Feb. 13, 1945. C. M. WOOD ET AL 2,369,629

SMOOTH SURFACED TUBULAR ARTICLE

Filed Dec. 30, 1942

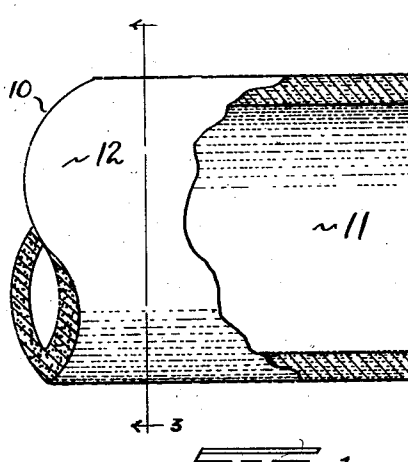


FIG. 1.

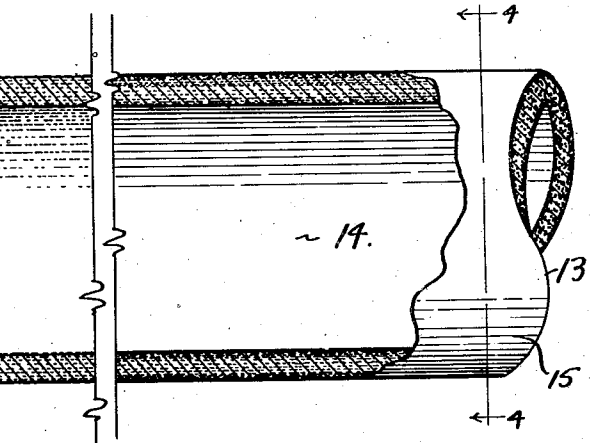


FIG. 2.

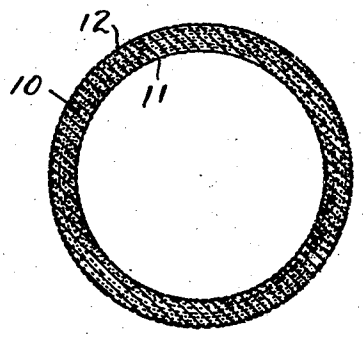


FIG 3

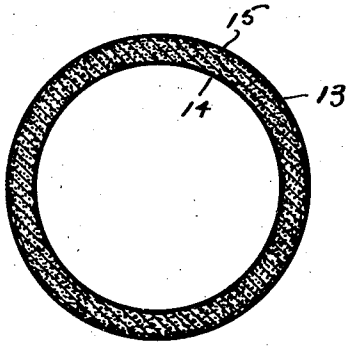


FIG 4

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SMOOTH SURFACED TUBULAR ARTICLE

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Application December 30, 1942, Serial No. 470,694

1 Claim. (Cl. 138—68)

This invention relates to a smooth surfaced tubular article.

The principal object of this invention is the provision of a smooth surfaced tube or similar article having the interior and/or the exterior thereof treated in accordance with the method set forth in our co-pending patent application; Ser. No. 436,868 on Interior finish for tubes and the like and method of applying the same, whereby a smoothing of the irregularities normally present in an article of this type is performed and a smooth surface provided said application having matured into Patent No. 2,353,951, granted July 18, 1944.

A further object of the invention is the provision of a tube or similar article having a protective, extremely smooth, hard interior and/or exterior surface.

A still further object of the invention is the provision of a tube or similar article, the interior and/or exterior surfaces of which are provided with an impregnating coating capable of preventing oxidation, smoothing out the irregular surfaces thereof, and generally forming permanently slick surfaces in or on the article so as to reduce friction loss as concerns materials passed through or over said article.

The present invention contemplates the provision of a new article of manufacture and particularly an article of tubular shape wherein the exterior and/or the interior surfaces are treated to reduce the irregularities commonly existing in surfaces of pipes, tubes and the like and against which irregularities the material being conveyed must necessarily come in contact. The object of providing an article having asmooth, slick, hard interior and/or exterior surface is the reduction of friction loss otherwise present. By providing an extremely smooth, slick, hard interior or exterior finish on the tubular article it is possible to establish and maintain a given flow of material through or around the article so treated with the assurance that the given flow can be maintained permanently as there will be no subsequent development of irregularities such as corrosion, scale or oxidation on the surfaces of the article which conditions would build up an uneven and highly irregular surface with the result of a substantial increase in the frictional loss as concerns materials passed therethrough or thereover. An article and particularly a tubular article free of such uneven and irregular surfaces is, therefore, of considerable commercial value as relatively smaller sized tubular articles may be employed with the knowledge that the material flow therethrough or thereover will remain constant.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a side elevation with parts broken away showing an untreated section of a tubular article, the normal grain structure thereof being shown in a highly exaggerated manner.

Figure 2 is a side elevation with parts broken away showing a section of a tubular article provided with an interior and exterior finish and illustrates the article of the invention, the normal grain structure thereof being shown in a highly exaggerated manner.

Figure 3 is a cross sectional elevation taken on lines 3—3 of Figure 1 and shows the normal grain structure and irregular surfaces.

Figure 4 is a cross sectional elevation taken on lines 4—4 of Figure 2 and shows the surfaces of the article of the invention impregnated with the coating material and smooth interior and exterior surfaces established.

By referring to the drawing and Figures 1 and 3 in particular, it will be seen that a normal tubular article 10 has been shown wherein the grain structure has been purposely highly exaggerated in order to illustrate the fact that the interior surface 11 and the exterior surface 12 are normally irregular and thereby offer considerable friction to materials moved through or over the article 10, the surface irregularities being indicated by appropriate dotted line shading on both the interior and exterior surfaces 11 and 12, respectively, which irregularities in the metal article 10 will obviously become more pronounced when the article is in use and corrosion and oxidation take place.

By referring to Figures 2 and 4 of the drawing the article of the invention comprising a tubular article 13 may be seen, the interior surface 14 and the exterior surface 15 of which are hard and slick due to the impregnation into the surfaces thereof of colloidal graphite which material possesses the property of migration and which will therefore enter and penetrate the interstices of the metal particularly when applied

thereto by a suitable method such as, for example, that set forth in our heretofore referred to co-pending patent application.

In all of the figures of the drawing the grain structure setting forth the interstices of the metal has been purposely highly exaggerated in order to graphically portray the hardening and smoothing action of the coating preferably formed of colloidal graphite on the finished article. In Figures 1 and 3 both the exterior and interior surfaces 12 and 11, respectively, are illustrated as being rough in formation and capable of further roughening due to oxidation and corrosion. In Figures 2 and 4 of the drawing both the exterior surface 15 and the interior surface 14 of the article 13 are formed by the colloidal graphite coating which has penetrated into the interstices of the metal of the article 13 and has formed a dense, hard and extremely smooth finish with the result that both the interior and exterior surfaces 14 and 15, respectively, of the article 13 are initially smooth and of a greater degree of hardness than the untreated article illustrated in Figures 1 and 3, and possess the property of remaining in a smooth, hard condition indefinitely.

The article, the subject of this invention, may be formed by several different methods, such as for example the application of a suitable solution of the colloidal graphite material specified with a pressure exerting roller apparatus which mechanical action will assist the tendency of the colloidal graphite to migrate and thus enter and penetrate the interstices or grain structure of the article. Other materials possessed of similar properties may be employed and such materials may obviously comprise plastics and synthetic resins and the like, the net result of which will result in the formation of a dense, hard coating penetrating the interstices or grain structure of the article itself.

It will thus be seen that a tubular article formed in accordance with this invention will possess the desirable qualities of having its interior and/or exterior surfaces covered with a protective coating preferably of colloidal graphite which coating in penetrating the interstices or grain structure of metal will have formed a hard, extremely smooth surface finish. The article resulting when used commercially will greatly offset the frictional loss commonly encountered with a definite economic advantage with respect to the amount of material delivered at a given pressure either through or over the article as well as the ability of the article itself to continue to deliver a given quantity of material at a given pressure over an indefinite time. As an example, various fluid conducting pipes commonly employed for various uses can be considerably reduced in size and thereby effect considerable savings in cost by utilizing smaller tubular articles formed in accordance with this invention and thus enable the smaller articles to carry, consistently, predetermined quantities of fluids. An example of the use of tubular articles having both interior and exterior finishes in accordance with this invention may comprise the placing of one tubular article within another tubular article of larger size, the smooth exterior of the smaller tubular article cooperating with the smooth interior of the surrounding tubular article thereby facilitating the even flow of material passed therebetween. Further, the tubular articles finished in accordance with this invention will insure the retension of usable space between the articles indefinitely and avoid the loss of use of this space which otherwise might occur due to corrosion, scaling or oxidation of the articles. Articles other than the tubular articles specifically mentioned in this disclosure are to be considered within the scope of the invention. Such articles may obviously comprise tanks, various ducts and miscellaneous flat surfaced articles on which the provision of a permanently smooth, slick, hard surface may be advantageously employed.

We claim:

A new article of manufacture comprising a metallic tubular object having at least one of its surfaces densified by the forceful application of colloidal graphite into the microscopic interstices of the metal surfaces.

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