(No Model.) 2 Sheets—Sheet 1.

J. W. OSBORNE.

ELASTIC ROLLER.

No. 277,154. Patented May 8, 1883.

Fig. 1

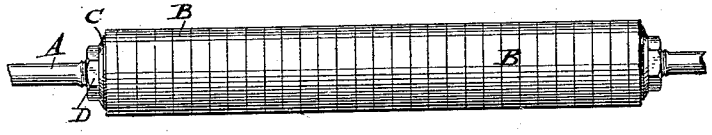


Fig. 4.

Fig. 2.

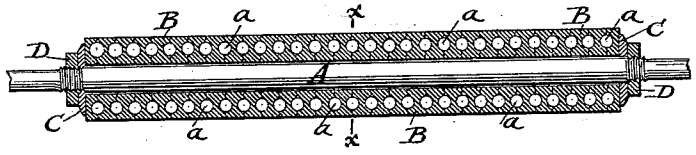


Fig. 3.

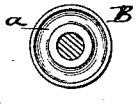


Fig. 5.

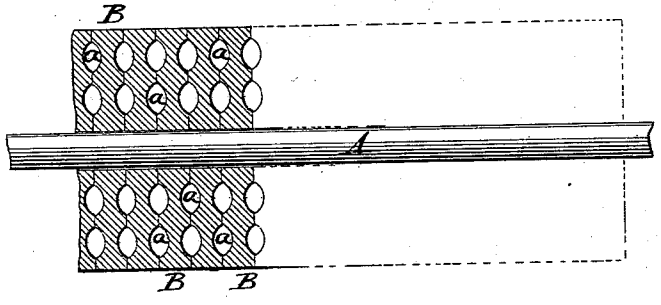
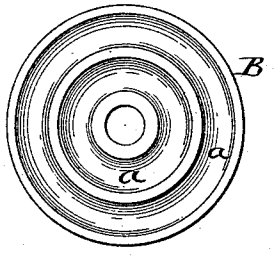


Fig. 6.



Attest.

Sidney P. Hollingsworth

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(No Model.) 2 Sheets—Sheet 2.

J. W. OSBORNE.

ELASTIC ROLLER.

No. 277,154. Patented May 8, 1883.

Fig. 7.
section on y-y.

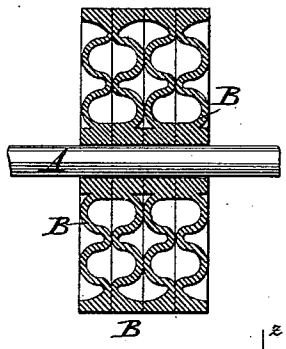


Fig. 8.

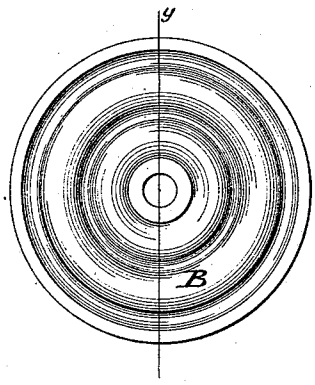


Fig. 10.

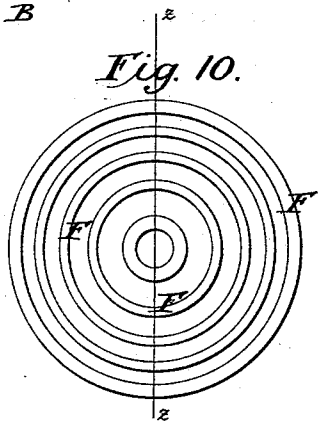


Fig. 9.
section on z-z.

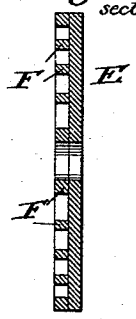


Fig. 11.
section on z'-z'

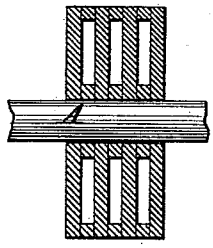
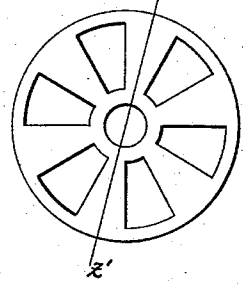


Fig. 12.



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Inventor:
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By his Atty
Philip P. Dodge.

UNITED STATES PATENT OFFICE.

JOHN W. OSBORNE, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO WILLIAM H. FORBES, OF BOSTON, MASSACHUSETTS.

ELASTIC ROLLER.

SPECIFICATION forming part of Letters Patent No. 277,154, dated May 8, 1883.

Application filed May 25, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. OSBORNE, of Washington, in the District of Columbia, have invented certain Improvements in Elastic Rollers, of which the following is a specification.

This invention has reference to those rollers and cylinders which are composed of a rigid shaft or spindle surrounded by a body of rubber or other elastic material; and its object is to impart to such rollers a greater range of elasticity than that usually obtained in devices of the kind, and to render them circumferentially of practically uniform elasticity.

To this end the invention consists, essentially, in constructing an elastic body of india-rubber or equivalent impervious material with numerous annular closed cavities or spaces in the interior, in distributing independent or unconnected cavities or cells throughout the entire length of the cylinder at suitable distances apart, and in certain details of manufacture for securing the construction above described.

In the annexed drawings, Figure 1 shows in elevation the roller I have invented in its simplest form. Fig. 2 is a longitudinal section of the same. Fig. 3 is a cross-section on the line *x x*, Fig. 2. Fig. 4 is a cross-section of a single ring or disk used in its construction. Fig. 5 is a longitudinal section of a part of a roller of large diameter, showing a modified form of construction. Fig. 6 is a side elevation of one of the elastic disks used in the construction of the foregoing roller. Fig. 7 is a longitudinal section through part of a roller constructed on another modified plan to give a greater range of elasticity. Fig. 8 is a side view of one of the disks employed therein. Fig. 9 is a cross-section of a single disk of elastic material, showing still another and simpler construction which may be employed. Fig. 10 is a face view of the same. Fig. 11 is a longitudinal section through a portion of a roller consisting of disks cut or stamped from sheet-rubber or equivalent material. Fig. 12 represents one of these disks in side elevation.

In these drawings, A represents in each figure the rigid shaft or spindle, ordinarily made of metal, upon which the elastic body of the roll is sustained. The body of the roll is ordinarily composed of a series of rings or perforated disks, B, placed upon the roll side by side and packed tightly together. These rings or disks are made of elastic material, such as vulcanized rubber, though other elastic impervious substances—such, for instance, as the compound of glue and molasses or glue and glycerine used for printers' rollers—may be used.

Referring to Figs. 1, 2, 3, and 4, it will be seen that each disk is formed with one or more annular depressions in its flat side faces, so that when several disks are placed side by side upon the shaft a number of cavities, *a*, are formed, which encircle the spindle in planes at right angles to the axis. Every elastic ring, however, comes into contact with those adjacent to it at the part surrounding the axle, as well as at the periphery of the roller, and they may come into contact at one or more intermediate points if additional support is required. On the spindle the disks are pressed into contact by the movable collars or end plates, C, and the nuts D, seated on screw-threads formed upon the shaft, or by equivalent devices fitted to the shaft, the only requirement being that suitable means shall be provided to force the series of disks firmly together and retain them in position.

The yielding capacity of a roller of this kind depends chiefly upon the thickness and resistant character given to those parts of the elastic material which connect the periphery of the roller with its hub or central portion, and therefore to a great extent upon the form given to such parts. As compared with a solid elastic roller, the comparatively large range of elasticity which my invention renders possible is due not only to the diminution in the size or thickness of the resisting radial substance which supports the periphery, but also to the fact that provision is made by the formation of the internal cavity for permitting the supporting substance to change its form and extend laterally.

When the roller in use is subjected to pressure which causes distortion of its outer cylindrical shape—such as the flatting of one side—the radial supporting material beneath the dis-

torted part is thickened for the time being, which change could not take place were the elastic part of the roller solid.

In constructing a roller of larger diameter than that represented in Figs. 1 to 4, in which, from the nature of the demands made upon it, a large mass of vulcanized rubber or its equivalent is required, it is desirable to provide two or more concentric cavities in the sides of the elastic disks, as shown in Figs. 5 and 6, whereby the yielding capacity of the roller is extended to a considerable depth; and when the maximum of yielding softness is required in a roller capable of immediately reassuming its cylindrical form after the distorting force upon its surface ceases to act, I prefer to give to the elastic disks the corrugated form in cross-section represented in Figs. 7 and 8, in which case the distorting force applied to the surface of the roller is expended in bending the yielding material rather than in compressing and thickening it. This construction admits of the successful use of hard rubber or ebonite employed in the form of thin corrugated disks, which is advantageous when a certain degree and kind of elasticity is demanded.

When elastic rollers of the nature I have invented are made of vulcanized rubber, their surface may be ground off in a lathe in the usual way after the disks have been put in position and fastened together, by which operation perfection of form and finish is obtained. The face of the roller so finished may of course be covered with such flexible material as may be required for the special work for which the roller is designed. Among the materials which may thus be employed are textile fabrics of various kinds, sheet metal, or a varnish applied in a liquid state and afterward solidified.

The several disks employed in the construction of my roller, whatever form may be given them as best calculated to secure the kind of elasticity required, may be cemented together at their abutting edges, and when this is done with a suitable material the appearance of the lines of junction on the face of the roller may be obliterated, the whole elastic surface becoming then practically a continuous mass; but for most purposes the uncemented rings will be found sufficient.

When rubber is employed for the manufacture of the disks hereinbefore described, it is necessary to mold it into the shape required and complete the vulcanization afterward; but a roller giving a large range of elasticity may also be successfully made of sheet vulcanized rubber, which in many cases is an economical method.

Figs. 9 and 10 represent a disk consisting of a flat rubber ring, E, on one side of which the separate rings F are concentrically cemented, so as to afford annular spaces within a body composed of a series of such disks.

Figs. 11 and 12 also illustrate a convenient way of building up a roller the material of which is cut from sheet-rubber. In this case the disks used are duplicates, being stamped out with cellular openings of the character of those represented in Fig. 12.

In order to give a roller composed of these disks uniform resistance and elasticity along its face, it is important that the disks should be assembled and arranged in such manner as to bring the solid portions of one opposite the openings in those that adjoin it, as indicated in Fig. 11, thus forming in the body of the roller a series of independent unconnected cavities or spaces.

It will be observed that in rollers constructed upon my plan the internal spaces or cells are closed or sealed, so that the air within them adds to their range of elasticity.

It will also be observed that in my roll the cavities or cells are not extended through the same from end to end, but the cells distributed at regular intervals throughout the length of the roller, and are unconnected with each other.

It will be observed that in rolls constructed in accordance with my system the peripheries of the disks or sections which are arranged in contact with each other constitute jointly a continuous or unbroken cylindrical surface.

It will be seen that a roller constructed in the manner herein set forth offers at all times the same elastic resistance to any compressing or distorting force applied on a line along its face parallel with its axis. My invention, in consequence of this fact, is very serviceable in many mechanical operations—as, for instance, in the construction of rollers for bronzing machinery, in the construction of inking-rollers used in printing, and also for the damping-rollers required in lithographic presses, in which case, however, they are given a suitable absorbent covering, and in many other technical processes in which a rolling pressure is required admitting of a wide range of adjustability or capable of yielding to variable exertions of force.

It will be readily understood from the foregoing that my invention is not restricted to any peculiar form of the disks in cross-section, but that it includes any and all elastic disks so constructed that when combined in series to form a roller-body the body will contain annular spaces or cavities.

It will also be observed, as another distinctive feature of my invention, that the cells or spaces within the roll-body have no connection with each other in a direction in line with the axis of the roll.

I am aware that a roll has been constructed by placing collars of pervious compressible material upon a shaft, with open spaces between them, and covering said collars with a sheet of rubber or equivalent material sustained above the interior spaces by means of longitudinal wires; and I am also aware that rolls have been constructed for wringing-machines by combining a series of pervious disks

upon a shaft, with intermediate collars to prevent their rotation, no provision whatever being made for internal cavities or spaces of any kind. To the above constructions I make no claim.

In rolls constructed on my plan, of impervious material which is incompressible, and which owes its elasticity solely to change of form, the surface pressure is distributed throughout, and sustained by the entire body of material, after the manner in which the crown of an arch is sustained by its supporting-walls.

Having thus described my invention, what I claim is—

1. A roll-body of elastic impervious material having annular concentric cells or spaces therein, substantially as described.

2. A roll-body composed of a central shaft and disks of elastic material provided with annular cavities in their side faces.

3. A roll-body composed of elastic impervious material, and having numerous closed cavities or cells distributed uniformly throughout its interior.

4. The roll-body composed of the shaft and a series of elastic disks thereon, each disk having between its center and its periphery a portion of reduced thickness, substantially as set forth.

5. The roll-body composed of the series of elastic disks, each disk having annular recesses in its side faces, with the supporting-web of corrugated form in cross-section.

6. An elastic roll consisting of a rigid shaft or spindle and a series of impervious elastic disks provided with internal cavities and an unbroken peripheral surface, and clamping devices, substantially such as shown, holding said disks in close contact with each other, whereby a roll is produced having numerous closed cavities within its body.

J. W. OSBORNE.

Attest:

PHILIP T. DODGE,

NEWTON WYCKOFF.