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APPARATUS FOR TRANSFERRING DESIGNS ONTO A CYLINDRICAL SURFACE BY PHOTOMECHANICAL PROCESS FOR PRINTING THEREFROM.

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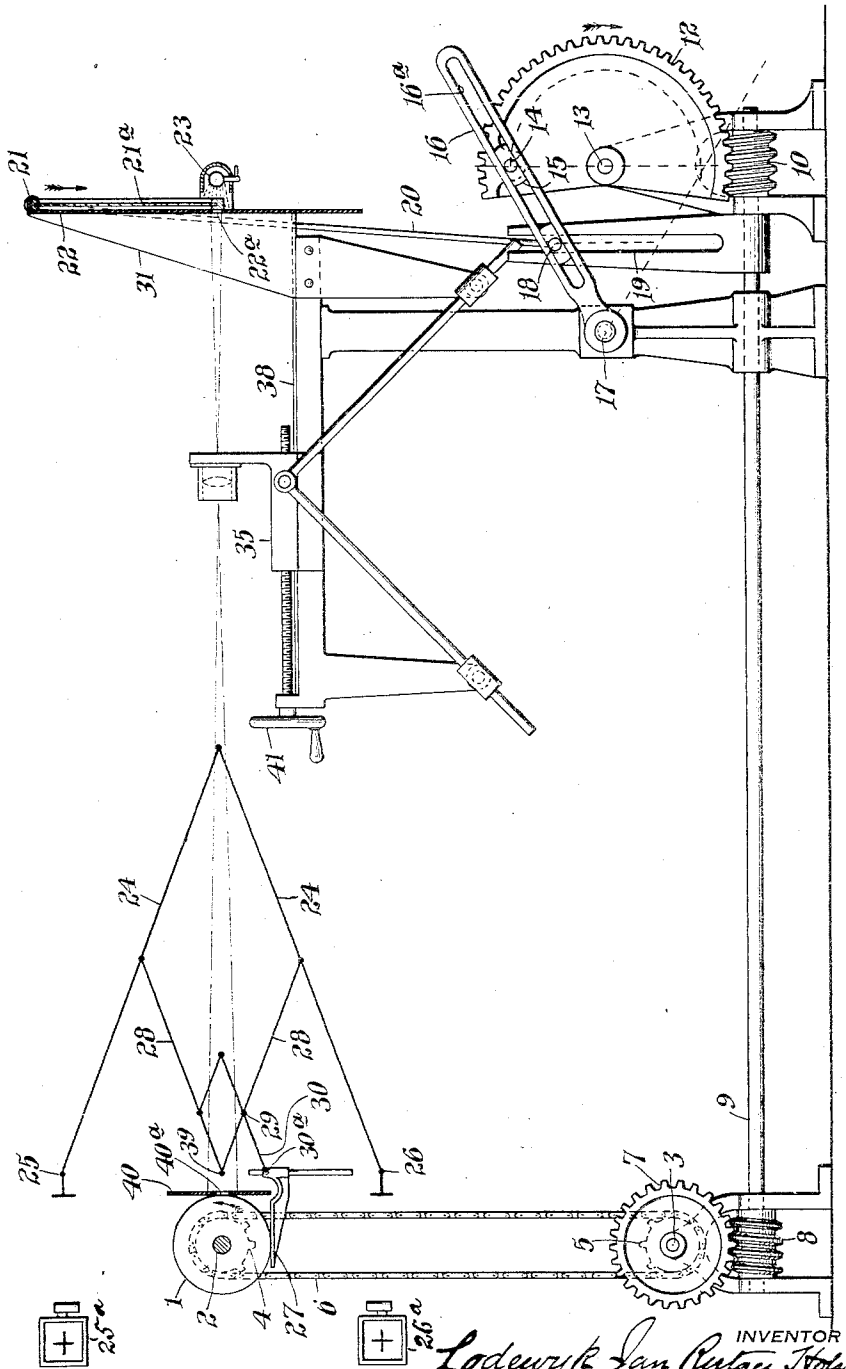

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APPARATUS FOR TRANSFERRING DESIGNS ONTO A CYLINDRICAL SURFACE BY PHOTO-MECHANICAL PROCESS FOR PRINTING THEREFROM.

1,051,997. Specification of Letters Patent. Patented Feb. 4, 1913.

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To all whom it may concern:

Be it known that I, LODEWYK JAN RUTGER HOLST, a citizen of the United States, residing at Lansdowne, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Transferring Designs Onto a Cylindrical Surface by Photomechanical Process for Printing Therefrom, of which the following is a specification.

My invention has relation to an apparatus for the production of a cylindrical printing surface, by photomechanical process, embracing the projection onto the sensitized cylindrical surface of a design contained on an original flat surface, and by which apparatus the original object-plate is subjected to a rectilinear movement in unison with a simultaneous rotary movement of the cylindrical surface around its axle; and in conjunction with which, the circumference of the cylinder is mechanically measured and the image mechanically focused thereon.

The principal objects therefore, of my present invention are, first, the production of cylindrical printing surfaces for continuous or intermittent designs in one or more colors in either superposed or in juxtaposed relations, in intaglio or in relief, in half-tone or in line character of printing; second, the provision of an apparatus for the production of printing surfaces adapted for high class mono-color or multi-color printing on rotary presses, by photomechanical process, in which the transfer of a flat design onto a sensitized cylindrical surface is mechanically derived from the original, and in which the cylindrical surface is rotated in unison with a rectilinear movement of the original object-plate, and, third, the provision of an apparatus for accurately ascertaining the circumferential length of the cylindrical printing surface, as extended into a straight line.

The nature, basic principle and general scope of my said invention will be more fully understood from the following description taken in connection with the accompanying drawing, illustrating an arrangement of a mechanical means for carrying out my said invention.

Referring to the drawing 1, is a cylinder on the sensitized surface of which the design contained on the object-plate 21^a, is to be transferred. The cylinder 1, is attached to a spindle 2, rotatably mounted in a framing of the machine, not shown, and adapted to be rotated with the spindle 2, by means of a sprocket 4 and a chain 6, engaging a like-sized sprocket 5, on a spindle 3. Any other convenient mode of transmitting rotary movement from the spindle 3, to the spindle 2, may be employed for the purpose of this invention.

Rigidly attached to the spindle 3, is a worm-wheel 7, which meshes with a worm 8, on a shaft 9. This shaft carries near its opposite end a second worm 10, meshing with a semi-circular worm-wheel 12. The relative dimensions of the worm-wheels 7 and 12, and worms 8 and 10, are such as to enable the spindle 3, to complete 360 degrees of a revolution in the same time that the spindle 13, of the worm-wheel 12, revolves through 180 degrees of a revolution.

The worm-wheel 12, carries a crank-pin 14, upon which is mounted a block 15, adapted to slide freely, but without play through a slot 16^a, of the lever 16. This lever 16, is pivoted to a pin 17, rigidly carried by the framing of the machine, as is also the spindle 13, of the worm 12. The distance between centers of the spindles 13 and 17, is accurately adjusted so, that the center of the spindle 17, forms one corner of the equilateral triangle, of which the stroke of the crank-pin 14, forms one side. In other words, the distance between centers of the shaft 13, and pin 14, is just equal to one-half the distance of the center of the pin 14, to the center of the fulcrum 17 in the position illustrated. A pin 18, is guided vertically in the guide-way 19, and also engages the slot 16^a, of the lever 16. The guideway 19, is adjustable over the base-plate of the machine, not shown, to permit of the bringing of the center of the said pin 18, at a greater or less distance from the fulcrum 17, but always so as to guide it in a line establishing a right angle with the said center line. The result of this arrangement is, that when rotating the worm-wheel 12, in the direction of the arrow by the action of said worm, the displacement of the block on the

pin 18, in the guide-way 19, will be at all times proportional to the angular displacement of the crank-pin 14, until this crank-pin has reached the other extreme end of its course, as indicated by the dotted lines in the drawing. Corresponding relative displacements will be established whatever the total distance traveled by the pin 18, may be, that is, no matter where the guide-way 19, is placed. It is to be understood that the movement transmitted to the spindle 2, through the operation of the worm 10, and the intervening mechanism already described, will cause this spindle to complete one revolution around its axis in the same time that the crank-pin 14, completes an arc of 180°, hence, the roller 1, will have made a complete revolution moving at all times with an angular displacement which is proportional to the linear displacement of the pin 18. This pin also serves as a pivot for the lower end of the lever 20, the upper end of which is attached to the plate slide 21, and is guided in a vertical plane by the shield 22, carried by the said guide 31, which itself is slidably supported on the bed 38, of the focusing mechanism. This bed forms a part of the general frame of the machine. The plate-side 21, will thus in its own plane be displaced exactly the same as the pin 18, in the guide-way 19, and if thus these guides are so adjusted as to regulate the course of the pin 18, to equal the height of the design on the plate 21^a, the operation of the mechanism so far described will cause the cylinder 1, to make a complete revolution in the same time that the plate 21^a, has been lowered through the height of the design carried thereon.

As it is in practice not feasible to regulate beforehand the height of the design on the plate 21^a, so as to exactly correspond with the circumference of the cylinder 1, no effort is made to give either any predetermined size, so long as both remain within the extreme capacity of the machine. The proper relationship between these two elements is established by means now to be described.

The adjustment of the course of the pin 18, to correspond with the height of the design is obtained by actual visual observation. The guide-way 19, is shifted to the position in which it causes the stroke of the pivot-pin 18, to equal the height of the image contained on the object-plate 21^a. A horizontal transverse slot 22^a, in the shield 22, readily allows of observation as to whether this adjustment has been established or whether the re-adjustment of the guide-way 19, has brought about the necessary correction. This being accomplished, the actual circumference of the cylinder is ascertained as follows:—The pantograph mechanism 24, contains a radius lever 28, which carries a smaller rod 30, pivoted in the point 29, which is chosen so that its distance from the fulcrum 39, relates to the total length of the lever 28, as 1 to 3.1416. This arrangement makes the distance of the points 25 and 26, equal the circumference of a cylinder having a radius equal to the distance of the centers of the fulcrum 39, to the end 30^a, of the rod 30. If thus the points 25 and 26, are used to carry small pieces of plate glass provided with cross-cuts, as shown, at 25^a and 26^a, in rear elevations thereof, the distance between these cuts will indicate the circumference of the roller. Only one source of error can occur owing to possible eccentric mounting of the cylinder 1, on the spindle 2, but whatever that eccentricity may be, it can be completely compensated for, by making the cylinder rotate in contact with the bracket 27, during the measurement of its developed circumference and observing the minimum and maximum distances between the points 25 and 26, so obtained. The exact circumference is equal to their average, and in that position the measuring mechanism is locked. As now both the circumferential length of the cylinder as developed into a straight line and the height of the design are known and observable by the means so far described, the focusing mechanism, preferably of a type such as fully described and claimed in my United States Letters Patent No. 1,029,297, dated June 11th, 1912, is employed to magnify the design to the extent as indicated by the before described operations. This magnifying system 35, is adjusted by means of the hand-wheel 41, until the design on the plate 21^a, is enlarged to the height 25—26, and in that position it is locked. It will be observed that after this focusing adjustment has been carried out, the ratio of magnification will be exactly equal to the ratio existing between the circumferential length of the roller and the height of the design on the object-plate, so that in transferring said design the rectilinear displacement of the object-plate will relate to the circumferential displacement of the cylinder in inverse proportion to the ratio of magnification produced by the said magnifying system. The machine is now ready for transferring the flat design contained on the plate 21^a, to the sensitized surface of the cylinder 1. A suitable source of light such as a mercury-vapor-tube 23, is placed behind the plate 21^a, so that the part thereof registering with the horizontal transverse slot 22^a, is evenly illuminated. This section of the object will thus be projected by the lens of said magnifying system 35, and as much of it as can pass the slot 40^a, in the shield 40, located in front of the cylinder 1, will strike the surface thereof, thus optically transferring the flat image onto

the cylindrical surface. The worm-shaft 9, is now rotated by any convenient source of motive power, and the plate 21ª, will gradually descend, continuously presenting a new part of its design, which on account of the simultaneous rotary movement of the cylinder is received on a new section of its surface, for every successive new part of the design presented, until on completion of one revolution of said cylinder the entire design has been projected.

In order that my invention may be understood in its varied phases, I will now describe how it may be used for producing cylinders for intermittent printing, and more particularly how perfect registration of various color-printings combining to make one picture or print can be obtained, while using separation negatives of different sizes.

It is well-known among those conversant with the art of multi-color printing that frequently great difficulty is experienced in properly superimposing successive printings of the same picture on account of the different sizes of the various color-separation negatives, due to variations of the focal-length of some lenses for different wave-lengths. So far, this difficulty can be overcome only by reproducing the original separation negative in a size corresponding with the size of the companion negative. According to my invention these difficulties are entirely eliminated, as no matter how different in size the separation negatives may be, the impressions of said negatives on the cylinders will all be of exactly the same size, and consequently will register exactly when printing therefrom, if care is taken to securely fasten the pantograph adjustment to the required size, and to regulate the degree of magnification required to obtain that size, from any negative by adequate adjustment of the focusing mechanism, in conjunction, of course, with the required corresponding re-adjustment of the pivot 18, so as to make the travel of each negative agree with the actual size of the image carried on the same.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An apparatus of the character described, comprising a design, a sensitized cylinder, means for causing rotary movement of the cylinder in unison with rectilinear movement of said design and means for projecting said design onto the cylinder.

2. An apparatus of the character described, comprising an object-plate, a cylinder having a sensitized surface, means to project onto the cylinder a design contained on the object-plate and means for causing a simultaneous rotary movement of the cylinder and rectilinear movement of the object-plate.

3. An apparatus of the character described, comprising an object-plate, a cylinder having a sensitized surface, means to project onto the cylinder a design contained on the object-plate, means for causing a simultaneous rotary movement of the cylinder and rectilinear movement of the object-plate and means for accurately ascertaining the circumferential length of the printing surface of said cylinder as extended into a straight line.

4. An apparatus of the character described, comprising an object-plate, a cylinder having a sensitized surface, means to project onto the cylinder a design contained on the object-plate, means for causing a simultaneous rotary movement of the cylinder and rectilinear movement of the object-plate, means for accurately ascertaining the circumferential length of the printing surface of the cylinder as extended into a straight line and means to mechanically control the ratio of optical reproduction between the design contained on said object-plate and the image thereof projected onto said cylinder.

5. An apparatus of the character described, consisting of an object-plate, means to project a design contained on the object-plate onto a sensitized cylindrical surface, means to cause rectilinear movement of the object-plate simultaneously with rotary movement of the cylindrical surface and the rectilinear displacement of said object-plate bearing to the circumferential displacement of the cylinder the inverse proportion of the ratio of magnification produced by said projecting means.

In witness whereof, I have hereunto set my signature in the presence of the two subscribing witnesses hereto.

LODEWYK JAN RUTGER HOLST.

Witnesses:
THOMAS M. SMITH,
HELEN F. MILLER.