Sept. 12, 1967 J. G. SPURLOCK 3,340,900

FLEXIBLE GALVANIZED METAL HOSE

Filed Oct. 13, 1964

Fig. 1

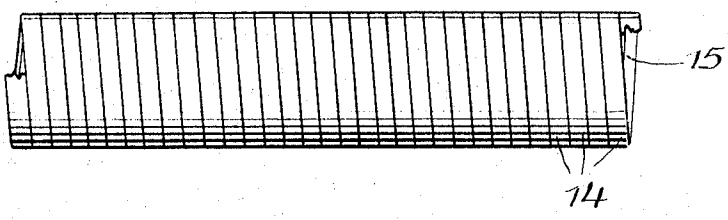


Fig. 2

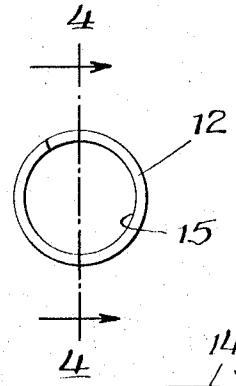


Fig. 3

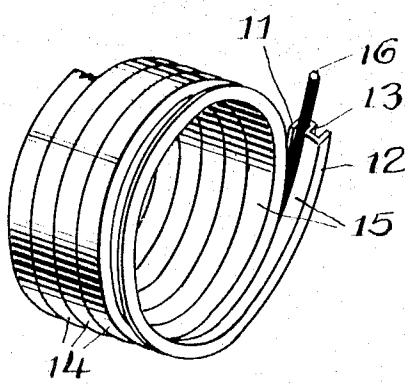
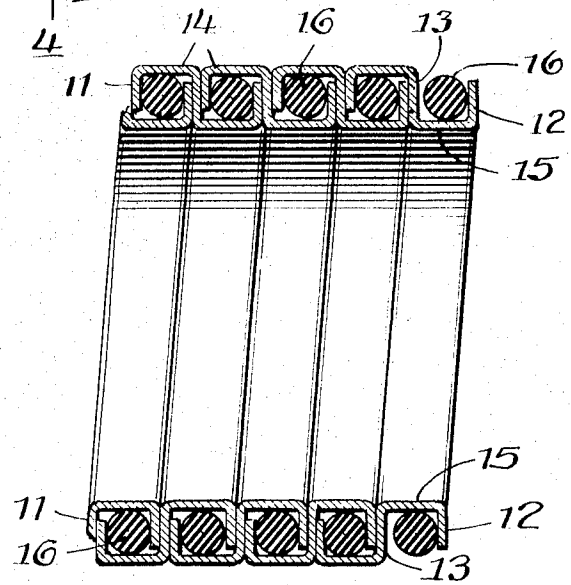


Fig. 4



INVENTOR.

Jerry G. Spurlock

BY

Benjamin Schlosser

Alby.

United States Patent Office 3,340,900 Patented Sept. 12, 1967

3,340,900

FLEXIBLE GALVANIZED METAL HOSE

Jerry G. Spurlock, Melrose Park, Ill., assignor to Coleman Cable & Wire Company, River Grove, Ill., a corporation of Delaware

Filed Oct. 13, 1964, Ser. No. 403,485
1 Claim. (Cl. 138—136)

ABSTRACT OF THE DISCLOSURE

A flexible metal hose comprises a helically wound strip of galvanized metal with the longitudinal edges of adjacent convolutions interlocked. The metal strip has two channels facing in opposite directions and sharing a common center wall. The leading longitudinal flange of one convolution extends downwardly between the common center wall and the upstanding trailing flange of the preceding convolution, and the trailing flange of each convolution extends upwardly between the common central wall and the downturned leading flange of the following convolution. A resilient plastic cord of uniform cross section is positioned between the leading flange of one convolution and the trailing flange of the preceding convolution and is wrapped helically with the metal strip. The compressibility of the plastic cord enables the conduit to flex uniformly as it is bent in any direction, and its resilience enables the plastic cord to regain its original shape when the bending force is released.

This invention relates to a flexible galvanized metal hose of the type used as a conduit for electrical conductors, and is particularly concerned with a metal hose that will flex uniformly in any direction and will retain its flexibility indefinitely.

Flexible metal hose fabricated by winding strips of galvanized steel helically and interlocking the longitudinal edges of the strip is well known. The metal strip for such hose is formed by passing a flat strip of galvanized steel through a series of forming rolls that impart the desired cross sectional configuration to the metal strip. The strip is bent to form two channels facing in opposite directions and extending side by side for the entire length of the strip, and when the strip is wound helically each of its outer longitudinal edges is juxtaposed against the center of the portion of the strip forming the adjacent convolution of the metal hose.

Metal hose as described above is not satisfactory because it will not flex uniformly throughout its length, and when it is flexed it is subject to considerable abrasive action that often separates the galvanizing metal from the steel base. Whenever the galvanizing metal becomes separated from the steel, the hose often rusts, and consequently loses its flexibility. Obviously rust also shortens the useful life of the metal hose. It has been proposed to use a packing of fibrous textile cord such as cotton, for example, to make the metal hose flex uniformly and to reduce the abrasive action when the hose is flexed. The limited space available for the packing makes it necessary to use fibrous textile cord of controlled quantity, i.e. cord of uniform diameter and free of knots, for the packing. In addition to other disadvantages hereinafter discussed, the fibrous textile cord is comparatively expensive.

In forming the flat galvanized steel strip to provide the desired cross sectional configuration, the forming rolls generate so much heat that it is necessary to use a coolant to reduce the heat sufficiently to prevent separation of the galvanizing metal from the steel. Oil is the preferred coolant, but it is not thin enough to provide the lubrication necessary for the forming rolls, and is therefore mixed with water. During the fabrication of the metal hose some

of the water of the coolant is absorbed by the fibrous textile cord. The hygroscopic character of fibrous textile cord slows down the rate of evaporation to such an extent that portions of the metal hose may rust before all the water is evaporated. In the finished metal hose the fibrous textile cord may absorb moisture from the air and induce rust if any of the steel of the hose is bare.

Another disadvantage of the fibrous textile cord is that it has a rough exterior surface. The rough exterior surface of the fibrous textile cord causes it to drag during the fabrication of the metal hose, with the result that the cord is stretched. The stretching of the cord is not uniform, and causes the cord to have an irregular diameter, thereby impairing its effectiveness as a packing for metal hose. The irregularity of the diameter of the cord also impairs the uniformity of the bend of the metal hose when it is flexed.

In accordance with the present invention, a packing is used comprising a cord of plastic material, for example, a thermoplastic polymer prepared from a monoethylenically unsaturated monomer, such as polyethylene or polyvinyl chloride. The plastic cord is non-hygroscopic and will not absorb moisture from the air to cause rust in the metal hose. Because of its non-hygroscopic quality, the plastic cord will not absorb water from the coolant. The amount of water that gets inside the metal hose during the fabrication of the hose is less when plastic cord is used instead of fibrous textile cord because the plastic cord will not absorb water from the coolant as the textile fabric does. Because less water gets in the hose during fabrication, it will evaporate before it has a chance to cause any rust. Furthermore the plastic cord is inexpensive, and has a uniform diameter and a smooth exterior surface. The smooth exterior surface of the plastic cord keeps it from dragging in the fabrication of the metal hose, and therefore the plastic cord retains its uniform diameter. The smooth exterior surface of the plastic cord also minimizes friction during the fabrication of the metal hose. The reduction of friction reduces the heat generated in the fabrication and therefore reduces the quantity of coolant required, thereby reducing the quantity of water that can reach the interior of the metal hose.

The structure by means of which the above mentioned and other advantages of the invention are attained will be fully described in the following specification, taken in conjunction with the accompanying drawings showing a preferred illustrative embodiment of the invention, in which:

FIG. 1 is an elevational view of a length of metal hose embodying the invention;

FIG. 2 is an end elevation of the structure of FIG. 1;

FIG. 3 is a perspective view of the metal hose, with a portion at one end thereof unwound to facilitate illustration of the structure; and

FIG. 4 is an enlarged cross sectional view, taken along the line 4—4 of FIG. 2.

In the drawings, a strip of galvanized steel is bent to form a flange **11** at one longitudinal edge of the strip, a similar flange **12** at the opposite longitudinal edge of the strip, and an intermediate section **13** midway between the flanges **11** and **12**. As shown best in FIG. 4, the flanges **11** and **12** extend in opposite directions. The intermediate section **13** is substantially parallel to the flanges **11** and **12**. An outer section **14** joins one edge of the flange **11** to one edge of the intermediate section **13**. An inner section **15** joins one edge of the flange **12** to the opposite edge of the intermediate section **13**. The flanges **11** and **12** are each slightly less in width than the width of the intermediate section **13**.

As the galvanized metal strip is wound helically, the leading flange **11** is positioned against one surface of the intermediate section **13** of the preceding convolution of the hose and a plastic cord **16** is positioned within an open

ended box-like enclosure. The enclosure consists of the leading flange **11** and the outer section **14** of the convolution of the hose being wound, and the trailing flange **12** and the inner section **15** of the preceding convolution.

The plastic cord has a diameter approximately equal to the distance between one flange **11** and the flange **12** of the preceding convolution. This distance is approximately the same as the distance between the outer and inner sections **14** and **15** of adjacent convolutions of the hose. The plastic cord **16** is compressible uniformly along its length, and whenever the hose is bent in any direction the flexing of the hose will be uniform in any direction. The resilience of the plastic cord enables it to regain its original shape whenever the bending force is released. The flanges **11** and **12** are wide enough so that even when the hose is bent as sharply as possible the flanges on the opposite side of the hose will not be displaced from their engagement with the intermediate sections of the adjacent convolutions far enough to separate one convolution from the adjacent convolutions of the hose.

Although I have described a preferred embodiment of the invention in considerable detail, it will be understood that the description thereof is illustrative rather than restrictive, as details of the structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact structure disclosed.

I claim:

A flexible metal hose comprising a plurality of helical convolutions of galvanized metal having the longitudinal edges of adjacent convolutions interlocked with a cord made of a thermoplastic polymer prepared from a monoethylenically unsaturated monomer, said cord having a uniform diameter throughout its length and confined in sealing engagement between the leading edge of one convolution and the trailing edge of the preceding convolution, said cord having an exterior surface sufficiently smooth to prevent irregular reduction of the cord diameter during fabrication of the hose as a result of frictional engagement with the metal convolutions, whereby the sealing action of the cord and the bending action of the hose are uniform.

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LAVERNE D. GEIGER, *Primary Examiner.*

C. L. HOUCK, *Assistant Examiner.*