

May 25, 1937.

G. ZAPF

2,081,691

CABLE MANUFACTURE

Original Filed March 25, 1931 2 Sheets-Sheet 1

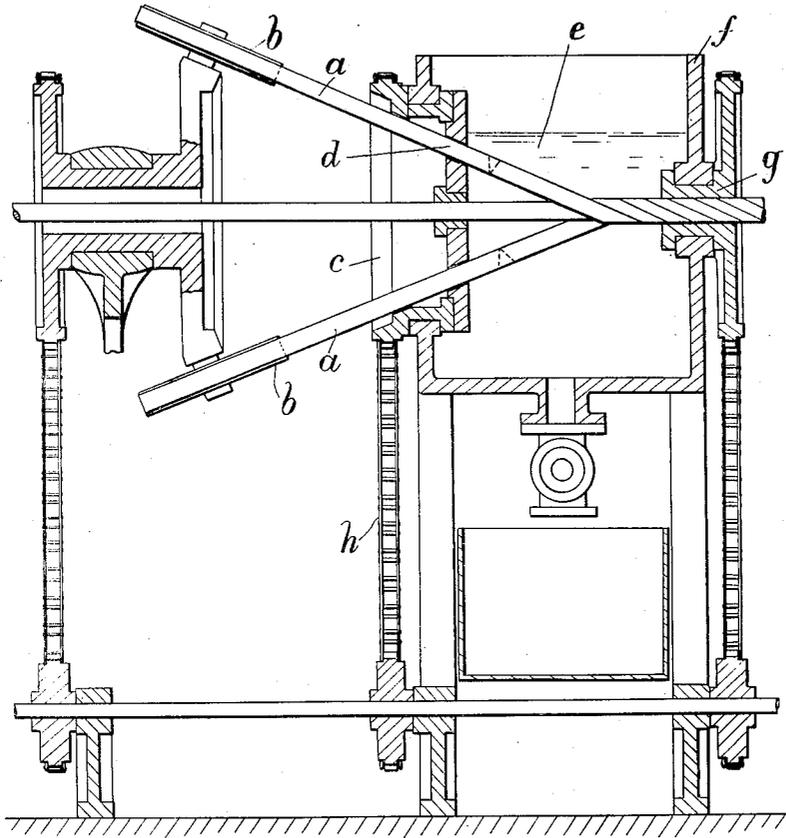


Fig. 1.

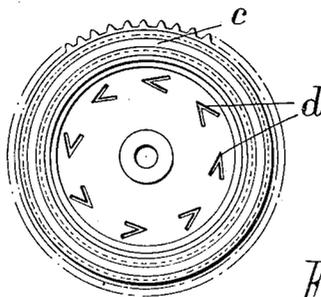


Fig. 2.

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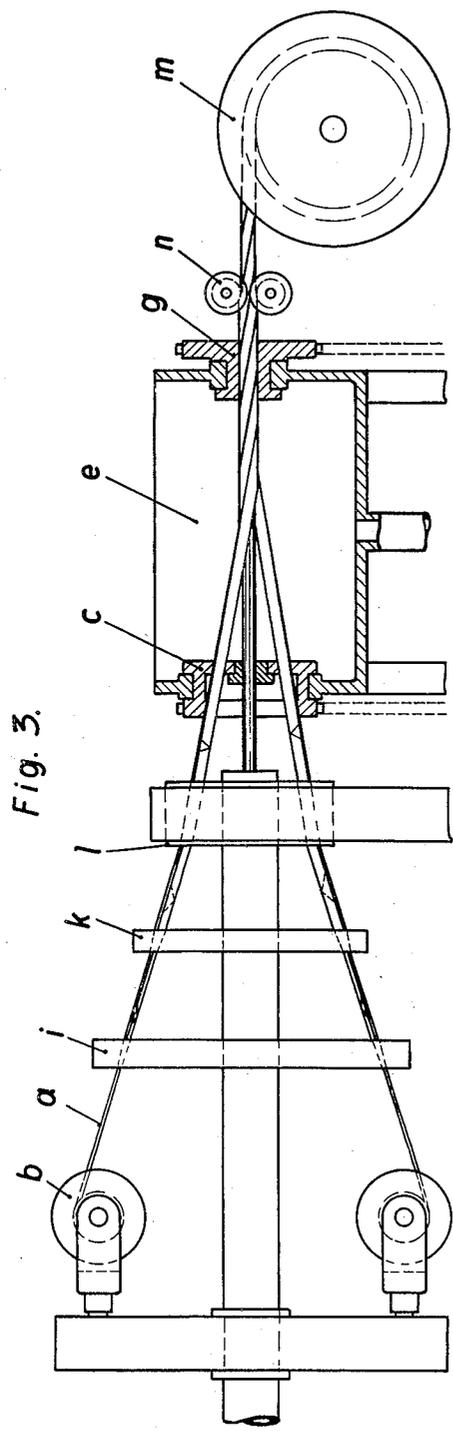


Fig. 3.

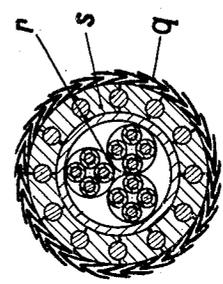


Fig. 5.

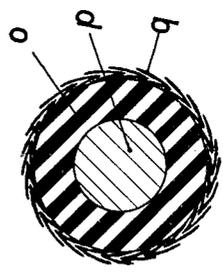


Fig. 4.

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## UNITED STATES PATENT OFFICE

2,081,691

## CABLE MANUFACTURE

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Renewed October 5, 1934. In Germany April  
15, 1930

2 Claims. (Cl. 113--35)

This invention relates to a method of manu-  
facturing a cable covering which surrounds the  
core of an electric cable so as to protect it from  
moisture.

5 In electric cables it is usual to enclose the core  
of the cable in a lead covering to protect it  
against the penetration of liquid. A number of  
manufacturing processes for applying the lead  
covering have already been proposed in order to  
10 obtain a greater homogeneousness of the cover-  
ing. None of the hitherto proposed methods  
have been suitable to avoid with certainty the  
occurrence of weak places such as are caused  
by hollow spaces, oxide deposit and seams in the  
15 lead sheath. In using lead as covering material  
it has also been found disadvantageous that the  
lead covering becomes brittle in cables which are  
constantly subject to vibration. This is due to  
intercrystalline corrosion and is especially no-  
20 ticeable in marine cables where it has a particu-  
larly detrimental effect.

The present invention relates to a cable cover-  
ing, which is equal to the lead covering as re-  
gards protection from the penetration of liquid  
25 into the interior of the cable, but which does not  
show the intercrystalline corrosion due to vibra-  
tion which is a property of lead, and the methods  
of making the same.

The method is valuable with marine cables in  
30 which the cable core is enclosed by a pressure pro-  
tecting casing. It consists in this that flat bands  
of metal with longitudinal acute angled folds are  
laid over the core of the cable, the apex of the  
acute angle of each flat band being introduced  
35 into the fold of the adjacent band so that the  
various bands form a covering concentric with  
the cable core. The joints between the separate  
flat bands are filled with a packing material  
while the folded bands are being laid. The  
40 bands may consist, for example, of copper,  
bronze, aluminum or iron.

For carrying out the method, flat bands either  
having longitudinal acute angled folds or un-  
folded may be provided on the reels of a twisting  
45 machine which is used for laying the flat bands  
around the cable core. If the bands provided  
with longitudinal acute angled folds are drawn  
from the reels of the twisting machine, it will,  
as a rule, be necessary to open the folded bands  
50 to a greater or less extent in order to enable the  
bands to interengage satisfactorily. If unfolded  
bands are drawn from the reels of the twisting  
machine, these must first of all be passed through  
folding devices in order to provide them with  
55 longitudinal acute angled folds.

The filling of the joints between the separate  
bands during the laying of the folded bands with  
a sealing material may be effected by carrying out  
the laying of the bands about the cable core in a  
5 container filled with a liquid sealing material. The  
sealing material may be, for example, a com-  
pound mass or a liquid metal (the latter princi-  
pally for cables with pressure protecting casing).

In both cases the flat metal bands, after hav-  
ing been properly folded, are led to the twisting  
10 die in such a manner that the vertex of the fold  
of each band lies in the recess of the next band,  
and the bands lie closely together around the  
cable core until they reach their final position  
at the twisting die. After leaving the twisting  
15 die, the cable constructed according to the inven-  
tion, before being wound on to the cable drum,  
may be led through a rolling apparatus in order  
to smooth the surface.

The invention is more particularly described  
20 with reference to the accompanying drawings  
which illustrate examples of the invention.

Figs. 1 and 3 show two constructional examples  
of a twisting machine for carrying out the meth-  
od according to the invention.

Fig. 2 shows a detail of the twisting machine  
25 according to Fig. 1.

Figs. 4 and 5 show two constructions of a cable  
made according to the invention.

Fig. 1 shows a twisting machine which is in-  
30 tended to draw flat bands with longitudinal acute  
angled folds from the reels of the twisting ma-  
chine and to lay the bands about the cable core.  
The folded bands *a* are wound on the reels *b* of  
the twisting machines. *e* is a container filled  
35 with sealing material. In the wall of the con-  
tainer *e*, in the side towards the reels *b* of the  
twisting machine, a disc *c* is rotatably mounted.  
This disc *c* has a central opening for the cable  
core, and near its edge a number of angular slots  
40 *d* (see Fig. 2) corresponding to the number of  
bands to be wound about the cable core. The  
wall of the container *e*, opposite the disc *c*, has  
a guiding bushing *g* for facilitating the passage of  
the cable core out of the container *e*, which in  
45 the drawings is shown as a twisting die (which,  
however, is not absolutely necessary).

The method of making the metal covering is  
that the cable core is drawn through the con-  
tainer *e* by means of a drawing off drum, such  
50 as is usual in twisting machines. In the sealing  
bath the folded bands *a* coming from the reels *b*  
of the twisting machine are folded around the  
cable core, which bands, while being drawn  
through the slots *d* have been given the necessary  
55

angle to enable them to interengage smoothly. The disc *c* must rotate at the same speed as the reels *b* of the twisting machine, and therefore is toothed at its circumference and coupled, for example by means of a chain *h*, with the drive of the twisting machine. The guiding bushing *g*, as shown in the drawings is rotatably mounted in the walls of the container and also is constructed as a sprocket wheel and coupled with the drive of the twisting machine by a chain. This arrangement serves for obtaining a considerable smoothing of the cable covering.

Fig. 3 shows a twisting machine which is intended for drawing unfolded bands from the reels of the twisting machine and providing them with longitudinal acute angled folds before winding them around the cable core. In this figure the same letters are used as in Fig. 1 for corresponding parts. The machine shown in this figure differs from that shown in Fig. 1 essentially by the arrangement of several discs *i*, *k*, *l* which serve the purpose of providing the unfolded bands drawn from the reels *b* of the twisting machine with longitudinal acute angled folds before they are laid. In this figure, smoothing rollers *n* are also provided between the twisting die *g* and the drawing off drum *m*.

Fig. 4 shows a heavy current cable, and Fig. 5 a telephone cable provided with coverings which are moisture-tight according to the invention. In Fig. 4, *o* is the insulation, *p* the conductor and *q* the moisture-tight covering. In Fig. 5, *r* is the cable core, *s* the pressure protecting casing and *q* again the moisture-tight covering.

With the method described a compact flexible covering, closed in itself, which gives the cable considerably greater physical protection than a lead covering, is obtained.

The vessel filled with the sealing mass may be capable of being heated in order to make the material in question fluid as desired. It is also possible to use a closed container and to keep the sealing mass under pressure.

The cable covering made according to the here-

in-described method serves as protection against the penetration of moisture. If a metal covering made according to the herein-described method is to be used for cables which must be insensitive to the action of a high pressure, the core of the cable preferably is provided first of all with a covering adapted to withstand high pressure and thereupon with a moisture-proof metal casing according to this invention. With regard to cables which must be protected from external damage by a special armoring, the metal casing made according to this invention is not designed as armoring, but an armoring is provided separately over the moisture-proof covering.

I claim:

1. A method of manufacturing a cable covering which surrounds the core of an electric cable so as to protect it from moisture, consisting in this that flat metal bands of uniform thickness over the entire width of the band are drawn from the reels of a twisting machine, given longitudinal acute angled folds and laid over the core of the cable, the vertex of the fold of each band lying in the recess of the next band, and the various bands forming a covering concentric with the cable core, and that during the laying of the folded bands the joints between the separate bands are filled with a sealing material.

2. A method of manufacturing a cable covering which surrounds the core of an electric cable so as to protect it from moisture, consisting in this that flat metal bands of uniform thickness over the entire width of the band are drawn from the reels of a twisting machine, are provided with longitudinal acute angled folds while passing from the reels of the twisting machine to the point of wrapping and then wrapped about the cable core, the vertex of the fold of each band lying in the recess of the next band, and the various bands forming a covering concentric with the cable core, and that at the point of wrapping of the folded bands the sealing material is applied to the joints between the separate bands.

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