Aug. 5, 1952 G. T. W. GRIEVE 2,605,738

APPARATUS FOR DRYING AND/OR IMPREGNATING ELECTRIC CABLES

Filed Aug. 8, 1951 3 Sheets-Sheet 1

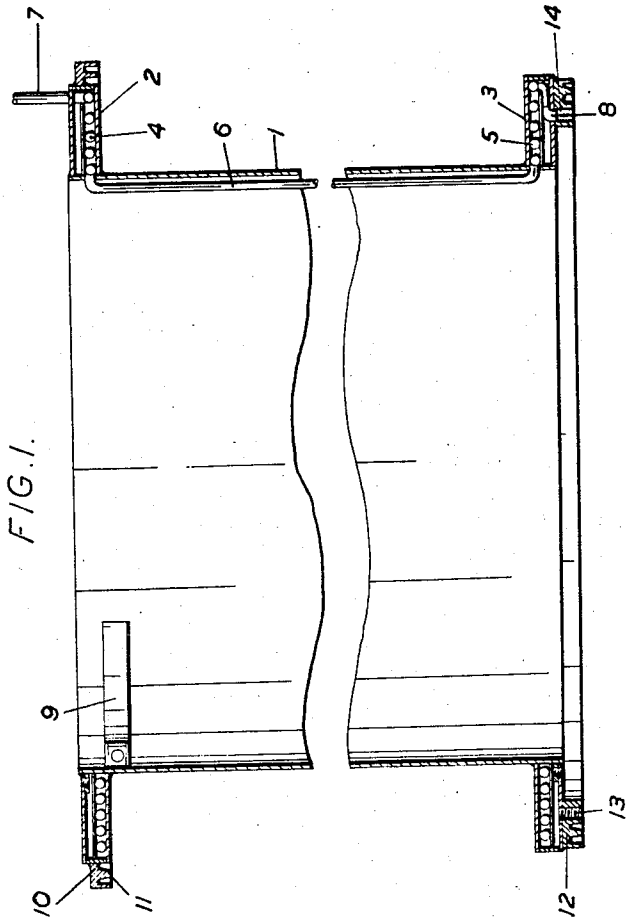


FIG. 1.

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Aug. 5, 1952 G. T. W. GRIEVE 2,605,738

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Filed Aug. 8, 1951 3 Sheets-Sheet 2

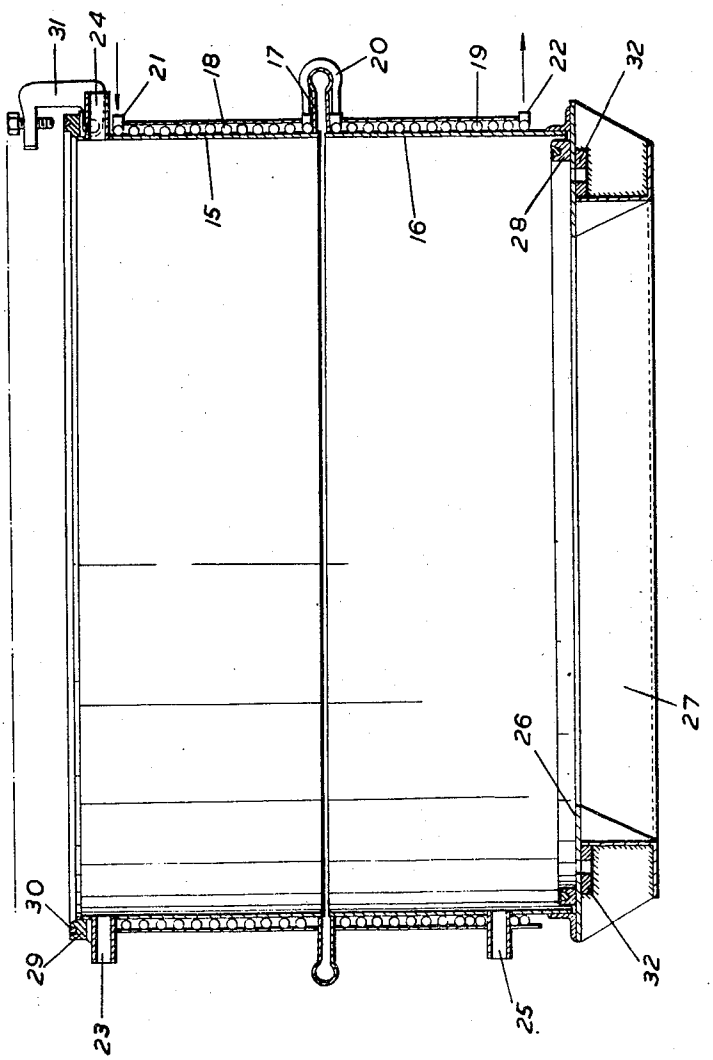


FIG. 2.

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Aug. 5, 1952 G. T. W. GRIEVE 2,605,738

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Filed Aug. 8, 1951 3 Sheets-Sheet 3

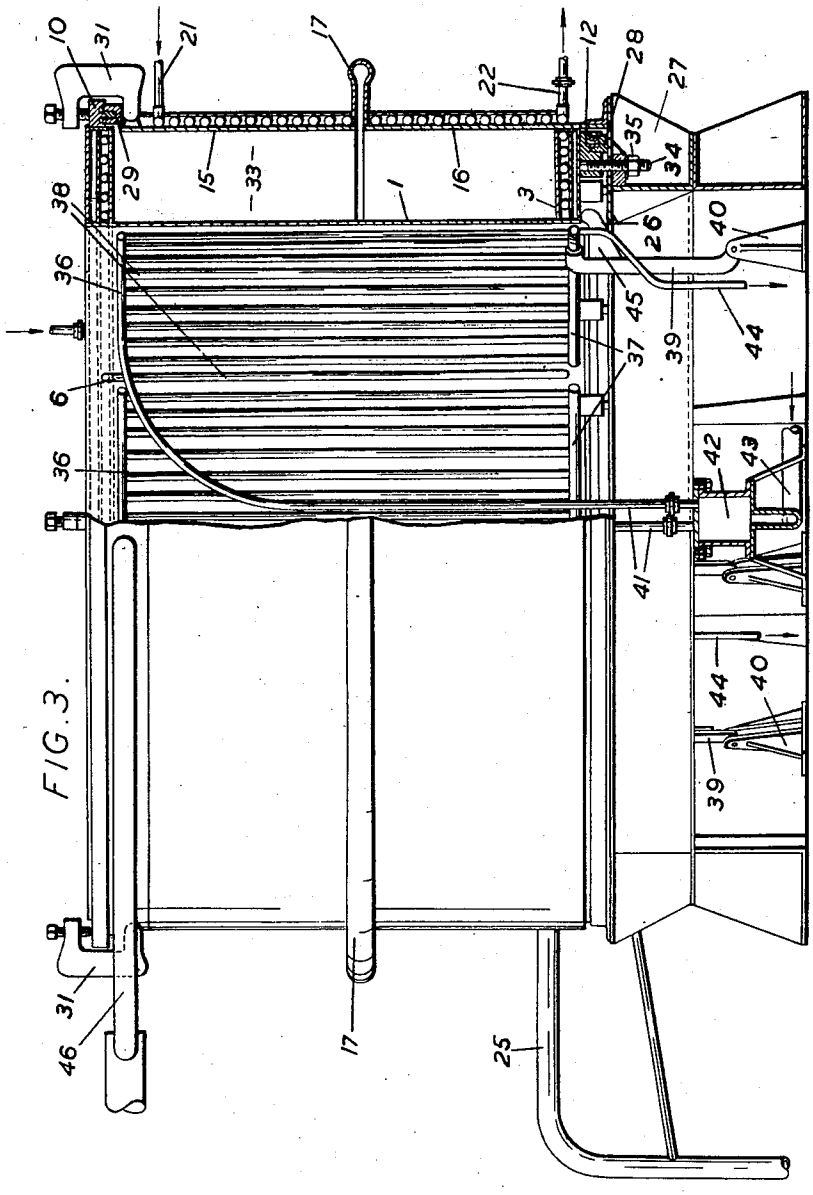


FIG. 3.

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UNITED STATES PATENT OFFICE

2,605,738

APPARATUS FOR DRYING AND/OR IMPREGNATING ELECTRIC CABLES

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10 Claims. (Cl. 118—50)

1

This invention is concerned with facilitating the handling of electric cable bodies in a process of manufacture which includes the step of drying and/or impregnating after the application of insulating material to the conductor or conductors. The invention provides improved apparatus for this purpose which achieves also economy in impregnant and in plant for the handling and treatment of the impregnant.

The improved apparatus comprises a drum structure in two parts. One part, the drum, comprises a drum barrel and two flanges of different outside diameters. This part is adapted to receive the turns and layers of an insulated cable body on the barrel between the flanges. This drum may have a centre part attached to the barrel, the attachment being permanent or removable, to permit mounting of the drum for turning on an axle. Alternatively, the drum may run on its flanges in a roller cradle in which case the centre part may be dispensed with. The second part of the drum structure is a flanged cylindrical casing adapted to enclose the space between the flanges of the drum, making at each end a joint. The drum flange of smaller diameter is adapted to be attached in a fluid-tight manner to a flange projecting inwardly from the casing at or near one end of the casing. The drum flange of larger diameter is adapted to be attached to the opposite end of the casing, preferably to a flange projecting outwardly from this end of the casing. Means for making pipe connections on one or both of the parts of the drum structure are provided.

With this apparatus the drum takes up a cable body (for instance of a single core paper insulated cable or of a three core cable with paper insulation and fillers between cores) as it comes from the paper lapping machine (in the first case) or from the laying-up machine (in the second case). When the required length of cable has been applied to the drum it is turned into the horizontal position, that is with its axis vertical, and has applied to it the flanged casing which passes over the outer part and makes joint with the flanges at the top and bottom of the drum (preferably compression joints) so as to seal up the space in which the cable body is located. Then appropriate pipe connections are made to vacuum and/or impregnating apparatus and heat is applied and the drying and/or impregnation proceeds.

It will generally be convenient to have the casing more or less permanently fixed in position and to lower or raise the drum into place within it. This arrangement has the advantage that the

2

pipe connections to the casing may be of a permanent character.

A suitable compression joint may be made by providing, on one flange, a circumferential rib with a recess in its face containing in its inner part a suitable compressible layer, such as oil-resisting rubber or lead, and providing also on the mating flange a recess to receive the rib and having projecting in appropriate position a ring adapted to pass into the recess in the rib and press against the jointing material within it. With this construction the jointing material and the ring both lie within recesses and are not liable to be injured either when the parts are being moved for assembly or disconnection or when the drum is being used away from the casing.

The compression of the joints may be made by series of U-shaped clamps placed at intervals round the peripheries of the flanges or may be made by studs passing through one of the flanges and engaging nuts on or in the mating flange, preferably captive nuts housed in that flange.

In order to ensure an effective seal by means of the two compression joints it is preferable to give a small degree of flexibility to the casing. This may be done, for example, by dividing it circumferentially into two parts and joining these together flexibly as by a narrow U-shaped ring of metal projecting outwards from the casing and secured at its two edges by welding to the two parts of the casing.

Heating of the structure when assembled is preferably carried out by applying heating elements to it. The elements may be built in as part of the drum or of the casing, or of both. In an arrangement particularly suitable when the casing is permanently fixed in position, heating elements may be arranged on the cylindrical part of the casing and may be disposed in a ring within the casing in such a position as to permit the drum to be inserted in the casing with its barrel in proximity to the elements which then may be moved outwards slightly i. e. towards the casing to make close application to the barrel. The heating elements for the drum are preferably carried on the flanges.

An example of apparatus in accordance with the invention is shown in the accompanying drawings.

In these drawings Figures 1 and 2 are cross-sectional elevations of the two main parts of the apparatus, that is the drum and the flanged cylindrical casing respectively, and Figure 3 is an elevation, partly in cross-section, of the as-

sembled structure comprising the drum, flanged cylindrical casing and ancillary apparatus.

Referring to Figure 1, the drum comprises a cylindrical barrel 1 and two hollow flanges 2 and 3 mounted on opposite ends of the drum 1; flange 2 is of larger outside diameter than flange 3. Inside the flanges are heating coils 4 and 5 in the form of two continuous steam pipes interconnected by a pipe 6.

A steam inlet pipe 7 projects from the outer face of the flange 2 and a steam outlet pipe 8 passes through the outer face of the flange 3. A gland through which access can be had to one end of the cable body, wound on the drum in the normal way, is shown at 9.

Attached to the edge of the larger flange 2 is a recessed metal ring 10, in the recess of which is formed a narrow projecting ring 11. A similar recessed ring 12 is mounted on the outer face of the flange 5 near to its outer edge. The ring 12 is formed with a number of threaded apertures 13 and with a single aperture 14 through which access can be had to the steam outlet pipe 8.

Referring now to Figure 2 of the drawings, the cylindrical casing shown in this drawing is in two parts, 15 and 16, interconnected by a flexible U-shaped ring 17. Heating coils 18 and 19 are attached to the two parts 15 and 16 and interconnected by a pipe 20 passing over the flexible ring 17. A steam inlet pipe 21 is connected to the coil 15 and a steam outlet pipe 22 to the coil 16.

Two pipes 23 and 24 pass through the wall of the part 15 of the casing and a single pipe 25 passes through the wall of the lower part 16 of the casing.

The lower part 16 of the casing is formed with an inwardly projecting flange 26 which is secured to a supporting structure 27 for the casing. On the upper surface of the flange 26 is mounted a recessed ring 28 having packing material in its recess. A similar ring 29 projects in the form of a flange from the upper edge of the part 15 of the casing; the recess in this ring carries packing material 30.

A number of U-shaped clamps of which one only (31) is shown in Figure 2, are pivoted near the upper edge of the part 15 of the casing. On the under surface of the flange 26, are secured a number of apertured blocks 32, the apertures in which coincide with similar apertures in the flange 26.

Figure 3 shows the two parts described with reference to Figures 1 and 2 assembled together to form a fluid tight enclosure 33 for a cable body wound on the drum (not shown). In this drawing parts already described are given the same references as in Figures 1 and 2. It will be seen that the ring 11 in the recess of the ring 10, mounted on the larger flange of the drum, fits into the recess in the ring 29 which projects as a flange from the upper edge of the upper part 15 of the cylindrical casing. By tightening the clamps 31, the ring 11 is forced into contact with the packing 30 in the ring 29 to form a fluid-tight joint between the flange and the casing. A similar fluid-tight joint is made between the ring 12 mounted on the surface of the smaller drum flange 3 and the ring 28 mounted on the upper surface of the flange 26 which projects inwardly from the lower part 16 of the cylindrical casing. In this case the drum flange 3 is drawn towards the flange 26 by means of a number of threaded studs 34 which screw into the threaded apertures 13 in the ring 12 mounted on the face of the drum flange 3. These studs pass freely through the apertures in the blocks 32 and hence can be utilised for drawing the two flanges together by tightening nuts 35. The small degree of flexibility necessary to enable both joints to be made without distortion of the parts is provided by the flexible U-shaped ring 17.

Inside the cylindrical casing there are arranged three steam heaters each in the form of upper and lower header pipes 36 and 37 interconnected by a number of vertical pipes 38. Together these three heaters form a complete cylinder of a diameter a little less than the diameter of the barrel 1 of the drum. Each heater is carried by a pair of pivoted arms 39 secured to the lower header pipe 37 and pivoted to a fixed trunnion 40.

For simplicity a number of these trunnions have been omitted from Figure 3. The headers 36 are each connected by vertical pipes 41 (two only of which are shown) to a common steam chamber 42 supplied with steam through a pipe 43. The lower headers 37 are each provided with steam outlet pipes 44. Each of the pivoted arms 39 is provided with a rigid projection 45 which is adapted to make contact with the inner part of the lower face of the flange 3 of the drum as the drum is being lowered into position within the casing. This ensures that when the drum is brought into its final position within the casing, the arms 39 are pivoted towards the inner surface of the drum barrel to bring the vertical pipes 38 into contact or close proximity with the barrel 1 of the drum.

The pipes 23 and 24 in the upper part of the casing are permanently attached to a manifold 46 which can be connected alternately to a vacuum pump or a source of supply of impregnating compound for the cable body. The steam supply and outlet pipes 21 and 22 to the cylindrical casing and the steam supply and outlet pipes 43 and 44 to the inner heating structures can be permanently connected to a steam supply. It is necessary, however to make connections to the steam inlet pipe 7 and outlet pipe 8 for the heating coils 4 and 5 in the drum flanges 2 and 3 after the drum has been placed in position within the casing.

When the drum, carrying a cable body for drying impregnation, has been placed in position in the casing and the fluid-tight connections have been made by tightening the clamps 31 and by screwing the studs 34 into position and tightening the nuts 35, the drying operation can be carried out in accordance with normal practice by steam heating the cable body while the enclosure 33 is evacuated through the manifold 46 and /or the pipe 25.

When the cable body has been dried, impregnation may be carried out as follows. The vacuum is broken by admitting the cable impregnating compound to the enclosure 33 through the pipe 25 and the temperature of the cable body is maintained, by means of the various steam heating coils described, at a value sufficient to cause efficient impregnation of the cable body.

It will be seen that by means of this apparatus handling and bending of the cable body is reduced and the quantity of apparatus required is substantially less than was the usual practice in which the cable is wound on special drums or in special trays which are inserted in complete drying and impregnating chambers. It will also be seen that the space to be evacuated and to be filled with impregnant is much reduced. This particularly bears on the size of plant for treat-

ment of the impregnant itself in preparing it for use and regenerating it after repeated use.

What I claim as my invention is:

1. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

2. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a flexibly expansible cylindrical casing for enclosing the space between said flanges having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

3. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing comprising two cylindrical parts joined together flexibly in a fluid-tight manner for enclosing the space between said flanges and having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

4. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing comprising two cylindrical parts joined together in a fluid-tight manner by a flexible U-shaped metal ring projecting outwards from the said casing for enclosing the space between said flanges and having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

5. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure including heating elements disposed in a ring within said casing and means for bringing said elements into close proximity with said drum barrel when said drum is in position within said casing.

6. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges having at one end an inwardly projecting flange, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure comprising heating elements mounted on said casing, heating elements mounted on at least one flange of said drum and heating elements disposed in a ring within said casing in a position such that they are in close proximity with the drum barrel when it is in position within the casing.

7. Apparatus for treating an electric cable body comprising a drum, on which said cable can be wound, comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges having at one end an inwardly projecting flange, means for making a fluid-tight joint between the said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the end of said casing opposite to the flanged end and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure including heating elements disposed in a ring within said casing and means actuated by said drum as it is moved into position within said casing to bring said elements into close proximity with said drum barrel.

8. Apparatus for treating an electric cable body comprising a mounting for said apparatus, a drum on which said cable can be wound comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges mounted with its axis vertical on said casing, a flange projecting inwardly from the lower end of said casing, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the upper end of said casing and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-

tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

9. Apparatus for treating an electric cable body comprising a mounting for said apparatus, a drum on which said cable can be wound comprising a barrel and two flanges of different outside diameters, a flexibly expansible cylindrical casing for enclosing the space between said flanges mounted with its axis vertical on said casing, a flange projecting inwardly from the lower end of said casing, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the upper end of said casing and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure.

10. Apparatus for treating an electric cable body comprising a mounting for said apparatus, a drum on which said cable can be wound comprising a barrel and two flanges of different outside diameters, a cylindrical casing for enclosing the space between said flanges mounted with its axis vertical on said casing, a flange projecting inwardly from the lower end of said casing, means for making a fluid-tight joint between said inwardly projecting flange and the smaller flange of said drum, means for making a fluid-tight joint between the upper end of said casing and the larger flange of said drum, said casing and drum together forming a fluid-tight enclosure for said cable body, at least one opening in said fluid-tight enclosure for the passage of fluid and means for heating a cable body in said enclosure including heating elements supported on said mounting in a ring within said casing and means for bringing said elements into close proximity with said drum barrel when said drum is in position within said casing.

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No references cited.