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PAVED CORRUGATED CULVERT AND METHOD OF PRODUCING IT

Original Filed May 10, 1930

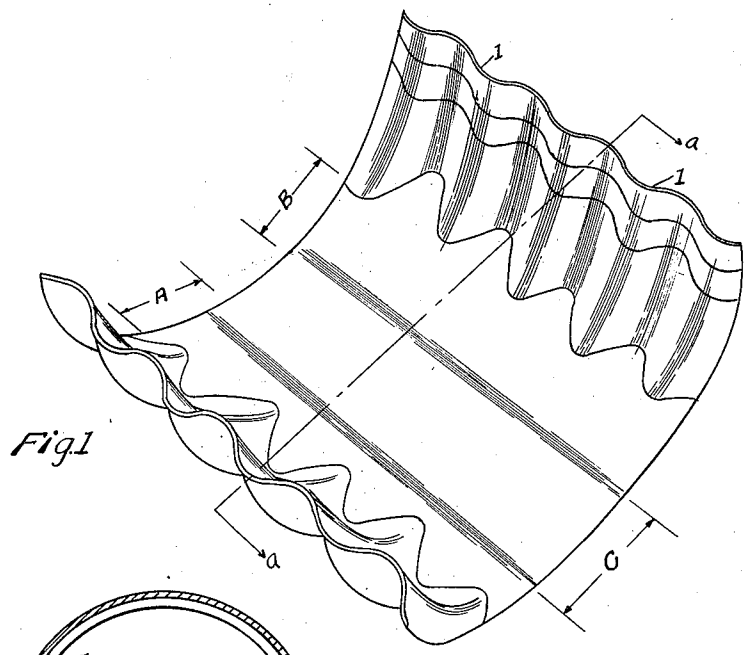


Fig1

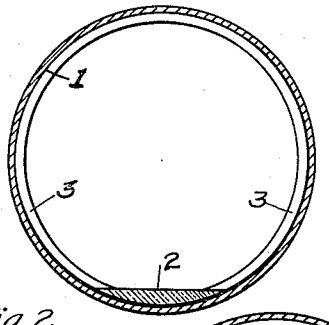


Fig 2

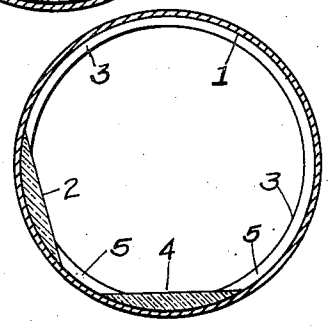


Fig. 3

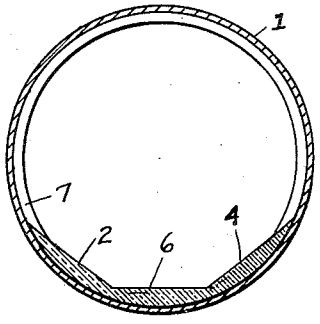


Fig. 4

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PAVED CORRUGATED CULVERT AND METHOD OF PRODUCING IT

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5 Claims. (Cl. 91—68)

Our invention relates to corrugated culverts in which the lowermost portion or floor is paved for the purpose of increasing the life of the culvert, as taught generally in Patent # 1,652,703 to Cushman. This application is a division of our application, Serial #451,453, filed May 10, 1930 and covers the process aspects thereof. Since the water in conduits used as culverts and the like almost invariably carries abrasive material such as sand and gravel, excessive wear is produced by abrasion, and all conduits, whether corrugated or not fail first at the floor. It has been demonstrated that the life of a corrugated culvert can be very greatly increased by paving this floor so as to fill up the corrugations thereon level upon the actual bottom. This eliminates the harmful effect of abrasion to a very great degree, since although the level of the water in the culvert is normally far above the level paving, the abrasive material is carried largely along the actual bottom of the culvert. Thus, by these means, the life of a culvert is lengthened very much more than would be expected from any abrasion resistance inherent in the paving, which is usually of bitumen, such as asphalt.

Regular invert paved culvert is manufactured by dipping a culvert, held in a horizontal position, beneath the surface of a bath of heated bitumen. Usually the culvert or pipe is dipped so that somewhat more than half of its circumference extends below the level of the liquid bitumen. It is then raised above the surface of the bath, and is allowed to drain while still held in a horizontal position. The bitumen drains away from the sides of the culvert leaving there only a thin coating on the culvert walls but fills the corrugations in the actual bottom or invert level full, making there a flat and level, but narrow pavement for the purpose described. The culvert is usually suspended horizontally by means of a frame which may be raised or lowered; but a supplementary chain or cable pull is advantageously attached to one end of the frame to tilt the culvert a little to facilitate draining. The culvert is held in the substantially horizontal position, however, until the paving has solidified.

In a paved pipe or culvert of the type described, although the abrasive material travels through the pipe for the most part along the pavement, some of it spreads out, causing wear on the adjacent corrugations. It will be understood that the level paving is fairly wide between the valleys of the corrugations; but is comparatively narrow at the crests of the corrugations.

The primary object of our invention is the production of a type of invert-paved culvert which is an improvement upon the culvert just described, together with a method of producing a culvert having the improved type of paving hereinafter described. Ancillary objects of our invention will be set forth hereinafter, or will be apparent to one skilled in the art upon reading these specifications wherein we have described a preferred embodiment of our culvert and a process of making it, reference being had to the drawing which forms a part hereof.

In the drawing:

Fig. 1 is a perspective view of our paved culvert, the upper half of which has been cut away to make a clearer showing.

Fig. 2 is a sectional view of a culvert in the first stage of our process.

Fig. 3 is a sectional view of a culvert in the second stage of our process.

Fig. 4 is a section of a completed culvert along the line *a—a* of Fig. 1.

An object of our invention is the provision of a culvert in which the paving, instead of being level over the actual invert is continued for some distance following the sides of the culvert, so that the portion thereof in which the corrugations are paved, i. e., filled level full of paving substance, forms a trough-like paving. We have found that a trough-shaped paving concentrates the abrasive materials entrained in the water in the bottom of the trough thereby protecting the crests of the corrugations adjacent the edges of the paving. The life of the culvert is thereby further considerably prolonged.

To this end, we prefer to proceed as follows: We form the usual invert paving by any suitable method, preferring the dipping method hereinabove set forth. Usually somewhat more than half of the culvert is dipped beneath the surface of the bitumen, so that the aforementioned thin coating is formed over a considerable arc of the circumference of the culvert, with the paving in the actual invert. This condition is indicated in Fig. 2, where the culvert 1 has an invert paving 2, and a thin coating 3 extending up the sides.

Next, we rotate the culvert on its axis (after the paving aforementioned has solidified) and dip it again. A second paving is formed offset from the first. This condition is illustrated in Figure 3, where the second paving is indicated

at 4, and a second thin coating, overlying the first in part, is shown at 5.

Finally, we again rotate the culvert on its axis when the second paving has solidified, so that the portion of the culvert between the former pavings now becomes the actual bottom. We dip the culvert again, and a third paving 6 is formed between the two, with a thin coating 7 overlying the other pavings, and a portion of the culvert walls. In Fig. 1 the surface areas of the several pavings are indicated by the letters A, B and C.

The sequence of steps in this process may obviously be varied without departing from the spirit of our invention. It is possible to form the separate pavings in overlapping sequence, and to form as many of them as desired, even to the extent of completely covering the inside of the culvert. This is not ordinarily desirable; and we have found three or four dippings as indicated, to be adequate for the formation of an excellent paving of our type. In some instances two contiguous pavements are sufficient. We prefer to form the two sidewise pavings first, and the lowermost paving over the edges of the first two, since this evens up the coatings and produces a smoother trough-like section. We are further not restricted to the dipping method of paving culverts, any of the methods hitherto proposed being applicable to our invention. Thus a coating of bitumen may be sprayed within a culvert, and if controlled as to quantity, allowed to flow down from the sides and collect in the bottom to form the invert paving. The culvert is then tilted and the step repeated. Or the culvert may have an initial paving formed by dipping and subsequent pavings formed by a spraying or otherwise.

When the second and later pavings are being formed, the first paving is rotated at an angle to the horizontal, and becomes covered with the hot liquid bitumen. The first pavement therefore would have a tendency to soften and run down into successive pavements as formed. In the regular dipping process it is advisable to keep the culvert bottom beneath the level of the molten bitumen in the bath until the metal parts are well heated, so that a satisfactory adhesion of the bitumen to the metal may be effected. We avoid the difficulty hereinabove set forth first by forming the first invert paving with a contiguous thin coating of the bitumen as shown at 3 over a considerable area of the culvert walls, such an area in fact as will make it unnecessary to form successive coatings and pavings elsewhere than upon this area. We form our first coating and paving under conditions which insure proper adhesion. Second, we permit the first coating and paving to solidify thoroughly, and the parts to cool. Thirdly, we form successive coatings as rapidly as possible, so that the parts are not heated any more than necessary. These applications are also allowed thoroughly to cool. The adhesion of bitumen to the previous bitumen coating is rapid and effective, and requires no such heating of the parts or time of treatment, as does the joining of bitumen to metal. Obviously the several coatings may comprise paving substances of different characteristics if desired.

The one smooth pavement in single paved pipe represents only a small portion of the bottom of the pipe. Two or more contiguous pavements in the bottom of a corrugated pipe provide a greater width of effective pavement, which due to its smoothness, protects a proportionately greater area of the bottom of the pipe against the effects of abrasive material passing through.

The single flat pavement is bound on either side within a narrow width by the crests of the coated corrugations, projecting upward into the path of flow along the pavement. A series of contiguous pavements results in the adjacent coated but unfilled corrugations being removed farther up along the sides of the pipe above the area affected by the forces of erosion.

In a single paved pipe, although the abrasive material travels through the pipe for the most part along the pavement, some of it spreads out, causing wear on the adjacent coated corrugations. On the other hand, erosive material such as sand or gravel, traveling through a multiple paved pipe is kept concentrated in the center of the bottom of the pipe by the sloping, trough-like pavements, rather than spreading out to the less-resisting coated corrugations.

Modifications may be made in our invention without departing from the spirit of it.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. A method of producing corrugated pipe having a trough-shaped paving, which comprises dipping a corrugated pipe while held in a horizontal position beneath the surface of a bath of liquid paving material, raising said pipe and allowing it to drain whereby an invert paving filling the corrugations in the then actual bottom portion thereof is formed together with a thin coating of paving material over a substantial arc of the interior walls of said pipe, allowing said paving to solidify, giving a partial rotation to said pipe and forming additional invert pavings in contiguous relationship to the first, with said thin coating covering intervening portions of the pipe, the second invert paving being formed in offset relationship to the first by giving a partial rotation to the pipe in one direction, and the third invert paving being formed between the first two by giving a partial rotation to the pipe a lesser distance in the opposite direction.

2. A method of producing corrugated pipe with a trough-shaped paving, which comprises dipping a pipe, while held in a horizontal position, beneath the surface of a bath of liquid paving material, raising said pipe and allowing it to drain whereby an invert paving filling the corrugations in the then actual bottom portion thereof is formed together with thin coatings of paving material over substantial arcs of the interior walls of said pipe beyond the sides of said paving, allowing said thin coatings and said paving to solidify, and giving a partial rotation to said pipe and forming additional corrugations-filling invert pavings therein in contiguous relationship to the first formed paving, said first formed paving and thin coatings being formed under conditions of high heat required to secure satisfactory adhesion of the paving material directly to the walls of the pipe, succeeding pavings being formed upon an area covered by a previously deposited thin coating and more rapidly, whereby the affinity of said coating for the material of the additional pavings is relied upon to produce adhesion without the necessity of prolonged heat treatment which would tend to melt said first pavement.

3. A method of producing paved corrugated pipe which comprises forming an initial invert paving filling up the corrugations in the then actual bottom portion of a corrugated pipe and at

least one sidewise extending thin coating of paving material on the wall of said pipe contiguous to said invert paving, and of at least the width of an additional invert paving all under conditions of heat and time duration sufficient to produce proper adhesion of said paving and said coating to the walls of said pipe, and afterward forming an additional invert paving by more rapidly depositing a corrugation filling layer of paving material located upon an area covered by said thin coating.

4. The method set forth in claim 1 including the step of forming said third invert paving of a material differing in characteristics from the material of said other invert pavings.

5. A corrugated culvert having a trough-shaped paving consisting of a plurality of flat, corrugation-filling pavements in joining relationship, and comprising a first pavement and a contiguous thin coating of paving material, both thoroughly bonded to said culvert, and additional pavements laid down upon the area covered by said thin coating and bonded thereto.

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