

PATENT SPECIFICATION

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(54) A COVERED, RIGID, ELONGATE MEMBER AND A
 METHOD OF AND APPARATUS FOR PRODUCING SAME

(71) We, SEKISUI ADOHEYA KOGYO KABUSHIKI KAISHA, a Japanese Body Corporate of 1, Soze-cho, Kita-ku, Osaka-shi, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to a method of and apparatus for producing a covered elongate member and to covered elongate members.

According to one aspect of the invention there is provided an article comprising a rigid elongate member, a tape extending in longitudinal direction of the elongate member in a direction parallel to the axis of the elongate member, the tape having a width substantially equal to the transverse peripheral dimension of the elongate member and being in contact with and completely covering the outer surface of the elongate member with the side edges of the tape abutting each other or being overlapped and a transparent layer of resin covering the exposed surface of the tape applied to the elongate member.

According to another aspect of the invention there is provided a process for covering a rigid elongate member, such process comprising applying a tape having a width substantially equal to the transverse peripheral dimension of the elongate member to the member to cover the outer surface thereof, the longitudinal axis of said tape being substantially parallel with that of the member, advancing the elongate member and the tape through throttling means to effect close contact of the tape with the elongate member, applying pressure by means of a roll to press adjacent side edges of the tape towards the elongate member and to allow the side edges to abut or overlap and covering the exposed surface of the tape with a transparent resin extruded

[Price 25p]

in tubular form.

According to yet a further aspect of the invention there is provided apparatus for producing a covered rigid elongate member, such apparatus comprising means for advancing an elongate member in the direction of its longitudinal axis, means for continuously supplying a tape having a width substantially equal to the transverse peripheral dimension of the elongate member to the surface of the advancing elongate member so that the tape extends in the longitudinal direction of the elongate member in a direction parallel to the axis of the elongate member, throttling means for pressing the tape into close contact with the outer surface of the elongate member, means separate from the throttling means for pressing adjacent side edges of the tape towards the elongate member so that the side edges abut one another or overlap and means for applying a layer of transparent resin to the outer surface of the tape.

The elongate member contemplated herein can be a tube or rod. In either case, the profile or a cross section at right angle to the longitudinal axis of the tube or rod need not be circular, but can be square, rectangular or any other complicated shape. However, it is preferable that any cross section of such member be uniform. The elongate member may be formed of any suitable material such as metal, wood or plastics material.

As to the tape, it is required that the width thereof be wide enough to encircle the outer surface of the tube or rod along the longitudinal axis thereof. Actually, the width of tape is preferably just equal to the circumference of tube or rod but may be a little wider than that. The tape may have a metallic gloss on its surface, and metallic foil or paper or plastics material metalized with metallic foil can be used as the material thereof. One of the most suitable materials

is tape aluminum foil, the thickness thereof being between 0.2 mm and 0.01 mm. The tape must be thin so as to be able to wrap around the outer surface of the elongate member. On this tape various patterns, marks and colours may be printed whenever required. Also if desired, the tape may be embossed.

The resin contemplated is transparent so that the surface of the tape is visible through the layer of resin. Also, the resin must be thermoplastic, if it is intended that it should be continuously applied through an extruder. Suitable examples of resin layers are a cellulose acetate, a polyvinyl chloride, or a cellulose acetate-butyrate layer. Such resin layers can be either of the so-called rigid or flexible types.

In the case of an elongated member made of metal a coating of a synthetic resin over the whole surface thereof may be provided before applying the tape and the outer resin layer.

It will be appreciated that the tape will not be damaged, destroyed, corroded nor faded easily, but will retain an attractive appearance indefinitely because it is covered with the transparent plastic resin. In the case of aluminum tape covered with a cellulose acetate resin, for example, the product appears similar to nickel or chromium plated metal or stainless steel, but is considerably more economical since iron or plastics material can be used for the tube or rod. Also, by embossing said aluminum foil and giving the foil a relief pattern before covering it with the resin, a unique appearance, which cannot be obtained by plating, can be provided.

An illustrative embodiment of the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a top plan view of one form of the apparatus,

Figure 2 is a view, partially in cross-section, illustrating the formation of a product, Figure 3 is a perspective view of a guide member of the apparatus of Figure 1,

Figure 4 is an end elevational view of part of the apparatus of Figure 1,

Figure 5 is a perspective view of a tape dispensing arrangement,

Figure 6 is a cross section of a product,

Figure 7 is a perspective fragmented view of a product; and

Figures 8, 9 and 10 show enlarged cross sections of other examples of product.

Referring first to Figures 6 to 10, *a* designates an elongate tube or rod, *b* a tape covering the rod or tube *a*, and *c* a transparent thermoplastic resin covering the tape. The reference *b*1 indicates the adjacent edges of tape *b*; and *e* another thermoplastic resin between the elongate member *a* and the tape *b*

The covered elongated product is suitable for material to compose various types of furniture such as kitchenware and the like. When a steel tube or rod is used as the elongate member *a*, and aluminum foil covers same, it can be cut to any desired length and by fixing an end cap *d* (Figure 7) by screwing or cementing, an attractive, neat end can be obtained.

The tape may be a thin tape having metallic gloss, or cloth, paper, or plastics film or sheet having a metallic glass. The tape is fed continuously as the tube or rod advances. To this end, we place the tube or rod above the tape so that the longitudinal axes of both are parallel, and then bring the two together, wrapping the tape on the tube or rod.

In order that the tube or rod and tape contact closely a throttle guide is provided, the object of which is to reduce the clearance between the tube or rod and the tape surrounding it and to cause the tape to contact closely the tube or rod. The throttle guide is provided with holes which are just big enough to pass the tube or rod together with the tube surrounding it; and by passing them through it, close contact between tube and tape is achieved.

A layer of synthetic resin may be interposed between the above tube or rod and the tape instead of directly contacting the tape on the tube or rod, however, such synthetic resin layer is not always required. In order to provide a synthetic resin layer between the tube or rod and the tape, the surface of the tube or rod is conveniently covered with a synthetic resin by extrusion or coated with synthetic resin coating. Any cheap resin can be used since it is not necessary for the synthetic resin to be transparent. Where the resin is extruded, a resin such as polyvinyl-chloride, polyethylene, polypropylene, is preferred.

It is necessary to apply further pressure to both edges of tape along the longitudinal axis thereof and bring them into close contact. As already described, the width of tape is just enough to encircle the outer surface of the tube or rod, therefore, after passing through the throttle guide, the tape will closely contact the tube or rod and both edges of the tape parallel to the longitudinal axis thereof will either come together or slightly overlap. Thus, it is intended to apply further pressure to make these meeting or slightly overlapping edges adhere more firmly together. This process of applying pressure may be achieved by a roll, and by placing the roll on the meeting or slightly overlapping edges and pressing same against the tube or rod. Before this pressing process, adhesive can be applied to the meeting or overlapping edges. When adhesive is applied, it is advisable to ensure the

adhesion by pressing the rolls which may be heated on the place where the adhesion is applied.

The tube or rod covered with tape is then advanced into cross-head type dies mounted on an extruder and the tube or rod is covered with transparent thermoplastic resin on the outer surface of the tape. Such cross-head dies for covering purposes and such covering process, are already known.

The rigid elongate member cannot be wound and it may always be used in a substantially straight length cut as desired, while the tape can always be supplied in a wound state. However, even if there are breaks in the tube or rod, it is not necessary to provide special means and covering can be performed continuously. After the covering process has been completed, lines of separation of the tube or rod can be easily found on the surface of plastics resin layer and if the member is cut at such part, the discontinuity of the tube or rod does not constitute any handicap. As stated, any desired pattern can be embossed or printed on the tape so that when covered with transparent plastics resin, an aesthetically pleasing appearance can be obtained and the embossment or print can be retained for long periods.

The transferring means may for example, comprise a series of aligned rolls or rolls with a conveyor belt extending along their upper surfaces.

The tape supply means is illustrated by way of example in Figure 5 wherein tape *b* is furnished in the form of a roll 2 mounted on a core 1. If desired, the tape may be printed or embossed after unrolling as by embossing rolls 3, 3. It is of course required that the longitudinal direction of the tape match that of the metallic tube.

Tape *b*, as shown in Figures 1 and 2, passes embossing rolls 3 and, by guide roll 5, is brought beneath the tube or rod *a* and is then conveyed together with the tube or rod *a* by several curved surface rolls 6 which gradually cause it to contact the bottom of the tube or rod. The tape and tube or rod then passes through guide 7 which, as shown in Figure 3, is provided with several parts 71, 72, 73, and 74, each of which has a hole, these becoming gradually smaller. By passing such guide 7, tape *b* is made gradually to contact closely to the surface of the tube or rod *a*. After tape *b* is thus almost fully contacted to the surface of the tube or rod *a*, they are transferred into throttling device 8.

The object of the throttling device 8 (Figures 1 and 2) is to complete contact of the tape *b* to the tube or rod *a*. The throttling device 8 is provided with a hole 81 through which passes the tube or rod *a* surrounded with tape *b*. The inside surface of such hole

81 is tapered, becoming narrower toward the direction in which the tube or rod progresses; and at its narrowest part, the hole is provided with elastic material which causes tape *b* to contact firmly the tube or rod *a*. As examples of elastic material to be used on the throttling device 8, we may use felt, woollen cloth, blanket cloth, rubber, artificial velvet, foamed fluorocarbon resin, polyethylene, etc.

An example of the pressing means to contact both edges of the tape together closely may be a roll 9 shown in Figures 1 and 2. This roll 9 presses the edges of tape *b* which are butted along the tube or rod *a*, and thus tape *b* contacts perfectly to tube or rod *a*.

An embodiment of the means for applying a layer of resin to the tape *b* is shown at 10 in Figures 1 and 2 and may comprise die 10 and extruder 11.

From the discharge outlet of the die 10, a thermoplastic resin 12 is extruded in tubular form and made to compose a cover layer *c* on the outside of tape *b*. Thus, tape *b* covers the outer surface of the tube or rod *a* and further transparent thermoplastic resin *c* covers the outside thereof so that we obtain a two-ply covered product. This apparatus is very simple in construction and yet assures excellent performance.

A specific example of the product incorporates an iron tube of outside diameter of 9 mm and a wall thickness of 1 mm, aluminum foil of a thickness of the order of 0.05 mm and a width of about 32 mm as tape, and cellulose acetate as plastics resin. Also polyvinyl acetate in emulsion was applied to both edges along the longitudinal direction of said tape.

The apparatus shown in Figure 1 was used, the tape *b* being unwound from roll 2 and supplied continuously to the under-surface of the metallic tube by guide rolls 5 through embossing rolls 3. An iron tube *a* cut to a standard length was transferred from the side indicated by an arrow in Figure 1 by rolls 4 and by guide rolls 5 placed above tape *b*, and furthermore conveyed by curved surface rolls 6. By curved surface rolls 6, tape *b* is pushed gradually nearer to the bottom of the tube *a*, and by passing same through guide 7, the degree of contact becomes very close; and then by passing the tube and tape through throttling device 8, the tape *b* is brought into closer contact with the tube. Rolls 9 press both side edges of the tape, and polyvinyl acetate may have been applied thereto before-hand to bond them together and prevent the side edges from peeling off.

After this, by covering the tape with cellulose acetate in die 10, we obtain a finished two-ply covered product shown in Figure 6.

This product does not appear as a two-
ply covered item since each layer settles
perfectly and uniformly, and the finished
product has a beautiful appearance as if it
5 were plated metallic tubing and any desired
pattern may be printed or embossed on the
tape to be visible. The product, therefore, is
valuable as a constructing material for fur-
niture and the like.

- 10 When the tube or rod and the tape are
not directly contacted but, as shown in
Figures 9 and 10, a synthetic resin layer is
provided between them, various advantages
15 can be obtained in the manufacturing
process as well as the product. The advan-
tages in the manufacturing process are first
that the tape *b* is readily held in contact
with the tube or rod *a* by providing the
synthetic resin layer, and secondly the
20 appearance of the tape *b* can be maintained
to aesthetically pleasing, since, even when
the outside diameter of tube or rod *a* is
variable, the diameter can be maintained
constant by coating with the synthetic resin.
25 Because, since the width of tape *b* is con-
stant, when the outer diameter of tube or
rod *a* is varied, the tube or rod would not be
completely covered by the tape. However,
such disadvantages is prevented by use of
30 the above mentioned synthetic resin which
enables the tube or rod *a* to be substantially
covered by the tape. In the case of using the
tube or rod *a* made of metal and the tape *b*
made of another metal, since the above two
35 kinds of metals are prevented from contact-
ing each other by the synthetic resin layer *e*,
the metals are inhibited against electric
corrosion and the product can be perma-
nently maintained aesthetically pleasing.

40 WHAT WE CLAIM IS:—

1. An article comprising a rigid elongate
member, a tape extending in the longi-
tudinal direction of the elongate member in
45 a direction parallel to the axis of the
elongate member, the tape having a width
substantially equal to the transverse peri-
pheral dimension of the elongate member
and being in contact with and completely
50 covering the outer surface of the elongate
member with the side edges of the tape
abutting each other or being overlapped and
a transparent layer of resin covering the
exposed surface of the tape applied to the
55 elongate member.

2. An article as claimed in claim 1,
wherein the elongate member is made from
a metal coated with a resin.

3. An article as claimed in any of the
60 preceding claims in which the resin forming
the transparent layer is a thermoplastic
resin.

4. An article as claimed in any one of
the preceding claims, wherein the tape has
65 a metallic outer surface.

5. An article as claimed in claim 3,
wherein the tape is formed of aluminium
foil having a thickness between 0.01 mm
and 0.2 mm and a width substantially equal
to the outside peripheral dimension of the
70 elongate member, and the resin layer is a
cellulose acetate-butyrate layer having a
thickness between 0.01 mm and 5 mm.

6. A process for covering a rigid elongate
member, such process comprising
75 applying a tape having a width substantially
equal to the transverse peripheral dimension
of the elongate member to the member to
cover the outer surface thereof, the longi-
tudinal axis of said tape being substantially
80 parallel with that of the member, advancing
the elongate member and the tape through
throttling means to effect close contact of
the tape with the elongate member, apply-
ing pressure by means of a roll to press
85 adjacent side edges of the tape towards the
elongate member and to allow the side edges
to abut or overlap and covering the exposed
surface of the tape with a transparent resin
extruded in tubular form. 90

7. A process as claimed in claim 6
wherein the elongate member and the tape
are advanced through a die and a trans-
parent thermoplastic resin is extruded onto
the outer surface of the tape to form the
95 transparent resin covering.

8. Apparatus for producing a covered
rigid elongate member, such apparatus com-
prising means for advancing an elongate
member in the direction of its longitudinal
100 axis, means for continuously supplying a
tape having a width substantially equal to
the transverse peripheral dimension of the
elongate member to the surface of the
advancing elongate member so that the tape
105 extends in the longitudinal direction of the
elongate member in a direction parallel to
the axis of the elongate member, throttling
means for pressing the tape into close con-
tact with the outer surface of the elongate
110 member, means separate from the throttling
means for pressing adjacent side edges of
the tape towards the elongate member so
that the side edges abut one another or over-
lap and means for applying a layer of trans-
115 parent resin to the outer surface of the tape.

9. Apparatus as claimed in claim 8,
wherein the throttling means includes an
aperture through which the taped member
is advanced longitudinally, the interior sur-
120 face of the aperture being tapered gradually
to narrow in the direction of movement of
the member, the narrow portion thereof
being elastic.

10. An article constructed and arranged
125 substantially as described herein with re-
ference to and as shown by Figures 6, 7, 8,
9, or 10 of the accompanying drawings.

11. A process of producing a covered
elongate member substantially as described 130



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125 substantially as described herein with re-
ference to and as shown by Figures 6, 7, 8,
9, or 10 of the accompanying drawings.

11. A process of producing a covered
elongate member substantially as described 130



herein with reference to Figures 1 to 5 of the accompanying drawings.

12. Apparatus for producing a covered elongate member, such apparatus being constructed and arranged substantially as described herein with reference to and as shown by Figures 1 to 5 of the accompanying drawings.

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