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O. R. HUGGINS

2,117,722

PRINTING CYLINDER

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Fig. 1.

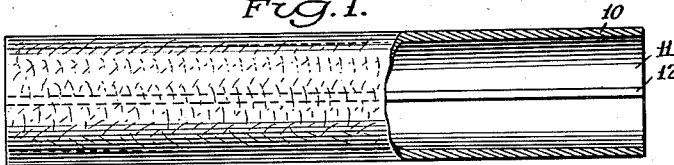


Fig. 2.

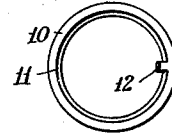


Fig. 3.

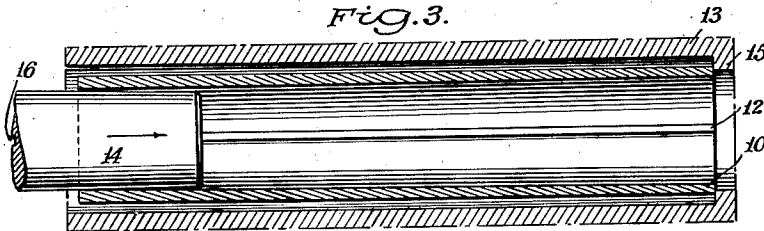


Fig. 4.

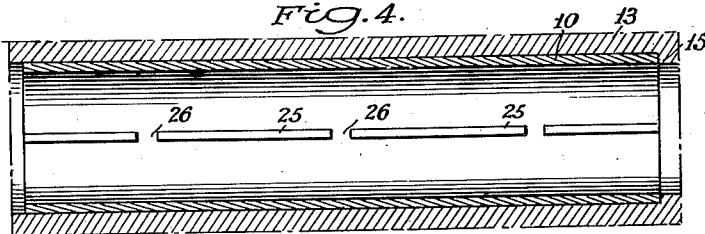


Fig. 5.

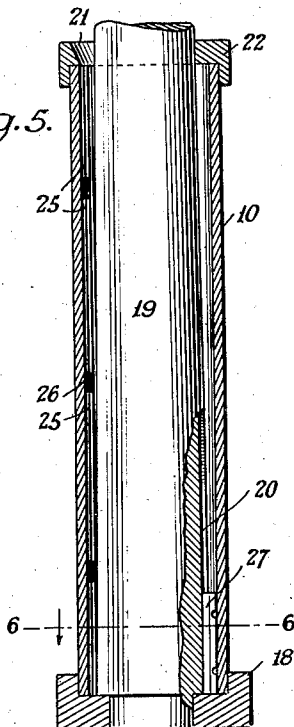


Fig. 6.

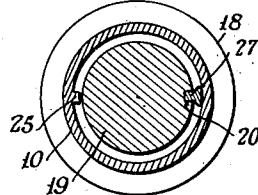


Fig. 8.

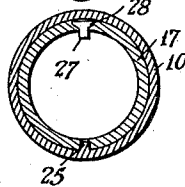
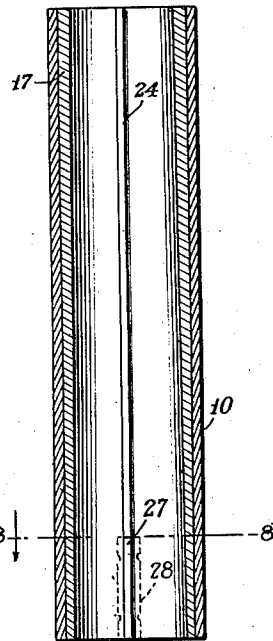


Fig. 7.



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PRINTING CYLINDER

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14 Claims. (Cl. 101—401.1)

This invention relates to methods of, and means for salvaging spent printing cylinders.

In general, a printing cylinder is made from copper, and in operation it is forced over a tapered mandrel, inked and then run over the material until the desired number of reproductions have been printed after which it is forced from the mandrel and then turned down and polished to permit a new design to be etched on its printing surface. In thus turning down and polishing the cylinder the thickness of the printing wall is reduced and when the thickness is so reduced that the printing surface becomes distorted as a result of the stresses and strains created during the printing operation or while the cylinder is being forced onto or off the tapered mandrel the cylinder is scrapped with a consequent loss.

A specific example of this loss is found in the textile industry wherein the diameter of the standard printing cylinder is approximately 5.092 inches and the diameter of the standard tapered mandrel averages approximately 3.500 inches, thus leaving a printing wall of approximately 0.796 inch. In this industry experience has taught that when the cylinder has been turned down until the thickness of the printing wall is reduced to approximately 0.588 inch the cylinder must be scrapped with a consequent loss of more than twice the amount of copper than is actually used during the life of the cylinder.

Heretofore, many attempts have been made to salvage these spent printing cylinders by adding copper to the outer surface to build up the thickness of the printing wall to a desired value. In thus adding copper to the outer surface of the spent cylinder, however, considerable expense is involved, and primarily for this reason it is still common practice to scrap the spent cylinders.

In accordance with the present invention, a spent printing cylinder is salvaged, not by adding copper to its outer surface but by expanding the cylinder and then lining it with a relatively inexpensive metal or alloy, such as zinc. More specifically, the spent printing cylinder is expanded until its outside diameter is substantially the same as it was originally, and after the cylinder is so expanded it is provided with a lining of relatively inexpensive metal through which a mandrel hole extends of substantially the same size and shape as the original mandrel hole, thus restoring the printing wall of the cylinder to its original thickness; and since the printing wall of the cylinder is restored to its original thickness the cylinder may be again turned down and

polished a number of times to permit new designs to be etched on its printing surface without danger of distortion during the printing operation or while the cylinder is being forced onto or off the mandrel.

For a clear understanding of the present invention reference may be made to the accompanying drawing wherein:

Fig. 1 is an elevational view, partially in section of a printing cylinder;

Fig. 2 is an end view of the same;

Fig. 3 is a view, partially in section, showing a printing cylinder in a mold, as well as the expander element used to expand the cylinder;

Fig. 4 is a sectional view showing the cylinder expanded in the mold;

Fig. 5 is a view, partially in section, showing the expanded cylinder prior to the formation of the lining therein;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 1;

Fig. 7 is a sectional view of the expanded cylinder with the lining formed therein; and

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7.

As shown in Fig. 1, a printing cylinder 10 is provided with a tapered mandrel hole 11 through which a key 12 extends, the tapered mandrel hole 11 being provided to permit the cylinder 10 to be easily forced onto and off a tapered mandrel, and the key 12 being provided to guide the cylinder as it is being forced onto the mandrel as well as to prevent displacement thereof after it is so mounted.

In practicing the present invention, a printing cylinder 10 of this sort, after being turned down and polished a number of times, is salvaged by expanding it to substantially its original outside diameter, and to this end, as shown in Fig. 3, it is placed in a mold 13 having an internal diameter substantially the same as the original outside diameter of the cylinder, and an expander element 14 is forced therethrough. The mold 13 is desirably made in sections so that it can be taken apart to permit the expanded cylinder to be easily removed therefrom; and to prevent displacement of the cylinder while it is being expanded the mold 13 is provided with an annular shoulder 15 against which one end of the cylinder is positioned. The expander element 14 desirably employed is tapered throughout its length and it is provided with a key way 16 which rides over the key 12 as the element 14 is forced through the cylinder so that the original key 12 is preserved while the cylinder is being expanded and

the original tapered mandrel hole is being enlarged and made uniform throughout its length. In forcing the expander element 14 through the spent cylinder it is desirably forced through from the small end of the original tapered mandrel hole and to this end the cylinder 10 is placed in the mold 13 with the end wherein the diameter of the mandrel hole 11 is the greatest positioned against the shoulder 15 and the shoulder 15, in turn, is positioned against a suitable stop (not shown). The expander element 14 is then forced through the cylinder 10 by any means, and as it is thus forced through the cylinder any excess copper is forced ahead to the other end thereof where it is removed to restore the cylinder to its original length.

After the spent cylinder has been thus expanded to substantially its original outside diameter a lining 17 is cast therein, and to this end the expanded cylinder is positioned vertically on a mold block 18, as shown in Fig. 5, and a core 19 is positioned therein. This core 19 is of substantially the same size as the original mandrel hole 11 and it has a slot 20 which is of substantially the same size as the original key 12. The core 19 is centrally positioned within the expanded cylinder, preferably with the big end of the core at the bottom of the cylinder, and after it is so positioned the space between it and the inner surface of the cylinder is filled with molten metal which is poured through an opening 21 in a retaining ring 22 through which the upper end of the core 19 extends. The metal thus poured is allowed to harden after which the core is removed thus providing a printing cylinder having an outer shell of distorted copper and a lining therefor of relatively inexpensive undistorted metal, and since the outside diameter of the copper shell is substantially the same as the outside diameter of the original cylinder and since the size and shape of the new mandrel hole in the lining is substantially the same as the size and shape of the original mandrel hole, the thickness of the printing wall of the salvaged cylinder is substantially the same as the thickness of the printing wall of the original cylinder. Under these conditions the salvaged printing cylinder may be mounted on a standard mandrel, and it may be turned down and polished a number of times to permit new designs to be etched on its printing surface.

In practicing the present invention it has been found that a better bond is obtained between the cylinder 10 and the lining 17 when the cylinder has been heated before the lining is poured since when this is done the cylinder is expanded still further and as it cools it contracts into firm engagement with the lining.

Also, in practicing the present invention it has been found desirable to break up the original key 12 as shown in Fig. 1, into a number of key sections 25, as shown in Fig. 4, by cutting a number of slots 26 therein before the formation of the lining 17. Then, as the lining 17 is formed, the key sections 25 become embedded and serve to anchor the lining 17 to the cylinder 10.

In the event the lining is formed from an extremely soft metal or alloy it may be desirable to provide means for protecting the lead end of the new key 24 to prevent it from being damaged as the salvaged cylinder is forced onto a mandrel, and when this protection is desired it may be obtained by positioning a short section of a preformed key 27 in the lower end of the slot 20 in the core 19 before the lining 17 is formed. The

preformed key section so used is desirably made from steel and it is provided with a retaining shoulder 28 which becomes embedded in the lining 17 as the lining is formed.

Having thus described my invention, I claim:

1. The method of salvaging a spent printing cylinder which comprises restoring the cylinder to substantially its original outside diameter, and then restoring the printing wall of the cylinder to substantially its original thickness by casting a lining therein.

2. The method of salvaging a spent printing cylinder having a key extending longitudinally therethrough which comprises restoring the cylinder to substantially its original outside diameter without destroying the key, and then restoring the printing wall of the cylinder to substantially its original thickness by casting a lining therein and about said key.

3. The method of salvaging a printing cylinder having a standard mandrel hole and a key extending longitudinally therethrough which comprises expanding the cylinder without destroying the key, centrally positioning within the cylinder a core which is of the same size as the standard mandrel hole and which is provided with a longitudinally disposed slot, positioning a short section of a preformed key in one end of said slot, pouring molten metal between the core and the cylinder, allowing the metal to harden and then removing the core.

4. The method of salvaging a printing cylinder having a standard mandrel hole and a key extending longitudinally therethrough, which comprises, expanding the cylinder without destroying the key, cutting a number of grooves in the key, centrally positioning within the expanded cylinder a core which is of substantially the same size as the standard mandrel hole and which is provided with a longitudinal slot, pouring molten metal between the core and the cylinder, allowing the metal to harden and then removing the core.

5. The method of salvaging a printing cylinder having a standard mandrel hole and a key extending longitudinally therethrough, which comprises, expanding the cylinder without destroying the key, cutting a number of retaining grooves in the key, centrally positioning within the cylinder a core which is of the same size as the standard mandrel hole and which is provided with a longitudinally disposed keyway, positioning a short section of a preformed key in one end of the keyway, pouring molten metal between the core and the cylinder, allowing the metal to harden and then removing the core.

6. A printing cylinder comprising an outer shell of copper having a number of key sections, and a lining therefor within which said sections are embedded, said lining having a standard mandrel hole and a key extending therethrough and said key being formed at one end by a preformed key section embedded in the lining.

7. The method of salvaging a spent printing cylinder which comprises forcing an expander element through the cylinder to increase the diameter thereof, and then providing the expanded cylinder with a lining through which a mandrel hole extends.

8. The method of salvaging a spent printing cylinder which comprises forcing an expander element through the cylinder to restore the cylinder to substantially its original outside diameter, and then providing the expanded cylinder

with a lining to restore the printing wall to substantially its original thickness.

- 5 9. The method of salvaging a spent printing cylinder having a key extending longitudinally therethrough which comprises forcing an expander element through the cylinder to increase the diameter thereof without destroying the key, and then providing the expanded cylinder with a lining in which the key is embedded.
- 10 10. The method of salvaging a spent printing cylinder which comprises forcing an expander element through the cylinder to increase the diameter thereof during which the length of the cylinder may be increased, lining the cylinder to increase the thickness of the printing wall, and restoring the cylinder to its original length.
- 15 11. The method of salvaging a spent printing cylinder which comprises forcing an expander element through the cylinder to increase the diameter thereof, and then casting a lining in said expanded cylinder while it is maintained at an elevated temperature.
- 20

12. A printing cylinder comprising a seamless outer shell of distorted metal having properties suitable to provide a printing surface, a lining of undistorted metal for said shell, and means for mechanically anchoring said lining to said shell. 5

13. A printing cylinder comprising a seamless outer shell of distorted metal having a key extending longitudinally therethrough, and a lining of undistorted metal for said shell in which said key is embedded to prevent relative movement between the shell and the lining during a printing operation. 10

14. A printing cylinder comprising a seamless outer shell of metal having a number of longitudinally spaced key sections, and a lining for said shell in which said sections are embedded to prevent relative movement between the shell and the lining during a printing operation. 15

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