Feb. 26, 1946. W. B. FORD 2,395,731

METHOD OF LINING CONTAINERS

Filed April 25, 1941

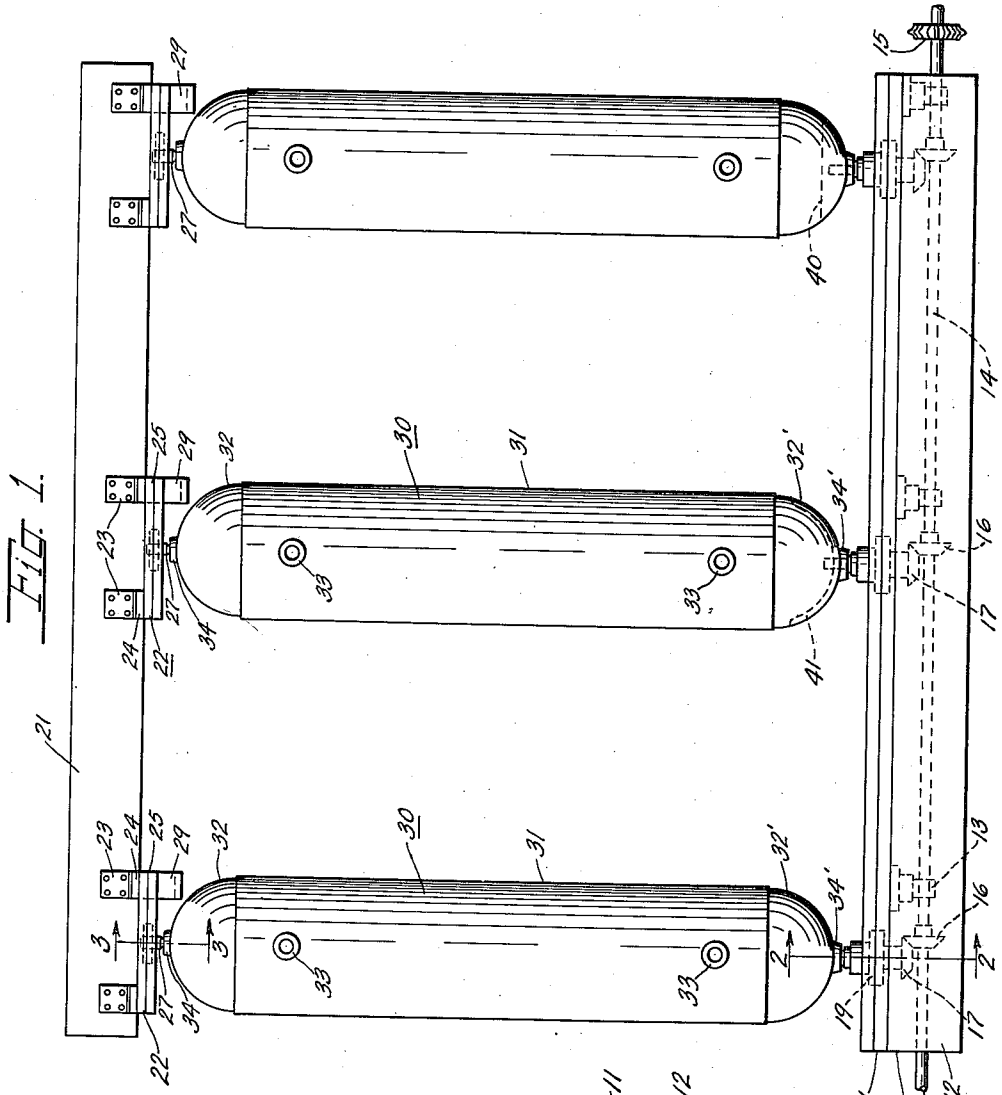


FIG. 1.

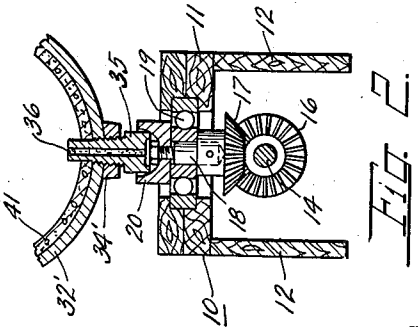


FIG. 2.

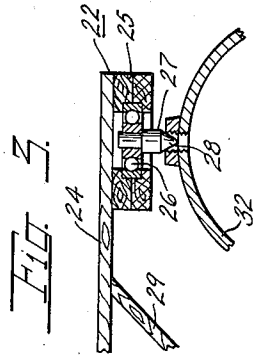


FIG. 3.

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METHOD OF LINING CONTAINERS

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4 Claims. (Cl. 117—97)

My invention relates to an improved method of lining containers, and more particularly the ends or heads of substantially cylindrical containers, with cement or concrete or similar plastic substances which have the property of setting or hardening.

It has been found that a lining of this type prevents corrosion and rust of an ordinary black iron tank, even though the cement or concrete lining, being somewhat porous, does not prevent contact of the water with the metal. However, it apparently acts as a filter to remove the substances carried by the water which are the actual cause of corrosion. Heretofore, when lining tanks of a size not permitting the entry thereinto of a man, such as an ordinary domestic hot water tank, it has been necessary to line the heads by spreading cement or concrete thereon by means of a trowel or the like before the heads are secured to the cylindrical portion of the tank. This not only is a time consuming and expensive procedure, and prevents the use of standard fully assembled tanks, but in addition the lining is apt to become loosened and crack when the head is welded to the remainder of the tank.

In accordance with my invention the heads of a completely assembled tank may be smoothly lined with cement or concrete by placing the tank in a vertical position with a suitable quantity of cement or concrete mix in plastic form within the tank, and then rotating the tank at a suitable speed to distribute the cement or concrete over the head. I have determined that it is only necessary to continue this rotation until the cement or concrete has obtained its initial set. Thereafter, the rotation may be stopped and the lining of the head will remain in place and may be permitted to obtain its permanent set.

For carrying out my invention I have provided an apparatus for rotating a tank which is so arranged that a tank may be quickly and easily placed in position thereon and removed therefrom without it even being necessary to stop the operation of the device. Preferably, provision is made for rotating a plurality of tanks at the same time.

Further objects and advantages of my invention will be apparent from the following description, considered in connection with the accompanying drawing which forms a portion of this specification, and of which;

Fig. 1 is a side view, partially in cross-section of a preferred apparatus for carrying out my invention;

Fig. 2 is an enlarged cross-sectional view taken on the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged cross-sectional view taken on the line 3—3 of Fig. 1.

Referring to the drawing, reference character 10 designates a base or support which conveniently may be in the form of a U-shaped channel having a web 11 and flanges 12. This channel may be made of wood or metal. Supported within the channel by means of bearings 13 secured to the underside of the web 11 is a drive shaft 14, which may be rotated in any suitable manner, as by means of a chain drive engaging the sprocket 15. Preferably, means are provided for varying the speed of rotation of shaft 14, such as a variable speed motor. Secured to the shaft 14 at suitably spaced intervals is a plurality of bevelled gears 16. These gears mesh with similar bevelled gears 17 secured to the lower ends of shafts 18 which are supported in thrust bearings 19 carried by the web 11. Secured to the upper end of each shaft 18 is a socket 20 having a rounded or conical recess in the upper end thereof.

Reference character 21 designates a suitable support, such as a vertical wall, to which are secured a plurality of frames 22 by means of pairs of hinges 23. Each frame 22 includes parallel arms 24 connected by means of a cross-piece 25. Mounted in each cross-piece is a ball bearing or the like 26 which carries a stub shaft 27, the lower end of which is preferably tapered, as is shown at 28. A stop member 29 is secured to one or both of the arms 24 and is adapted to contact the wall 21 so as to prevent the bracket 22 from pivoting downwardly to a vertical position.

The brackets 25 are so dimensioned and positioned that, when each bracket is in a substantially horizontal position, the shaft 27 thereof is in axial alignment with the respective shaft 18 in the base 10. Reference character 30 designates a tank or other container which is to be lined with concrete. The tank includes a substantially cylindrical portion 31 to either end of which are secured heads 32 and 32'. As is the usual practice, these heads are somewhat dished so as to better withstand the internal fluid pressure to which the tank is subjected when in use. The tanks illustrated in the drawing are of the type commonly employed in connection with domestic hot water systems and are provided with suitable pipe connections 33 in the sides of the cylindrical portions and similar connections 34 and 34' located at the centers of the ends or heads 32 and 32', respectively.

Before placing a tank in the position shown in Fig. 1, a short length of threaded pipe or the like 35 is screwed into the connection 34'. As is shown

more particularly in Fig. 2 the threads have been removed from the inner end of pipe 35 so that this end will project somewhat beyond the inner surface of the head 32'. Moreover, the bore of the pipe 35 is plugged with any suitable material, such as concrete 36. Obviously, if desired, a solid rod could replace the plugged pipe.

After the pipe 35 has been screwed into the connection 34, a suitable quantity of cement or concrete in plastic form is introduced into the tank, preferably through one of the openings 33. The quantity should be sufficient to provide a lining of the desired thickness covering one end of the tank and may be determined readily either through experience or calculation. Obviously, the greater the area at the end of the tank, the more the concrete will be required to provide a lining of given thickness. Thereafter, the tank is placed in a vertical position with the lower end of the pipe 35 received in the recess in socket 20. The corresponding bracket 24 is pivoted upwardly a sufficient distance and then downwardly so that the shaft 27 thereof may be introduced into the connection 34 so as to maintain the shaft 27 in engagement with the opening in the tank. Due to the fact that the shaft is provided with a tapered end 28 it may snugly engage openings of different sizes. With the tank in this position, and before rotation has commenced, the cement or concrete will occupy the position as shown at 40 in the right-hand tank in Fig. 1.

The weight of the tank is sufficient to provide a frictional connection between the pipe 35 and the shaft 18, whereby the tank will be rotated. This rotation causes the cement or concrete mix within the tank to be distributed, under the influence of centrifugal force, smoothly over the inner surface of the head 32', as is shown at 41 in the center tank of Fig. 1. The speed required for this distribution depends upon the consistency of the mix and the amount the head is dished. However, I have found that with a tank having an ellipsoidal head, a speed of about 60 R. P. M. gives very satisfactory results. The rotation of the tank in this manner should be continued until the concrete receives its initial set. This depends on various factors, such as the ingredients of the mix, and the temperature. Quick setting cements are available which receive their initial set within a very few minutes, but are comparatively expensive. Ordinary cements require from three-quarters of an hour in hot weather to several hours at lower temperatures to obtain the initial set. Thereafter the tank may be removed from the device, but it is advisable to handle it carefully so as to avoid jarring. The inner end of pipe 35 extends inwardly a distance greater than the thickness of lining 41. The pipe is preferably removed before the cement or concrete receives its permanent set, thereby leaving an opening in the lining in alignment with the connection 34'.

The tank may be placed in either a vertical or a horizontal position until the lining has received its permanent set. Thereafter, the pipe 35 is screwed into the connection 34 in the other end of the tank and the above described process repeated so as to line this end. This other end should not be lined until the previously applied lining has received its permanent set, inasmuch as the slight jarring to which the tank may be subjected while being rotated would be apt to dislodge the lining from the upper end of the tank.

Due to the relatively low speed of rotation and the fact that there is only a frictional connection between the shaft 18 and the pipe 35, a tank may be placed in position or removed from the apparatus without it being necessary to stop the shaft.

After both ends have been lined, the cylindrical portion 31 may be lined by placing a suitable quantity of cement or concrete mix within the tank and rotating the latter about a horizontal axis. However, this does not constitute any part of my present invention.

While I have described one more or less specific embodiment of my invention, it is to be understood that this has been done for the purpose of illustration only and that the scope of my invention is not to be limited thereto, but is to be defined by the appended claims.

What is claimed is:

1. That improvement in the art of lining the inner concave end of a substantially cylindrical container with a plastic hardenable substance, the end having an aperture therethrough, which includes closing said aperture, supporting the container in a vertical position with the end to be lined at the bottom, introducing a sufficient quantity of said substance in plastic form into said container to provide a lining of substantial thickness, rotating said container about a vertical axis at a speed determined by the consistency of said substance and the conicity of said end to distribute the substance over the concave surface of the end of the container to form a lining of substantially uniform thickness, continuing said rotation until the substance has received an initial set, and opening said aperture before the substance receives a permanent set to thereby provide an opening through said lining in alignment with said aperture.

2. That improvement in the art of lining the inner concave end of a substantially cylindrical container with a plastic hardenable substance, the end having an aperture therethrough, which includes introducing a plug into said aperture a sufficient distance to extend inwardly beyond the lining, supporting the container in a vertical position with the end to be lined at the bottom, introducing a sufficient quantity of said substance in plastic form into said container to provide a lining of substantial thickness, rotating said container about a vertical axis at a speed determined by the consistency of said substance and the conicity of said head to distribute the substance over the concave surface of the end of the container to form a lining of substantially uniform thickness, continuing said rotation until the substance has received an initial set, and removing said plug before the substance receives a permanent set to thereby provide an opening through said lining in alignment with said aperture.

3. That improvement in the art of lining the inner concave end of a substantially cylindrical container with a plastic hardenable substance, the end having an aperture therethrough, which includes introducing a plug into said aperture a sufficient distance to extend inwardly beyond the lining, supporting the container in a vertical position with the end to be lined at the bottom, introducing a sufficient quantity of said substance in plastic form into said container to provide a lining of substantial thickness, rotating said container about a vertical axis at a speed determined by the consistency of said substance and the conicity of said end to distribute the substance over the concave surface of the end of the container to form a lining of substantially uniform thickness, continuing said rotation until

the substance has received at least an initial set, and removing said plug after the substance receives an initial set to thereby provide an opening through said lining in alignment with said aperture.

4. That improvement in the art of lining the inner concave ends of a completely closed container with a plastic hardenable substance, each end having an aperture therethrough, which includes closing said apertures, supporting the container in a vertical position with the end to be lined at the bottom, introducing a sufficient quantity of said substance in plastic form into said container to provide a lining of substantial thickness, rotating said container about a vertical axis at a speed determined by the consistency of said substance and the conicity of said end to distribute the substance over the concave surface of the end of the container to form a lining of substantially uniform thickness, continuing said rotation until the substance has received an initial set, and opening said aperture before the substance has received a permanent set to thereby provide an opening through said lining in alignment with said aperture, then reversing said container to position the other uncoated end to be lined at the bottom, and repeating the aforesaid steps to coat the said other end.

WELLMAN B. FORD.