Sept. 8, 1953 W. F. HUCK 2,651,256

IMPRESSION CYLINDER FOR INTAGLIO PRINTING PRESSES

Filed Jan. 17, 1949

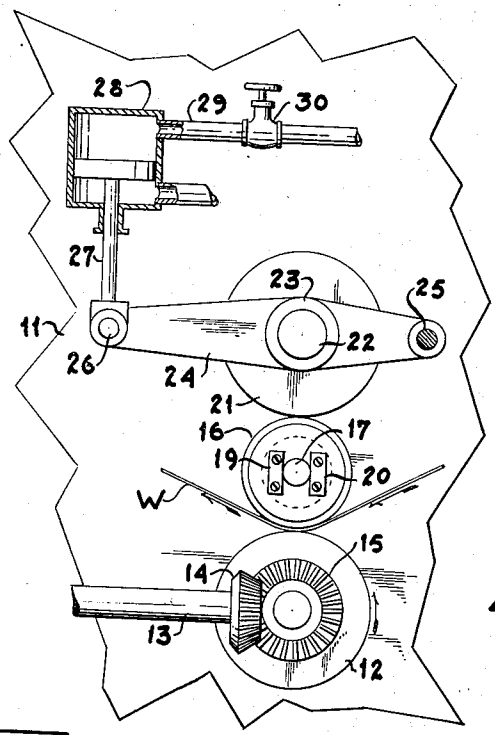


Fig. 1

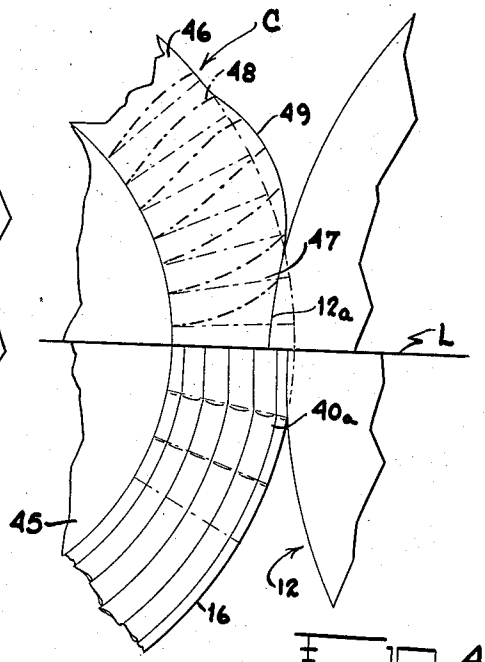


Fig. 4

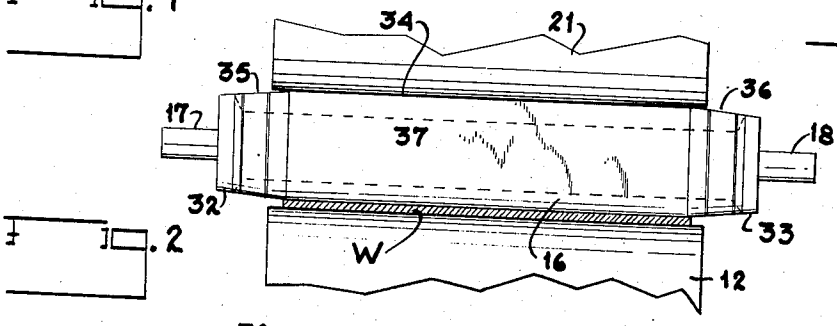


Fig. 2

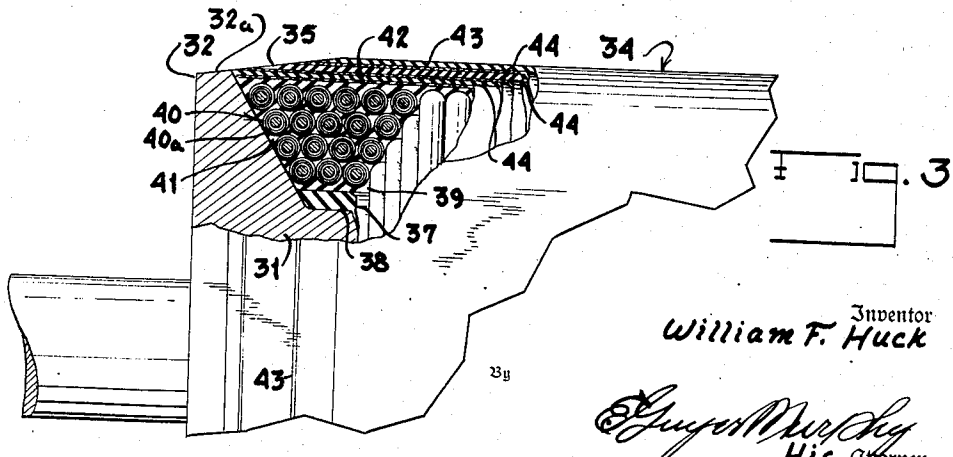


Fig. 3

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Patented Sept. 8, 1953

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UNITED STATES PATENT OFFICE

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IMPRESSION CYLINDER FOR INTAGLIO PRINTING PRESSES

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Application January 17, 1949, Serial No. 71,250

4 Claims. (Cl. 101—407)

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This invention relates in general to printing machinery and more particularly to impression cylinders for intaglio printing presses.

The principal object of the invention is to provide an impression cylinder of a novel design and construction, affording an effective degree of operating resiliency while preventing or minimizing the deformation or flow of the rubber covering and the consequent early deterioration and breakdown of the impression cylinder itself.

Another object of the invention is the provision of an impression cylinder particularly designed and adapted to assure a more uniform, pressure-resisting surface, a longer life for the cylinder itself, and a substantial reduction in impairment and breakage of the rubber covering of the cylinder and of the web being printed.

Another object is to provide an impression cylinder of the kind indicated with a novel pressure and distortion-resisting covering concentrically encircling the core of the cylinder.

A further object of the invention is the provision of an improved intaglio impression cylinder having means to assure a more uniform printing surface, a minimum of surface distortion during operation, and a saving in cost and labor by the elimination of the blankets customarily employed between the coacting printing and impression cylinders.

In the operation of intaglio printing presses, where extremely high pressures are employed, it is essential that means be provided to assure a uniform contact of the paper with the surface of the printing or plate-carrying cylinder. The use of rubber covered impression cylinders in intaglio printing hitherto has proven more or less unsatisfactory since the local displacement or flow of the rubber covering at the line of contact between the printing and impression cylinders, set up internal stresses and strains in the said rubber covering that resulted in its comparatively early breakdown. In view of this fact, blankets are generally employed between the printing and impression cylinders in this type of printing. However, the use of blankets entails considerable additional cost of operation, and in practice, an increased difficulty of handling during printing operations.

The salient feature of the present invention is the provision of an impression cylinder having a core covered by a multiple layer of rubber-coated wire cables which are embedded and vulcanized in rubber composition that fills all interstices between the adjacent portions of these cables. This design and construction, as will be

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explained more fully in the ensuing paragraphs, limits the displacement or flow of the rubber covering, thereby reducing the distortion and heat encountered in conventional type rubber covered impression cylinders, and consequently permitting its use in intaglio printing with the added ease of operation afforded by the elimination of the cumbersome blankets. Although the invention is particularly designed and adapted for the improvement of intaglio printing, it is to be understood that the improved impression cylinder is equally adapted for use in any of the printing fields requiring the use of a flexible and resilient covering over a rigid core.

The invention will be best understood by reference to the drawings wherein:

Figure 1 is a fragmentary, side elevational and partly diagrammatic view of adjacent portions of an intaglio printing press to which an embodiment of the invention has been applied;

Fig. 2 is an elevational view of the novel impression cylinder in its normal operating position between the printing and pressure-applying cylinders, and showing the paper web between the nip of the impression and printing cylinders;

Fig. 3 is an enlarged, fragmentary, longitudinal sectional view of the impression cylinder shown in Figure 1, and disclosing its novel pressure and distortion-resisting structure; and

Fig. 4 is a composite and diagrammatic view showing the relative deformation of the surface and adjacent inner portions of the improved impression cylinder and that of a conventional type, rubber-covered impression cylinder, under similar pressure applied through a printing cylinder.

Referring now to the drawings wherein similar characters of reference indicate corresponding parts in the several views of the preferred form of the invention, the numeral 11 designates generally the frame of a printing machine of the intaglio type. On the frame 11, a printing or plate-carrying cylinder 12 is rotatably mounted and driven from a shaft 13 through the intermediary of the meshing gears 14, 15. The shaft 13, in turn, is connected to and driven in the direction of the arrow from the general drive (not shown) of the printing press.

The impression cylinder 16 embodying the present invention, has its journals 17, 18 rotatably confined in a horizontal plane, as seen in Figure 1, between bearings, as at 19, 20. Movement of the impression cylinder in a vertical plane is permitted by this arrangement in order

to vary the pressure upon the web and plate cylinder, as described hereinafter.

The web of paper W which is to be printed, is operatively pressed by the impression cylinder 16 against the printing or plate-carrying cylinder 12, while travelling in the direction of the arrow superimposed thereon. The web W, it will be observed, partly encircles the impression cylinder which thereby maintains it on firm operative contact with the printing, intaglioed surface of the cylinder 12 and under the desired pressure.

The impression cylinder 16 is engaged on its upper surface by a pressure-applying or backing-up roller 21, having end journals, as at 22, turnably supported in bearings, as at 23. The bearings 23, only one of which is illustrated, are secured in a pair of similar lever arms 24, swingingly supported on fulcrum pins, as at 25, fastened to the frame 11. Each lever arm or bar 24, only one of which is shown, has a pin or stud shaft 26 at its outer end, and to which the adjacent end of a piston rod 27 is turnably secured. The piston rod 27 is reciprocatingly arranged in a pressure cylinder 28 fastened to the frame 11 and adapted to be supplied with fluid under pressure from a pipe 29 connected thereto and having a pressure-controlling valve 30. The pressure-applying roller 21 serves to apply a variable pressure against the impression cylinder 16 which in turn forces the paper web W against the engraved or intaglioed surface or plates of the printing cylinder 12 in order to receive a printing impression therefrom.

In accordance with a salient feature of this invention, the impression cylinder 16 includes a body portion or core 31 formed of any suitable material, such as steel, and having two circumferential flanges 32, 33 at its opposite ends from which the journals 17, 18 directly extend. The inner side of each flange 31, 32, as best shown in Figure 3, is shaped to provide a sloping or shelving surface, as at 32*a*, for a purpose to be described hereinafter. Encircling the body portion or core 31 and positioned between the flanges 32, 33, is the novel cylinder covering conforming to this invention and indicated in its entirety at 34. The cylinder covering 34 has tapering or sloping end portions 35, 36.

A circumferential recess or well 37 is provided between the flanges 32, 33. This recess 37, which overlies the body portion of the impression cylinder 16, accommodates a layer of bonding rubber or material of equivalent characteristics, indicated generally at 38 and occupying the bottom or innermost portion of the circumferential recess 37. Vulcanized to and superimposed upon this layer of bonding rubber is a second layer of rubber 39. Over these two layers of rubber and encircling the core 31 is a rubber-covered wire cable, indicated generally at 40 that is tightly wrapped thereabout in such wise as to provide a plurality of successive layers or windings, as at 40*a*. As viewed in cross-section in Figure 3, it will be observed that each overlying layer of cable 40 has its coils or windings in staggered or offset relation with respect to the vertical axes of the coils or windings of the layer immediately thereunder. This arrangement minimizes the tendency of any coil or winding to shift its position laterally while affording a plurality of triangular or V-shaped spaces or interstices as at 41, between the adjacent layers of coils to accommodate the mass of bonding rubber, indicated generally at 42, that fills up the said interstices of the superimposed coils. The sloping

sides 32*a* of the flanges 32, 33 serve to facilitate the positioning of the successive windings in the staggered relation shown and for the purpose indicated above. The number of overlying layers or rows of the rubber-covered wire coils may be varied to suit individual needs. In the present instance, four layers, by way of example, are illustrated. The alternate layers of coils and bonding rubber interspersed therebetween, it is to be understood, are built up until a diameter approximating that of the flanges 32, 33 is reached. It may also be pointed out that, if preferred, coils of bare wire may be substituted for the rubber-covered cable 40, and alternated with layers of rubber vulcanized thereto to the desired thickness.

In further accordance with this invention, the upper layers of the covering 34 are reinforced with a concentrically wound strip 43 of strong woven material, such as canvas or metal cloth, which is embedded in and between concentric layers 44 of the bonding rubber. These outer, concentric layers of rubber and woven cloth, it is to be understood, assure a smooth, uniform surface over the inner layers of cable, so that unevenness of pressure during the printing operations, which might otherwise occur, is substantially eliminated. The surface of the cylinder covering 34 is now suitably finished to the exact size required.

Although for convenience in manufacture, one continuous rubber-covered wire cable is preferably employed; it is to be understood that, if desired, a plurality of individual cables may be used and wrapped about the circumference of the body portion of the impression cylinder to provide the successive staggered coils or windings illustrated.

In order to more fully comprehend the differences in function and operation between a conventional type, rubber-covered impression cylinder, herein designated by the letter C, and the improved impression cylinder 16 of this invention, the contrasted structures of the composite view in Figure 4 should now be examined. In this last-mentioned figure, the printing cylinder 12 is being applied with considerable pressure to the periphery of the conventional impression cylinder C shown in the upper half of the figure and above the line of demarcation L. Below this demarcation line, the printing cylinder 12 is being applied with equal pressure to the improved impression cylinder 16 that conforms to the precepts of this invention.

Referring to the conventional type impression cylinder C, the inner metal core 45 thereof is encircled by a comparatively thick layer of rubber 46, as customary. This rubber covering 46 is engaged by the rotating printing cylinder 12 under the heavy pressure mentioned above. This pressure has created an arcuate recess or pocket, as at 47, in the rubber covering 46 at the line of contact, and has displaced or caused to flow the circumferential, adjacent portions of the said covering, the lines of stress and displacement of the rubber material being indicated diagrammatically by the dash and dotted lines, as at 48, and the resultant deformation of the rubber material, by the full lines, as at 49.

Further inspection of the composite view of Figure 4, will disclose that certain portions of the upper layers of the rubber 46 are forced to flow outwardly or radially to a considerable extent, while other portions of the rubber layers are compressed and constricted. In the latter case, the

distance of the core 45 of the conventional impression cylinder C from the periphery of the printing cylinder 12, is materially reduced. The net result of this displacement and deformation is to create a comparatively large area of contact, as indicated by the arcuate, recess-indicating line 47, between the rubber covering 46 of the conventional type cylinder C and the printing cylinder 12, whereby the contact pressure per square inch is substantially reduced. This reduction of effective contact pressure militates against good results in intaglio printing, and often requires the application of increased pressure which in turn aggravates the further flow and deformation of the rubber covering. These results, in combination with the heat and friction engendered during the operation of printing, makes inevitable the premature breakdown of the rubber covering of the conventional type impression cylinder.

It is of interest to note that the production of heat and the deformation and breakdown of conventional type rubber coverings on impression cylinders, is similar in many respects to the destructive effects produced in an underinflated tire on a travelling motor vehicle. As a further consequence, it may be pointed out that the outward displacement or bulging of the rubber covering causes a pronounced frictional engagement between the cylinder covering and the surface of the paper web which, in view of the extreme pressures employed, is detrimental to and a prolific source of breakage of the said web.

Referring now to the operating conditions shown beneath the horizontal line of demarcation L, and wherein the improved impression cylinder 16 is employed, the surface of the latter is in compressive engagement with the printing cylinder 12 at the line or area designated 12*a*. In this instance, substantial circumferential flow or displacement of the rubber component of the covering 46 is prevented or minimized by the bonded engagement between the rubber and the concentric layers of wire cables around the core 31. The flow or displacement reaction of the rubber to the pressure of the printing cylinder 12 results in a shearing stress distributed along the surface of the many layers of coils of the wire cables or metal cloth employed; and these stresses or forces are thereby transferred into the steel or whatever other wire component is used for the reinforcement of the said cables or material. In this manner, the tendency to displacement or flow of the rubber of the impression cylinder is limited to a comparatively small amount, as indicated by the sinuous or wavy lines 40*a* that indicate the comparatively slight change or deformation from the original, straight, radially extending, dash and dotted lines of the sectioned portions of the cylinder 16. Comparison of the upper half with the lower half of Figure 4, discloses that the flow or displacement of the rubber covering has been substantially reduced, while the strength of the covering, as a whole, has been materially increased. Breakage of the paper web, as pointed out above, is minimized, and deterioration and breakdown of the rubber component of the cylinder is correspondingly decreased.

The function and general mode of operation of the invention has been substantially indicated above, but it may be again emphasized that by eliminating the use of blankets customarily employed in high pressure intaglio printing, and by providing an impression cylinder that makes possible the direct and efficient application of the

impression cylinder to the web, thereby prolonging the life of rollers designed originally for lower pressures and now in use, a reduction in cost of equipment and maintenance, and a substantial gain in ease of operation of the intaglio press as a whole is achieved.

It is to be understood that the invention is susceptible to some modification and change without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. In an impression cylinder of the kind described, a body portion, means at either end of the body portion and providing therewith a circumferential recess, said means including a pair of flanges, each of said flanges being disposed in angular relation with respect to the said body portion, a flexible covering arranged within the recess, said covering including a bottom layer of rubber directly engaging and bonded to the body portion, a layer of rubber composition superimposed upon and attached to the first mentioned layer of rubber, a rubber covered wire embedded within said rubber composition and encircling the body portion in staggered layers of windings, and means including additional rubber and woven material for reinforcing the flexible covering and providing a uniformly smooth surface thereon.

2. An impression cylinder for intaglio printing presses and comprising a body portion, flanges arranged in spaced relation on and angularly with respect to the body portion, a rubber-covered wire arranged between the flanges and about the body portion, said wire being disposed in a plurality of layers of windings about the body portion, each of said layers of windings being superimposed on but offset with respect to the vertical axes of the layers of windings thereunder, woven material encasing the outermost layer of said windings, and rubber composition material arranged between the woven material and the said outermost layer of windings.

3. In an impression cylinder of the kind described, a body portion, a circumferential recess formed on the body portion, a flange arranged at one end of the body portion, a second flange arranged at another end of the body portion, bonding composition superimposed on the body portion and between the flanges, a wire encircling the body portion and seated on the bonding composition, said wire being continuously covered with rubber composition and disposed in staggered layers of windings, said layers being located between the said first and second mentioned flanges, a sloping surface formed on an inner portion of each of said flanges and effective to maintain an adjacent winding in a predetermined position, and woven material encircling an outermost layer of said wire and providing an exterior smooth surface for the impression cylinder.

4. In an impression cylinder of the kind described, a body portion, a recess arranged circumferentially on the body portion, a flange arranged at one end of the body portion, a second flange arranged at another end of the body portion, a wire wrapped about the body portion and disposed thereover in a plurality of layers of windings, said windings being arranged in stag-

gered relation and providing substantially triangular-shaped interstices, bonding material disposed in said interstices, a sloping surface formed on an inner surface of each flange and effective to maintain an adjacent winding in a predetermined position and within the said recess, woven material encircling an outermost layer of the windings and providing an exterior smooth surface for the said impression cylinder; and rubber composition material arranged between the woven material and outermost layer of windings.

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