

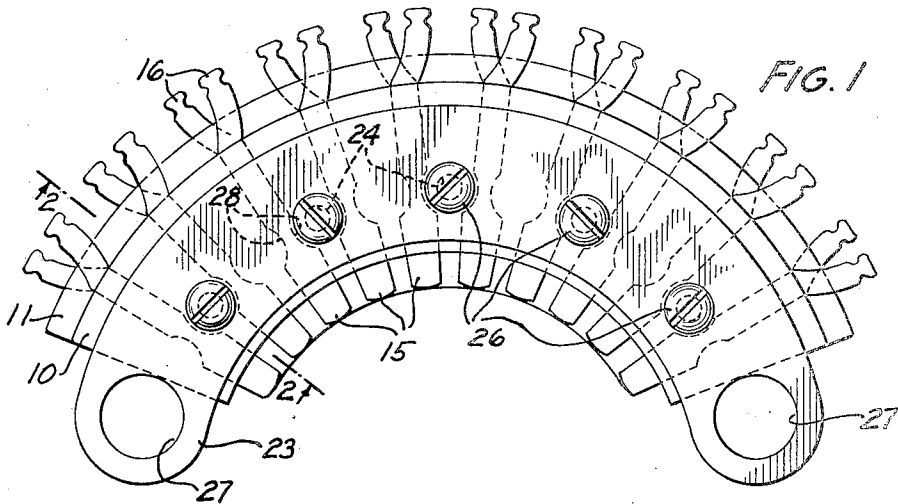
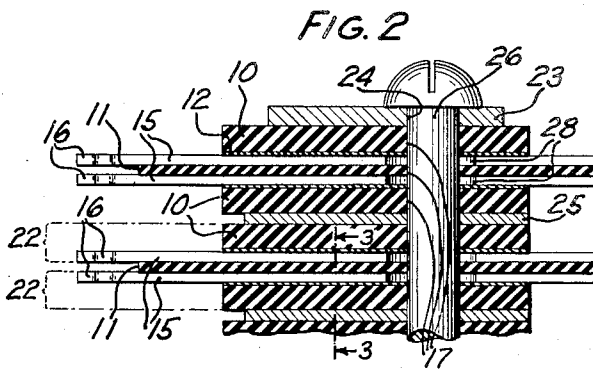
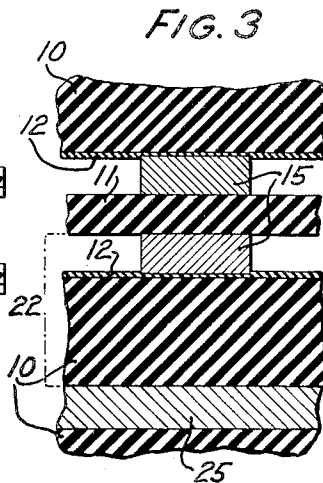
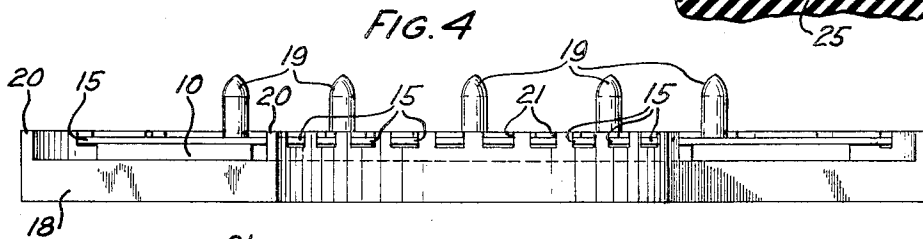
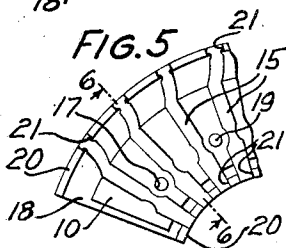
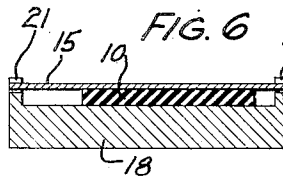
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COMPOSITE ARTICLE

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COMPOSITE ARTICLE

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7 Claims. (Cl. 175—306)

This invention relates to composite articles, and more particularly to terminal banks for rotary telephone switches.

One type of terminal bank used in telephone selector switches includes a plurality of superimposed or piled up rows of individual terminals arranged in groups of two rows spaced a desired distance apart by an insulator blank, the terminals of each row being uniformly spaced in a lateral direction. At one side this insulator blank lies flush with the ends of the terminals so as to space them a definite distance apart. Each group of terminals is spaced from the adjacent group a desired distance by a pair of spaced insulator blanks and a metal ground plate filling the space between the blanks. The whole pile-up of uniformly spaced groups of terminals with their insulator blanks and ground plates is clamped under pressure between upper and lower mounting plates with the terminals projecting on either side from the insulator blanks and the ground and mounting plates. In this type of terminal bank it has been difficult to provide a uniform desired spacing between the two rows of terminals of each group as well as between the groups due to variations in the thickness of the individual insulator blanks used in the pile-up. Furthermore, it has been the practice to rely chiefly on the carefulness in carrying out the assembly operations to prevent the individual terminals from being dislocated during their initial assemblage in the pile-up and in their final assemblage the pressure exerted on the clamped pile-up has been relied upon to maintain the individual terminals in their desired spaced relation. Due to the arrangement of the terminal bank above described it is not possible to provide vertical guides for positively locating the terminals during assembly.

An object of the present invention is to provide an improved composite article wherein the parts thereof have a desired spacing and are firmly united to prevent relative displacement therebetween.

In accordance with the above objects, wherein one embodiment of the invention is applied to the production of terminal banks of the type hereinbefore referred to, the terminal banks are built up from a plurality of previously formed terminal units, each unit comprising a row of terminals adhered to an insulator support of a selected thickness. Specifically, each unit comprises a completely cured phenol fibre strip or blank of a desired thickness and contour to form a support for the unit. The term "phenol fibre

blank" will be described in detail hereinafter. The side of the blank to which the terminals are to be adhered is coated with a thermosetting resin, such as phenol varnish, which preferably is allowed to dry before laying the terminals thereon. The phenol fibre phenol varnish coated blank for each terminal unit is selected for thickness so as to provide a desired overall height at the completion of its assemblage with the terminals. Thereafter the conducting terminals are deposited in a desired spaced arrangement upon the coated surface of the phenol fibre blank which is supported on a fixture. The blank with the terminals thereon is then placed between heating and compressing members and subjected to heat and pressure to bring them to a desired overall height during which the dry coating of phenol varnish upon the blank is first softened, thereby yielding under pressure, and while pressure is maintained the softened phenol varnish is cured. This results in a terminal unit of a desired overall height with the terminals firmly adhering to the blank in their desired spaced arrangement thereon. The method of assembling the units into a completed terminal bank will be described in detail hereinafter.

Other objects and advantages of this invention will more fully appear from the following description taken in connection with the accompanying drawing, wherein—

Fig. 1 is a top plan view of an assembled terminal bank comprising a plurality of superimposed composite terminal units embodying the features of this invention;

Fig. 2 is an enlarged fragmentary vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical section, still further enlarged, taken on the line 3—3 of Fig. 2;

Fig. 4 is a side view of a fixture which may be used in assembling the phenol fibre phenol varnish coated blanks and the superimposed conducting terminals;

Fig. 5 is a fragmentary top plan view of Fig. 4 on a reduced scale, and

Fig. 6 is an enlarged vertical section taken on the line 6—6 of Fig. 5.

A terminal bank comprising a plurality of superimposed composite terminal units embodying the features of this invention may be produced by first producing a number of arcuate-shaped strips or blanks 10 and 11 of different areas and thicknesses, each serving in the finished terminal bank in a particular manner which will be referred to hereinafter. The blanks 10 and

11 are formed from sheets of different areas and thicknesses, comprising laminations of fibrous material, such as paper or fabric, each lamination thereof having been impregnated with a phenolic condensation product and the whole united and completely cured by the application of heat and pressure to produce a sheet of an incompressible, infusible, and insoluble character and a desired accurate thickness, within tolerance limits, the blanks 10 and 11 then being cut from the sheets. The sheet material just described is commonly known as phenol fibre.

The sheet of phenol fibre from which the blanks 10 are formed and previous to the cutting of the blanks therefrom is preferably fairly heavily coated on one of its side surfaces, as indicated at 12 (Figs. 2 and 3), with a thermosetting resin in solution, such as phenol varnish, which is allowed to dry. The resin of course is not completely cured at this time. Phenol varnish which has been found suitable for coating the surface of this blank is of a type which upon drying for a suitable period of time will be flexible and non-brittle, but upon the application of heat and pressure it will rapidly change from a dry to a tacky state and then change from a tacky to a dry hardened and fully cured state, thus giving it good adhesive qualities. This coating 12 of phenol varnish, which after curing is infusible and insoluble, has excellent electrical insulation properties at high humidities.

While a phenol varnish comprising a solution of a phenolic condensation product is preferred for the coating, other thermosetting resins which harden under the action of heat may be employed, providing their dielectric properties are satisfactory.

Each terminal unit in the embodiment illustrated includes ten conducting terminal strips 15 of a desired thickness and contour which may be formed from brass sheets. At the rear each terminal is extended and offset to form a soldering portion 16.

Referring particularly to Fig. 2 a plurality of perforations 17 are formed in the phenol fibre blanks 10 and 11, which in the assembly of the blanks with the conducting terminals 15 into a terminal unit are aligned, the perforations being used in the assemblage of the blanks and the terminals 15 into terminal units and subsequently in the assembling of a plurality of terminal units into a finished terminal bank.

In uniting the phenol fibre blank 10 having upon one of its side surfaces a fairly heavy coating 12 of dried phenol varnish of the type previously described and a set of ten terminals into an integral terminal unit, the phenol varnish coated blank 10, which is selected as to thickness so as to provide a desired overall height when finally assembled with the terminals 15 and thereby an accurate and uniform spacing between the rows of terminals, is mounted upon an arcuate-shaped fixture (Figs. 4, 5 and 6) comprising a base 18 having a plurality of vertically disposed metal alining pins 19 which extend freely through the spaced perforations 17 formed in the blank. The opposite arcuate sides of the base 18 are provided with vertical flanges 20, each of which upon its upper surface is formed with a plurality of notches or nests 21 having a predetermined uniform spacing and depth.

After the accurate positioning of the blank 10 upon the base 18 in the manner described the

assembling fixture is located under a mechanism (not shown) which includes ten supply magazines for the terminals 15 having discharge openings for each of the terminals, the openings being spaced for alinement with the nests 21 in the opposite flanges 20 of the base 18 when the fixture is correctly located thereunder, for supplying to and locating the terminals on top of the phenol varnish coated upper surface of the blank 10 in their accurate desired positions. The terminal supplying mechanism is then operated and ten terminals 15 are deposited on top of the blank 10, the opposite ends of the terminals being located in the nests 21 which serves to prevent their displacement relative to each other and to the blank in subsequent assembly operations, their relative positions being shown in Figs. 1 and 5. The terminals may of course be placed in the nests 21 by hand if desired. The assemblage of the superimposed blank 10 correctly positioned and retained upon the base 18 by the pins 19 and the terminals 15 correctly located and retained on the blank by their opposite ends positioned in the nests 21 of the flanges 20 of the base 18 is then inserted between compressing members (not shown), the upper one being a heating member, the projecting ends of the pins 19 being aligned with suitable apertures provided in the adjacent heating member. The lower surface of the heating member is preferably formed with extending portions which have a lateral spacing similar to that of the terminals 15 and aligned therewith so that the heat is applied directly to the upper surfaces of the terminals where it is needed to soften the phenol varnish coating on the blank 10, directly under the terminals, and consequently the coated surface of the blank between the terminals is not so greatly affected. The heating and compressing members are then relatively moved to compress the assemblage of the blank 10 and the terminals 15, the fairly heavy coating of phenol varnish directly under the terminals first softening and then yielding under pressure until a desired overall height of the blank and terminals is reached, which is reached when stop surfaces on the heating and compressing members engage each other. The heating member above referred to is heated in any suitable manner and the heat applied to the phenol varnish not only softens the varnish to cause it to yield, but is applied long enough to cure and harden the varnish as is well understood in the art of thermosetting resins. Thereafter the assemblage comprising the blank 10 and the terminals 15 is cooled either by room temperature after ceasing to apply heat to the heating member or by applying a cooling medium thereto by suitable means and simultaneously therewith the compressive action on the superimposed blank and terminals is maintained. The finished terminal units are indicated by the numeral 22 (Figs. 2 and 3). With the termination of the cooling step the terminals 15 are firmly united to the phenol varnish coated top surface of the phenol fibre blank 10 due to the adhesive action of the phenol varnish between the terminals and the blank, which varnish upon the setting or baking thereof becomes hard and cured and provides a firm bond between the parts. The resultant integral structure has a desired overall height and the terminals 15, due to their adherence to the top surface of the blank 10, will not be dislocated in subsequent handling of the terminal units 22 prior to or during the final assemblage operations into a finished terminal bank.

It is to be understood that during the application of heat and pressure to the superimposed phenol fibre phenol varnish coated blank 10 and the terminal 15, no change in the individual thickness of the blank 10 occurs, since the blank, as hereinbefore described, has been completely cured before assemblage with the terminals 15 into an incompressible, infusible, and insoluble blank.

Since the heating and compressing operations may be performed in any convenient apparatus, a disclosure of a specific apparatus for accomplishing these operations is not believed necessary to a full understanding of this invention and have been omitted.

Although in the above described method of forming terminal units to a desired overall height it is stated that the phenol fibre blank 10 and the terminals 15 are of selected thicknesses and the blank as being fairly heavily coated with a thermosetting resin, which upon being softened yields under pressure to a thickness governed by the stops on the heating and compressing members to provide a desired overall height to the unit; if the blanks and terminals are sufficiently carefully selected as to thickness the stops may be omitted and sufficient pressure applied to insure a layer of coating material of negligible thickness between the blank and the terminals. In this case less coating material is required.

In producing a multiple unit terminal bank, referring particularly to Figs. 1 and 2, which includes a pile-up of predeterminedly spaced and aligned preformed terminal units 22 of the type previously described, there are provided top and bottom mounting or clamping plates 23 of metal, the top plate only being shown. The plates 23 are arcuate-shaped and formed with a plurality of perforations 24 similar to and spaced for alinement with the perforations 17 formed in the phenol fibre blanks 10 and 11. In assembling the bank the bottom plate is first positioned on an assembling fixture (not shown) provided with a plurality of removable vertically disposed metal alining pins which register with the aligned perforations of the various terminal units 22, spacers, and plates used in building a finished terminal bank. Upon the top of the lower clamping plate 23 is positioned a preformed terminal unit 22 and upon the top of the latter a phenol fibre blank 11 of the type previously described. Another preformed terminal unit 22, only reversed in position so that the lower surfaces of the conducting terminals 15 will abut the upper surface of the phenol fibre blank 11, is then positioned on top of the latter blank. This is followed by placing an arcuate-shaped perforated metal ground plate 25 of a desired thickness on the upper surface of the phenol fibre blank 10 of the last mentioned terminal unit 22. Thereafter another preformed terminal unit 22 with the terminals 15 thereof uppermost is positioned on the top of the ground plate 25 and then the order of assembly of the preformed terminal units 22, phenol fibre spacer blanks 11, and ground plates 25 is continued until the desired number of terminal units have been superimposed upon the pins of the assembling fixture to provide a terminal bank of the desired number of terminals. Upon the uppermost terminal unit 22 of the bank the upper mounting or clamping plate 23 is positioned. Thereafter the pins of the assembling fixture are removed, one or a small number at a time, preferably in the following manner: First, one of the end pins is removed and a screw

26 is passed through the aligned perforations of the blanks and plates, and then the opposite end pin is replaced by a screw 26, and so on until all of the pins have been replaced by screws. Since the screws 26 accurately fit the perforations of the blanks and plates they serve to firmly hold the units 22 and plates from relative longitudinal and lateral displacement, when removed from the fixture. The assembly with the associated screws 26 is then removed from the fixture and nuts are then threaded onto the ends of the threaded ends of the screws and tightened until the required overall height of the assembled terminal bank is reached.

The upper and lower mounting or clamping plates 23 are formed with the usual perforations 27 in order that the terminal bank may be secured to the switch frame. It will be noted, referring to Fig. 1, that the conducting terminals 15, which are disposed close to the screws 26, are notched, as indicated at 28, upon opposite edges and in line with the screws so that no short circuit or path of low conductance between the terminals and the screws at this point can occur.

From the above description it will be apparent that by practicing the method of the invention a terminal bank may be economically and efficiently produced wherein the several rows of preformed terminal units predeterminedly spaced from each other by insulating and metal spacing strips and plates, respectively, of selected accurate thicknesses will have a desired accurate spacing upon complete assemblage into a bank and the individual terminals of each row will be maintained firmly in their desired laterally spaced relation. This primarily results from the described methods of preforming the individual terminal units 22 from completely cured phenol fibre strips 10 of selected thicknesses and having the described surface coating 12 of phenol varnish on one side with the conducting terminals 15 accurately arranged on top of the coated surface. The assembled strip and terminals comprising the terminal unit 22 is thus formed into a firmly united composite structure of a desired overall height wherein the strip and terminals are firmly bonded to each other due to the adhesive action of the phenol varnish coating on the phenol fibre strip upon completion of the heating and compressing steps of the method.

While a manual method of assembling the preformed units 22 into completed banks has been described, the terminals are sufficiently firmly attached to the insulating strips that if desired machine methods of assembly may be used.

While the foregoing describes but one embodiment of a composite article of this invention, it will be understood that the invention is capable of application to other types of articles and is only limited by the scope of the appended claims.

What is claimed is:

1. A unit for use in building a multiple unit terminal bank, said unit comprising an insulating strip, a series of terminals and an adhesive securing said terminals to said strip, said adhesive consisting of a thermosetting resinous material cured under heat and pressure to make a good bond between the strip and the terminals and to bring their combined thickness to a desired value.

2. A terminal bank comprising a plurality of units, each unit comprising an insulating base having terminal strips secured thereto by a fully cured thermosetting resin, the units being individual and preformed to a predetermined size

and means for clamping the units together to form a single unitary structure.

3. A terminal bank comprising a plurality of units, each unit comprising an insulating base having terminal strips secured thereto by a fully cured phenol varnish, the units being individual and preformed to a desired overall height, and means for clamping the units together to form a single unitary structure.

4. A terminal bank comprising a plurality of units, each unit comprising a base of completely cured phenol fibre of an accurate thickness having terminal strips secured thereto by a fully cured thermosetting resin, the units being individual and preformed to a predetermined size, and means for clamping the units together to form a single unitary structure.

5. A terminal bank comprising a plurality of units, each unit comprising an insulating base of an accurate thickness having a plurality of laterally spaced metal terminal members of a desired thickness secured thereto by a fully cured thermosetting resin, the units being individual and preformed to a desired overall height, and means for clamping the units together to form a single unitary structure.

6. A terminal bank for telephone exchange systems comprising a plurality of units, each unit comprising a base of completely cured phenol fibre of an accurate thickness having a plurality of laterally spaced metal terminal members of a desired thickness secured thereto by a fully cured phenol varnish, the units being individual and preformed to a desired overall height, and means for clamping the units together to form a single unitary structure.

7. A terminal bank for telephone exchange systems comprising a pile-up of units alternately reversed in position and alternate elements of insulation and electrical conducting material of a predetermined accurate thickness between successive terminal units, each of said units comprising an insulating base having a plurality of laterally spaced metal terminal members of a desired thickness secured thereto by a fully cured thermosetting resin, the units being individual and preformed to a desired overall height, and means for clamping the units together to form a single unitary structure.

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