July 1, 1952 F. R. LEAR, SR 2,602,024

ROLLER ETCHING MACHINE

Filed Sept. 13, 1950 2 SHEETS—SHEET 1

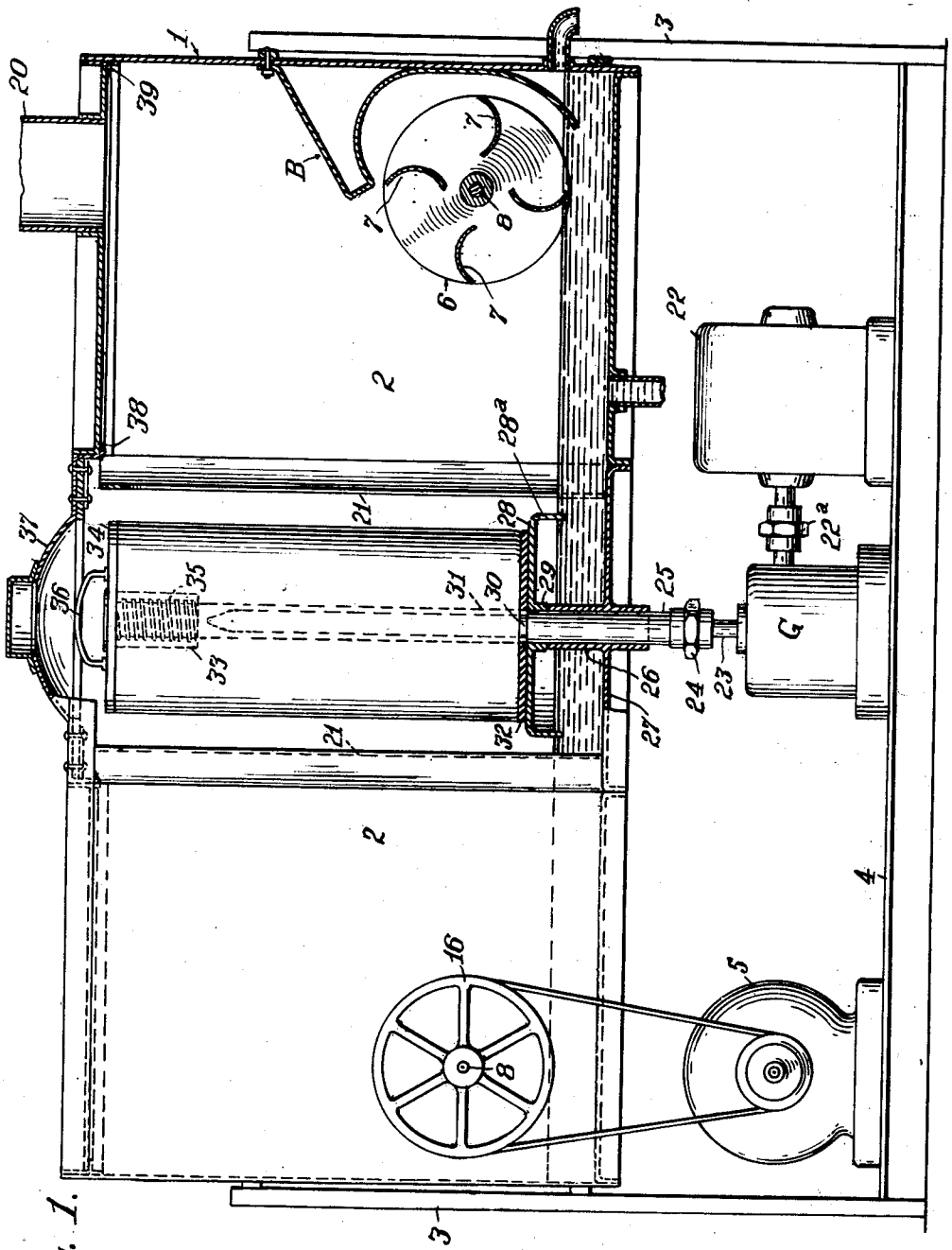


Fig. 1.

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ROLLER ETCHING MACHINE

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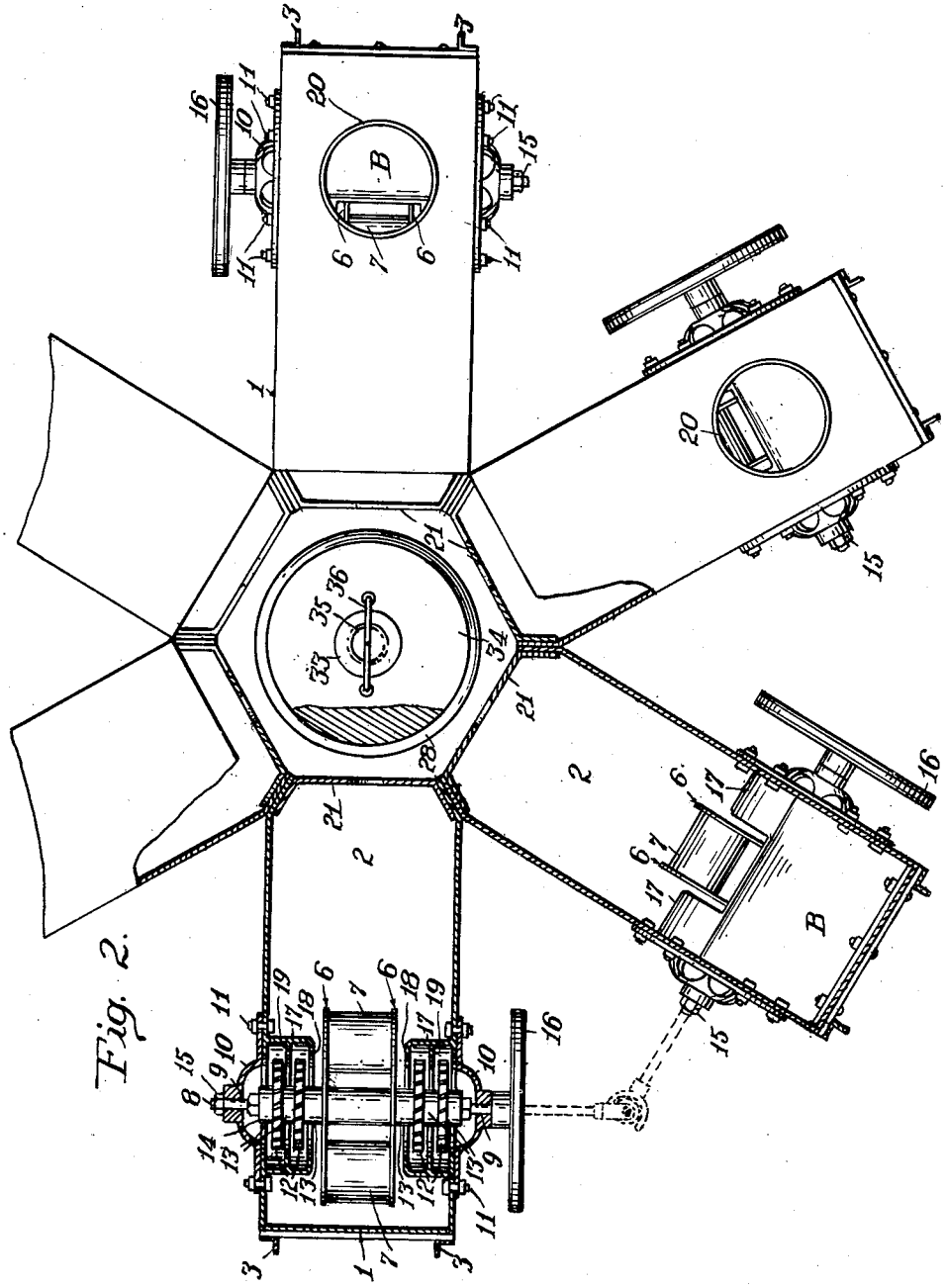


Fig. 2.

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Patented July 1, 1952

2,602,024

UNITED STATES PATENT OFFICE

2,602,024

ROLLER ETCHING MACHINE

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Application September 13, 1950, Serial No. 184,675

15 Claims. (Cl. 41—9)

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This invention relates in general to etching machines and more particularly to etching machines comprising a plurality of centrally connected and radially disposed casings provided with means for impelling an etching material on to a remotely rotating cylindrical surface.

Heretofore, etching machines have been provided with paddle elements for applying etching material onto a surface being treated. Generally, this surface has consisted of a plate for use in such processes as relief, planographic and intaglio printing. Etching is a well-known process and in one form or another is contacted by everyone almost every day of their lives. As a contributing process, it is a very essentially part of the graphic arts, to say nothing of advertising and its related industries. This process is very often accomplished by placing the prepared plate, or roll, depending on the use for which it should happen to be intended, in an acid bath and allowing the metal to become etched until the low areas are of suitable depth. The back of a plate, as well as the inside of a roll must be protected in some manner to prevent the acid from etching this surface while the work surface is being treated. This is accomplished in various ways; for example, by placing the plates horizontally or at other varying angles, in a housing and rotating the paddles therebelow in order to spray the material outwardly. Usually, the opposite side of the plate, i. e., adjacent the housing is prevented from being etched by reason of its location relative thereto. Oftentimes rolls are protected by providing conical plugs which are forcibly inserted into each end of the cylinder immediately before it is placed in the acid bath.

While the machines and the elements thereof which have been developed and may be found in the prior art are satisfactory, it is believed that the present improvement provides the ultimate in cylindrical etching processes.

The primary object of the invention is to provide an etching machine capable of producing an etched surface on a cylindrical element wherein the dots and lines on said surface will have a pyramidal base, thereby substantially increasing their strength to withstand printing pressures.

Another object of the invention is to provide a controlling element for directing the etching material into the surface being etched at an angle of substantially 90°.

Still another object is to provide a low speed turntable on which the cylindrical roller to be etched is positioned during treatment.

With these objects in view the invention comprises applying closure means to each end of the cylindrical roller, placing it on the revoluble turntable, thereafter energizing the motors to start rotation of the table through the speed reducing means and the impeller means to begin the etching operation, all as will be explained more fully hereinafter and finally claimed.

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These and other objects and advantages of the invention will be apparent from the following description when considered in connection with the accompanying drawings, in which:

Figure 1 is a side elevation of the etching machine with a portion of the casing removed and the parts thereof exposed in section, and

Figure 2 is a top-plan view of the machine illustrating the multiple tanks, one of which is shown in section.

With reference to Figure 1, the casing indicated generally as 1, which may comprise any of a desired number of tanks 2 and in the present instance is illustrated as having six sections radiating from a common central point, is provided with perpendicularly disposed legs 3 for supporting the machine above the floor level. A spoke-shaped platform 4 is secured to the legs, in any suitable manner, and is provided for reinforcing the housing supporting members as well as serving as a base for the paddle driving motors 5, each tank being provided with a separate driving motor.

Referring to Fig. 2, the paddles 6 comprise a pair of centrally apertured discs that are held in spaced arrangement by dished elements 7 which impel the etching material toward the centrally disposed work surface. The paddle is secured to revoluble shaft 8 which is supported at its opposite ends in bearings 9, these in turn being carried by a bell-shaped spider element 10 bolted, as at 11, to the adjacent sides of tank 2. The paddle supporting shaft 8 is also provided with a plurality of venting fans 12 which are spacedly arranged on said shaft by means of collars 13. It will be apparent from an examination of this view that after each of the outermost fans are placed on the opposite ends of the shaft, another collar 13 may be placed thereon and, thereafter, a lock washer 14 and a nut 15 is secured to the shaft. Afterwards, this assembly is mounted in the spiders 10 and lateral movement is prevented by securing the nut 15 to the shaft, thereby drawing the hub of the pulley 16 up adjacent to its respective bearing 9. An annular terraced element 17 having offstanding arms 18 and 19 is welded or secured in any suitable manner to the chamber walls. The offstanding arms are dis-

posed co-planar with, but between, the several fan blades 12 and are positioned in such a manner as to confine the incoming air to a tortuous path and thereby swirl throughout the chamber and take with it to the venting stack 20 any fumes which are formed as a result of the churning action of the paddles in the acid bath. It is apparent that the shaft assembly operation may take place within the machine or outside thereof. Should the latter be preferred, it is necessary to make the terraced element separable about a horizontal axis in order to facilitate the assembly of the shaft and its parts relative to the terraced element. The manner in which the parts of the terraced element may be held together will be obvious to those skilled in the art.

In each of the tanks is a spray confining elongated perpendicularly disposed centrally slotted plate 21 which controls the blast of the spray admitted to the roller being treated.

The slotted plate aforementioned, may be designed in such manner as to have an adjustable opening, thereby permitting precise and fine control of the stream of material admitted to the work-surface of the roller. It is, of course, understood that the particular opening or size of the slot selected would depend on the character of the design to be etched, the etching medium used, and the type of material being etched. Moreover, should it be more desirable, plates provided with slots of varying sizes could be used in lieu of an adjustably slotted plate. It is also conceivable that the machine could be constructed in such manner that the blast of material could be emitted from a narrow tank and thereby achieve a satisfactory resultant work-surface.

Through carefully conducted experiments it has been determined that if a cylinder or tube were etched by a spray or single stream of acid against the curved surfaces, the dots or lines produced thereon would be substantially undercut—resulting in a surface with such dots and lines being so weakened that they would be unable to withstand printing pressure. Whereas, the present improvement in cylindrical etching processes produces a work surface having dots and lines provided with pyramidal bases and therefor sufficiently capable of repeated use in a printing machine.

A baffle element B is secured to the wall of each chamber adjacent to the paddle element and serves to control the spray emitted by the paddles. In effect, as seen by referring to Fig. 2, where the housing comprises six tanks the slotted plate 21 forms one side of a hexagon. It is to be understood that each of the tanks is constructed and arranged alike as described in connection with the portion illustrated in section. Suffice it to say, however, it is unnecessary to have but one venting means referred to hereinbefore.

The pulleys 16 supported by shafts 8 are driven by individual motors mounted on the platform immediately below the respective tanks. It will be understood that it is not essential for each tank to be provided with an individual driving motor, but that by coupling the shafts together as indicated in Fig. 2 in phantom outline, one motor would be sufficient to drive all of the paddles in the multiple tanks.

The number of paddles or tanks containing the same is not particularly material to the production of etchings of good printing quality. It will be obvious to those skilled in the art that any number of paddles or tanks desired may be used, and, that this factor is determinable when constructing the machine so that the greatest number of paddles or tanks could be assembled within the radius of a circle and thereby achieve the ultimate in rapidly etching the particular surface.

However, it is also to be understood that it is within the scope of the present invention to etch a roller or other cylindrical surface by making use of a single casing and positioning the turntable there-within and remote from the spraying paddles, the same being separated therefrom by nothing more than the liquid flow controlling slotted element.

With further reference to Fig. 1, a separate electric motor 22 is connected through a coupling 22a to a reduction gearing box, indicated generally at G, and projecting perpendicularly from the axial top of this box is a shaft 23 to which is connected another coupling 24 that is adapted to drive the turntable shaft 25.

A sleeve 26, provided in the center of the housing bottom 27, is adapted to receive the turntable shaft 25. The gearing arrangement is such as to rotate the turntable at the preferred speed of approximately 15 R. P. M. The base 28 of the turntable is bowl-shaped and has a downwardly turned annular flange 28a which subdues and partially controls the splashing action of the etching material in the trough of the casing, thereby making it unnecessary to provide expensive sealing means between the hub 29 of the turntable shaft 25 and sleeve 26. Extending perpendicularly above the turntable base is a centering mandrel 30, which facilitates the positioning of the cylindrical roller on the turntable. An elongated sleeve 31 is secured to a centrally apertured rubber covered disc 32, the upper end being externally threaded as at 33 and adapted to receive the cap 34.

For convenience in assembly the base 28 may be provided with protuberances which coincide with indentations in disk 32 to assure a positive drive and eliminate the possibility of slippage between these elements. Any other means for obtaining this result is to be considered to be within the scope of this invention.

The cap 34 consists of a disc-shaped element, the lower face of which is also rubber covered. Depending from the axial center of said cap is an internally threaded collar 35 that is adapted to be threaded on to sleeve 31, thereby preventing any etching material from coming into contact with the interior of the roller. The roller is introduced to the machine after the assembly of the sleeve and cap, and for convenience in handling said cap is provided with a handle 36. After the roller is placed in the machine a cover 37 is placed thereon and the etching operation begun. Each of the casings 2 has a removable rectangularly-shaped lid or cover 38 which is supported by angle irons, projecting tongues carried by the walls of the casing, or any other suitable means indicated generally at 39.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims:

I claim:

1. In combination with an etching machine, a vertically disposed work-holding mandrel positioned within a casing provided with intercommunicating radially arranged tanks, a roller supported for rotation by said mandrel, means

in said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel, and means for controlling the material applied to said roller.

2. A vertically disposed work-holding mandrel positioned within a casing, tanks disposed in radial arrangement with respect to said mandrel, said tanks intercommunicating with said casing and means in said tanks for impelling a liquid substantially radially with respect to said mandrel.

3. A vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks intercommunicating with said casing disposed in radial arrangement about said mandrel, and means in said tanks for impelling a liquid substantially radially with respect to said mandrel.

4. In an etching machine comprising a vertically disposed work-holding mandrel positioned within a casing, tanks intercommunicating with said casing and disposed in radial arrangement with respect to said mandrel, and means in said tanks for impelling a liquid substantially radially with respect to said mandrel.

5. In an etching machine comprising a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks intercommunicating with said casing and disposed in radial arrangement about said mandrel, and means in said tanks for impelling a liquid substantially radially with respect to said mandrel.

6. An etching machine comprising a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks intercommunicating with said casing and disposed in radial arrangement about said mandrel, means in said tanks for venting the same and means for impelling a liquid substantially radially with respect to said mandrel.

7. A claim as in claim 6, wherein there are combined means in said tanks for venting the same and for impelling a liquid substantially radially with respect to said mandrel.

8. A claim as in claim 6, wherein adjacent ends of the impeller carrying shaft are provided with venting means.

9. A claim as in claim 6, wherein there are impeller means comprising a plurality of paddles supported by spacedly arranged discs, venting means carried adjacent thereto, said impeller means impelling a liquid substantially radially with respect to said mandrel.

10. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

11. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, said cover means comprising a disk provided with an upstanding sleeve member projecting through said roller, and adapted to receive a cap, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

12. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, said cover means comprising a disk provided with an upstanding sleeve member projecting through said roller, said sleeve being threaded and adapted to receive a threaded cap, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

13. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, said cover means comprising a disk provided with an upstanding sleeve member projecting through said roller, and surrounding said mandrel, said sleeve being threaded and adapted to receive a threaded cap, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

14. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, said cover means comprising a laminated disk having a friction producing material adjacent one surface thereof, an upstanding sleeve integral with said disk projecting through said roller and adapted to receive a cap, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

15. An etching machine having in combination, a vertically disposed work-holding mandrel positioned within a casing, a plurality of tanks disposed in radial arrangement and communicating with said casing, a roller supported for rotation about the axis of said mandrel, cover means carried by adjacent ends of said roller, said cover means comprising a laminated disk having a friction producing material adjacent one surface thereof, an upstanding sleeve integral with said disk projecting through said roller and adapted to receive a cap, said cap having a friction producing surface adjacent said roller, and means within said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel.

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