

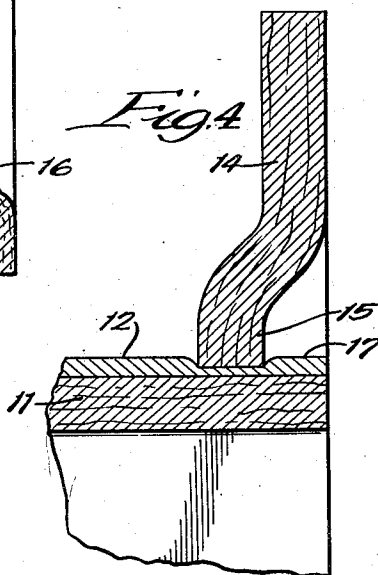
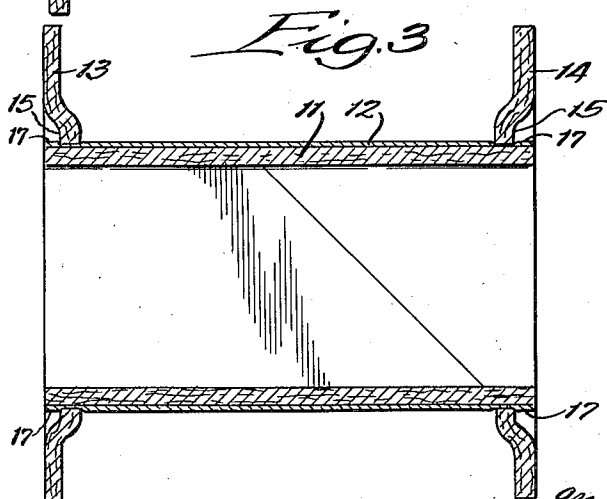
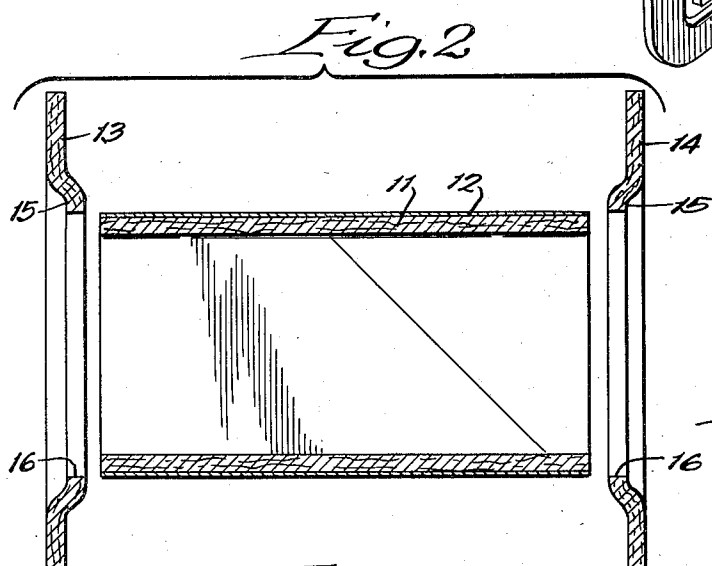
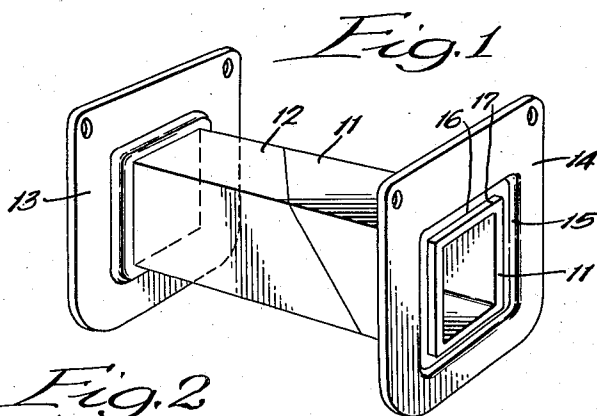
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BOBBIN

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BOBBIN

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This invention relates to bobbins and to a process for making them; in particular, it concerns an improved bobbin or coil form of the type commonly employed in industry for holding transformer windings and the like, and to a method of making such bobbins or coil forms.

Coil forms or bobbins of the type here under consideration have a very extensive use in the electrical industry, millions of them being used annually in the United States as supports for electrical windings. Such a form or bobbin consists, in general, of a core—which may be circular, square, or rectangular in cross section—provided at its respective ends with terminal flanges which extend radially outward at right angles to the axis of the core. In the most commonly used form, the core is made of laminated paper and the terminal flanges are formed of hard fiber.

In the prior art, so far as we are aware, such coil forms have been universally made by placing the flanges on the ends of the core and then swaging the core ends to lock the flanges in place. In many cases, to prevent the swaging action from forcing the flanges too far inward along the core, the core has been provided with a central zone of larger dimensions than its terminal zones, as by covering the laminated paper core with an additional sleeve of paper or fiber. This central zone of increased dimension would, during the swaging operation, serve as an anchor for the flanges and, after swaging, the flanges would be securely locked between the outer ends of the increased-dimension zone and the swaged extremities of the core proper.

The mode of manufacture just described has been in universal use for a number of years and has been highly satisfactory so far as the performance of the end product is concerned. It is a relatively expensive manufacturing technique, however, for the reason that each individual form or bobbin must be subjected to mechanical swaging—an operation which calls for expensive machinery and which consumes considerable time.

We have, in the present invention, provided a means of making bobbins or coil forms of the type just described which produces an end product fully as satisfactory as the bobbins made by the swaging technique and at a much-reduced manufacturing cost. Bobbins made by our process have very great mechanical strength, are consistently uniform in dimensions, and can be processed in batches of several hundreds or thousands at one time, in contrast to the swaging of the prior art which must be performed individually on each bobbin.

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It is accordingly a major object of our invention to provide a method of making coil forms wherein terminal flanges are anchored in place by chemical-mechanical means, without swaging, and without the use of centering sleeves or any equivalents thereof.

Another object of our invention is to provide a coil form or bobbin which, while possessing great mechanical strength and rigidity, can be assembled, and its terminal flanges locked in place, in a single mass operation, hundreds or thousands of forms being simultaneously processed.

Still another object of our invention is to provide a bobbin or coil form comprising a plastic-coated laminated core equipped with terminal flanges chemically locked in place by swelling the plastic core after the flanges are snugly fitted thereover.

A still further object of our invention is to provide a novel chemical bath in which bobbins or coil forms made according to our method can be treated en masse to anchor the terminal flanges to the core by chemical action, without necessity for swaging.

Other objects and advantages of our invention will appear as the specification proceeds.

The appended drawing shows an illustrative embodiment of our novel coil form, made according to the process of our invention. In the drawing, Figure 1 is a perspective view of a coil form or bobbin embodying our invention; Fig. 2, a side view in cross section of the coil form of Fig. 1 as it appears prior to assembly, with the core and terminal flanges shown separately; Fig. 3, a sectional view similar to Fig. 2 but showing the appearance of our coil form after the terminal flanges have been placed in correct position on the core and anchored therein by being subjected to treatment in a chemical bath; and Fig. 4, a greatly enlarged fragmentary view of a portion of Fig. 3, showing in detail the manner in which the terminal flange is secured to the core after chemical processing.

In carrying out the process of our invention, we provide laminated paper cores, which may be conventional, with a thin layer of plastic, preferably cellulose acetate, wound over the surface of the core to form a continuous single layer thereon. Such winding can easily be done in the course of manufacturing the cores. On the drawing, the core of the coil form therein illustrated is denoted 11 and the plastic layer deposited thereon is denoted 12.

The terminal flanges, which may be conven-

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tional in all respects, are denoted respectively 13 and 14. In the illustrated embodiment, each of the flanges is equipped with an axial indentation 15, and the indentation 15 surrounds a central aperture 16 which conforms in shape and size to the surface of core 11 as covered by plastic layer 12. That is, terminal flanges 13 and 14 are stamped with central apertures which will fit snugly but readily over core 11.

In the case of the particular embodiment shown, providing flanges 13 and 14 with the indentations 15 permits the construction of a coil form in which the outer perpendicular surfaces of flanges 13 and 14 are flush with the respective ends of core 11, there being nevertheless a small zone 17 of core 11 projecting beyond the apertures 16, as may be best seen in Figs. 3 and 4.

Flanges 13 and 14 are placed over core 11 in the position which it is desired they occupy when the coil form is finished. This may be done mechanically or by hand, according to the magnitude of the manufacturing operation. The coil form, along with as many hundreds or thousands of similar coil forms as the size of the facilities will permit, is then placed in a chemical bath operative to soften and swell the plastic layer 12. Exposure to the bath for an interval from one to five seconds results in substantial swelling of all the plastic layer 12 which is able to contact the bath. As a result, the plastic layer promptly swells, as indicated in Figs. 3 and 4, and securely locks the flanges 13 and 14 into proper position on core 11.

After the forms have been removed from the bath, they are dried—preferably by exposure to controlled heat in an oven—and are then ready for shipment or use.

We have found that the mechanical strength of coil forms made according to our invention is fully equal to, and in some cases exceeds, the mechanical strength of similar coil forms made according to the prior-art swaging method.

The chemical composition of the treating bath may take any desired form within wide limits. In general, the treating bath should comprise a moderate amount of a swelling agent combined with substantially greater quantities of solvent. While wide discretion in the choice of solvents and their proportions may be allowed, the composition employed will greatly influence the length of time required for the bath to effect the swelling and setting actions which in our invention accomplish the anchoring of the flanges to the core. We have found that effective yet extremely rapid results can be obtained when the swelling agent is combined with a plurality of solvents having radically different time characteristics. In our most satisfactory compositions, we have employed a relatively small quantity of a mild solvent combined with larger and substantially equal quantities of an active solvent and an extremely active solvent.

The swelling agent, when cellulose acetate is employed as the plastic coating on the core, may be selected from among the ketones; we have found methyl isobutyl ketone particularly satisfactory.

While it is not necessary in most cases, we have found helpful the addition to the bath of a small quantity of plasticizer. This ingredient prevents the plastic layer from becoming brittle and thus increases the ability of the completed bobbins to withstand mechanical abuse. We have found dibutyl phthalate and tri(2-chloroethyl) phosphate satisfactory plasticizers for this purpose.

Following are two examples of bath composi-

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tions found to be highly successful in practicing the method of our invention:

Example I

A bath was made up of 60 parts of tetrahydrofuran, an extremely active solvent for cellulose acetate, 50 parts of acetone, a somewhat less active solvent, and 20 parts of ethylene glycol monomethyl ether, a mild softening solvent, and 10 parts of methyl isobutyl ketone, the swelling agent. The ingredients were mixed thoroughly at room temperature, and the bath was then ready for use. It was found that excellent results were obtained with this bath when the coil forms were placed in it for a period of five seconds.

Example II

A chemical bath for carrying out our invention was prepared by employing 64 parts of furfural, 40 parts of ethylene glycol monomethyl ether, and 40 parts of methyl isobutyl ketone. These ingredients were mixed thoroughly at room temperature and to them was added one part of dibutyl phthalate. The resulting bath was employed at room temperature in the practice of our invention. It was found that immersion of the coil forms in the bath for intervals of one to five seconds effectively swelled the plastic coatings on the cores and provided excellent anchorage for the terminal flanges.

It will be understood, of course, that the construction shown in the drawing, which employs the axial indentations 15 in the terminal flanges, is merely a preferred form. If the application does not require that the surface of the flanges be flush with the ends of the core, planar terminal flanges may be employed.

While we have in this specification described in detail a particular embodiment of our invention, and certain particular techniques for practicing our process, it will be understood that these are for illustration only. Many variations, both in the product and the process, will occur to persons skilled in the art without departing from the spirit of our invention.

We claim:

1. A bobbin comprising a core having a thin outer layer of plastic adapted to swell upon application of appropriate swelling agents, and a flange fitted snugly over said core and plastic intermediate the ends of said core, said flange being anchored to said core by swollen zones of enlarged thickness of said plastic on both sides of said flange.

2. A bobbin comprising a core having a thin outer layer of plastic extending from end to end thereof and adapted to swell when subjected to the action of suitable swelling agents, and a pair of terminal flanges fitted snugly over said layer and core intermediate the ends thereof, said flanges being anchored to said core by swollen zones of enlarged thickness of said plastic on both sides of said flanges.

3. A bobbin comprising a core having a thin outer layer of cellulose acetate and a flange fitted snugly over said layer and core intermediate the ends thereof, said flange being anchored to said core by swollen zones of enlarged thickness of said acetate substantially abutting said flange on both sides thereof.

4. A bobbin according to claim 1 wherein the flange has a central aperture and an axial deformation therearound operative to permit the plastic layer to extend on both sides of the central aperture when the principal portion of the

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flange is substantially flush with the end of the core.

5. A bobbin according to claim 2 wherein said core is of uniform cross section throughout its length, and the flanges are provided with central apertures and with symmetrical axial deformations operative to permit the plastic layer to extend on both sides of both flanges when the principal portions of the respective flanges are oriented substantially flush with the respective ends of the core. 10

6. A bobbin, comprising a core having a uniform cross section throughout the length thereof, said core having a thin outer layer of a normally hard material adapted to swell upon the application of suitable swelling agents, at least one flange snugly received about said core intermediate the ends thereof, each of said flanges being firmly anchored to said core by swollen zones of said material providing enlargements substantially abutting each flange on both sides thereof. 20

7. A bobbin, comprising a core having an outer surface composed of a normally hard material adapted to swell in response to the action of

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suitable swelling agents, at least one flange snugly received about said core intermediate the ends thereof, each flange being firmly anchored to said core by swollen zones of said material providing abutments on both sides of each flange. 5

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