intermediate sprocket means to the sprocket means on the support means and to the sprocket means on the drum for rotation of the support means and the drum in unison, and of means for copying the design on one cylinder from the other, said means for copying comprising tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder, and an articulated linkage suspended over the rotatable support means, and connecting the tracing means and cutting means for movement of the tracing and cutting means in unison.

2. The combination in an apparatus for copying a design on one cylinder from another, of means for simultaneously rotating both cylinders, said means comprising coacting idler and driven roller supports in contact with the cylinders for rotatably sustaining the cylinders in parallel spaced relation, sprocket means fixed on the driver roller supports for rotary motion therewith, a rotatable drum including sprocket means, said drum and its sprocket means being mounted adjacent the supports and a chain connection between the drum sprocket means and the sprocket means fixed on the roller supports whereby rotation of the drum in one direction rotates the roller supports in the same direction, and of means for copying the design on one cylinder from the other, said means for copying comprising tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder, and means connecting the tracing means and cutting means for movement thereof in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising an assembly of spaced uprights, horizontal members fixed to the uprights, perpendicular links pivoted to the horizontal members and depending from both sides of the carriage, horizontal transverse links pivotally connecting the depending links for movement in unison therewith, at least one intermediate link parallel with the transverse links and bell crank means mounted on opposed ends of the transverse links pivotally connecting the transverse links and the intermediate link for reciprocation of the transverse links and intermediate link, the bell crank means at one end of the transverse links including means for engaging said cutting means and the bell crank means at the other end of the transverse links including means for engaging said tracing means.

3. The combination in an apparatus for copying a design on one cylinder from another, of means for simultaneously rotating both cylinders in the same direction, said means comprising an idler roller and a driven roller for each cylinder for freely sustaining each cylinder in parallel and spaced relation from the other, sprocket means fixed to the driven roller supporting each cylinder and revoluble therewith, a rotatable drum adjacent the rollers, sprocket means secured to the drum for rotary movement therewith and a chain



connection between the drum sprocket means and the sprocket means on each of the driven rollers whereby rotation of the drum rotates the driven rollers in the same direction, thereby rotating the cylinders in the opposite direction, and of means for copying the design on one cylinder from the other, said means for copying the design comprising tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder, and means connecting the tracing means and cutting means for movement thereof in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising links pivoted to the carriage and depending from both sides of the carriage, at least one transverse horizontal link pivotally connecting the depending links for movement in unison therewith, at least one intermediate link parallel with the transverse link and bell crank means mounted on opposed ends of the transverse link pivotally connecting the transverse link and the intermediate link for reciprocation of the transverse link and intermediate link, the bell crank means at one end of the transverse link including means for engaging said cutting means and the bell crank means at the other end of the transverse link including means for engaging said tracing means.

4. The combination in an apparatus for copying a design on one cylinder from another, of means for simultaneously rotating both cylinders, said means comprising coacting idler and driven rotatable supports for rotatably maintaining the cylinders in parallel and spaced relation, sprocket means fixed on the driven supports to rotate therewith, a rotatable drum mounted adjacent the supports, sprocket means secured to the drum for rotation therewith, intermediate sprockets constructed and arranged to rotate between the drum and the supports, a chain connection between the sprocket means secured to the drum and one of the intermediate sprockets, and another chain connection between the remaining intermediate sprockets and the sprocket means fixed on the supports, whereby rotation of the drum in one direction rotates the supports in the same direction, thereby rotating the cylinders in the opposite direction, and of means for copying the design on one cylinder from the other, said means for copying comprising tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder and means connecting the tracing means and cutting means for movement thereof in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising links pivoted to the carriage and depending from both sides of the carriage, at least one transverse horizontal link pivotally connecting the depending links for movement in unison therewith, at least one intermediate link parallel with the transverse link and bell crank means mounted on opposed ends of the transverse link pivotally connecting the transverse link and the intermediate link for reciprocation of the transverse link and intermediate link, the bell crank means at one end of the transverse link including means for engaging said cutting means and the

bell crank means at the other end of the transverse link including means for engaging said tracing means.

5. The combination in an apparatus for copying a design on one cylinder from another, of means for supporting the cylinders in parallel spaced relation, means for simultaneously rotating the cylinders in the same direction and to the same degree, tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder and means connecting the tracing means and cutting means for movement thereof in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising links pivoted to the carriage and depending from both sides of the carriage, at least one transverse horizontal link pivotally connecting the depending links for movement in unison therewith, at least one intermediate link parallel with the transverse link and bell crank means mounted on opposed ends of the transverse link pivotally connecting the transverse link and the intermediate link for reciprocation of the transverse link and intermediate link, the bell crank means at one end of the transverse link including means for engaging said cutting means and the bell crank means at the other end of the transverse link including means for engaging said tracing means.

6. The combination in an apparatus for copying a design on one cylinder from another, of means for supporting the cylinders in parallel spaced relation, means for simultaneously rotating the cylinders in the same direction and to the same degree, tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder and means connecting the tracing means and cutting means for movement thereof in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising an assembly of spaced uprights, horizontal members fixed to the uprights, perpendicular links pivoted to the horizontal members and depending from both sides of the carriage, horizontal transverse links pivotally connecting the depending links for movement in unison therewith, at least one intermediate link parallel with the transverse links and bell crank means mounted on opposed ends of the transverse links pivotally connecting the transverse links and the intermediate link for reciprocation of the transverse links and intermediate link, the bell crank means at one end of the transverse links including means for engaging said cutting means and the bell crank means at the other end of the transverse links including means for engaging said tracing means.

7. The combination in an apparatus for copying a design on one cylinder from another, of means for supporting the cylinders in parallel spaced relation, means for simultaneously rotating the cylinders in the same direction and to the same degree, tracing means adapted to contact the surface of one of the cylinders, cutting means for contacting the surface of the other cylinder and means connecting the tracing means and cutting means for movement there-



of in unison in any direction, said connecting means comprising a carriage mounted for bodily movement between the cylinders to traverse the length of the cylinders, an articulated linkage secured to the carriage above the cylinder supporting means, said linkage comprising an assembly of spaced uprights, horizontal members fixed to the uprights, rotatable pins bridging the space between the horizontal members, perpendicular links depending on both sides of the carriage from said rotatable pins, at least one horizontal transverse link pivotally connecting the depending links for movement in unison therewith, at least one intermediate connecting link parallel with the transverse link and bell crank means mounted on opposed ends of the transverse link pivotally connecting the transverse link and the intermediate link for reciprocation of the transverse link and the intermediate link, the bell crank means at one end of the transverse link including means for engaging said cutting means and the bell crank means at the other end of the transverse link including means for engaging said tracing means.

8. The combination in a pantograph for delineating lines on a work piece from a pattern, of tracks intermediate the pattern and the work piece, a carriage mounted on the tracks for bodily movement of the carriage in a horizontal plane, elevator means underneath the tracks for bodily moving the tracks and the carriage in a vertical plane and an articulated system of links mounted on the carriage for copying the design on the work piece from the pattern, comprising an assembly of interconnected and coacting fixed uprights and fixed cross members, movable uprights pivotally connected to the fixed cross members, movable cross members pivotally connected to the movable uprights, at least one intermediate horizontal link between the fixed cross members and the movable cross members, pivoted links on both sides of said carriage for connecting the intermediate link with the movable cross members for reciprocation of the intermediate link and the movable cross members, a movable arm fixed to said pivoted connecting links on one side of the carriage and extending away from the fixed uprights, tracing means mounted on the movable arm, a second movable arm fixed to the pivoted connecting links on the other side of the carriage and extending toward the fixed uprights and cutting means mounted on the second movable arm.

9. The combination in an apparatus for copying a design on one cylinder from another, the cylinders being of uniform diameter, of rotary means for simultaneously revolving both cylinders in the same direction, said rotary means comprising rotatable support means for maintaining the cylinders in parallel and spaced relation, sprocket means fixed on the support means to rotate therewith, a rotatable drum mounted adjacent the support means, sprocket means secured to the drum for rotation therewith, intermediate sprocket means constructed and arranged to rotate between the drum and the support means and chain means connecting the intermediate sprocket means to the sprocket means on the support means and to the sprocket means on the drum for rotation of the support means and the drum in unison, carriage means constructed and arranged to be mounted between the cylinders for horizontal movement of the carriage to traverse the length of the cylinders, elevator means for bodily moving the carriage in a vertical plane, tracing means dependent from one side of the carriage means, cutting means depending from the other side of the carriage and link means connecting the cutting means and the tracing means for reciprocation of the cutting means and the tracing means in unison.

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