

Sept. 24, 1968

J. A. KLATTE ETAL

3,403,366

PLUG-IN TRANSFORMER STRUCTURE

Filed Aug. 29, 1966

4 Sheets-Sheet 1

FIG. 1

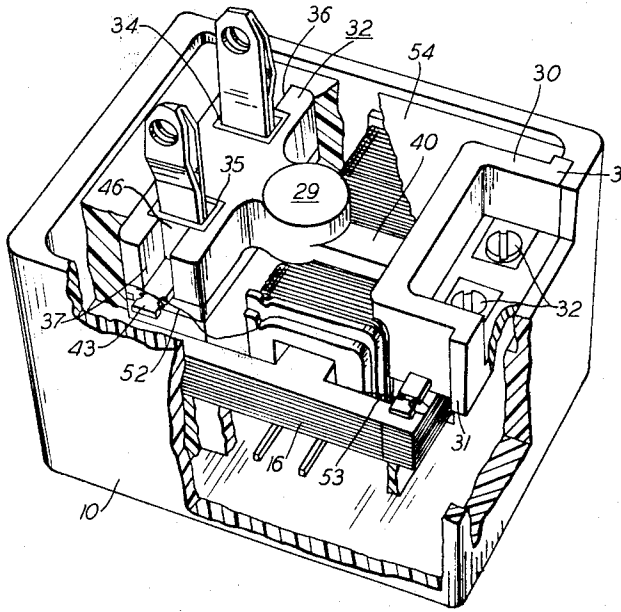
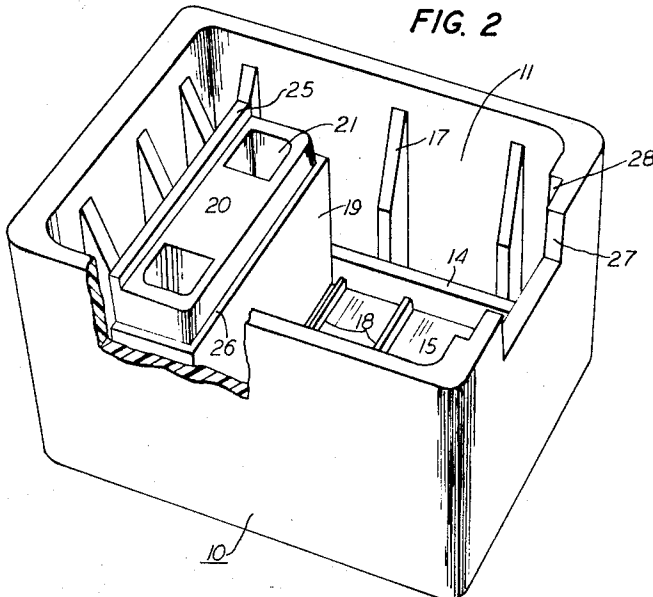


FIG. 2



INVENTORS
JOHN A. KLATTE
JOSEPH C. DILL

Charles E. Groues

ATTORNEY

Sept. 24, 1968

J. A. KLATTE ET AL

3,403,366

PLUG-IN TRANSFORMER STRUCTURE

Filed Aug. 29, 1966

4 Sheets-Sheet 2

FIG. 3

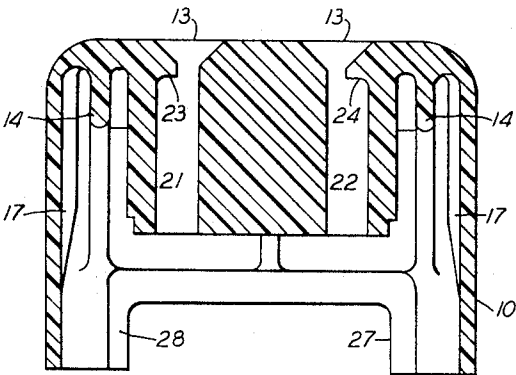
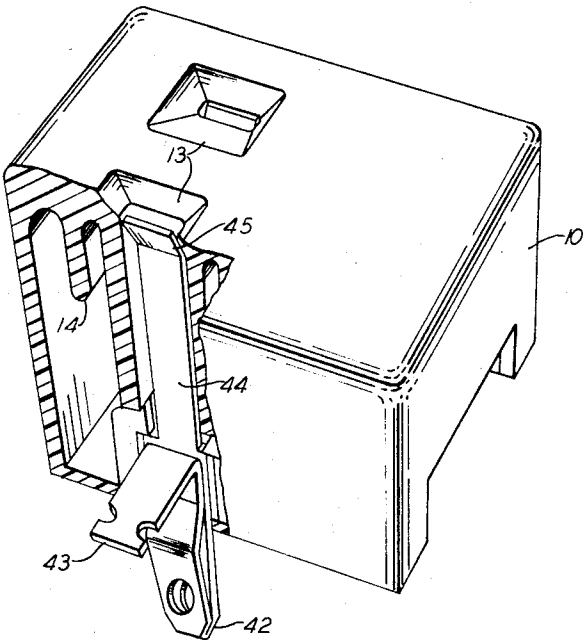


FIG. 4A

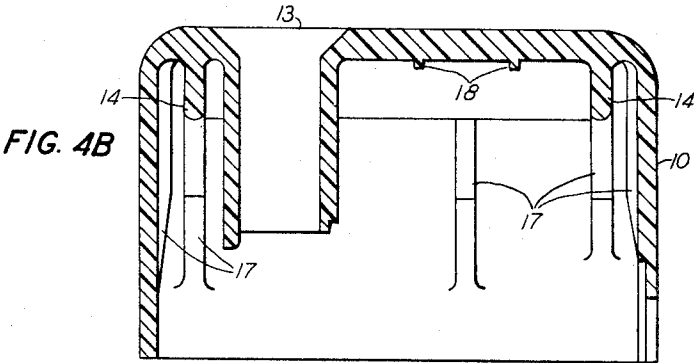


FIG. 4B

Sept. 24, 1968

J. A. KLATTE ETAL

3,403,366

PLUG-IN TRANSFORMER STRUCTURE

Filed Aug. 29, 1966

4 Sheets-Sheet 3

FIG. 5A

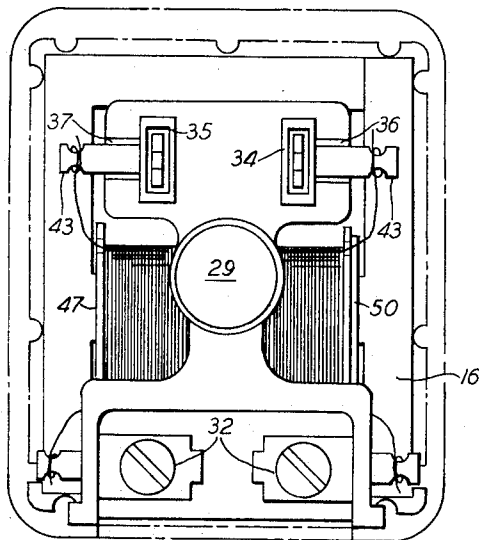
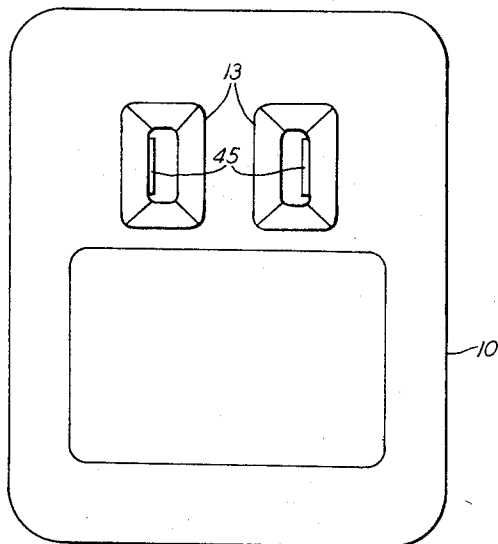


FIG. 5B



Sept. 24, 1968

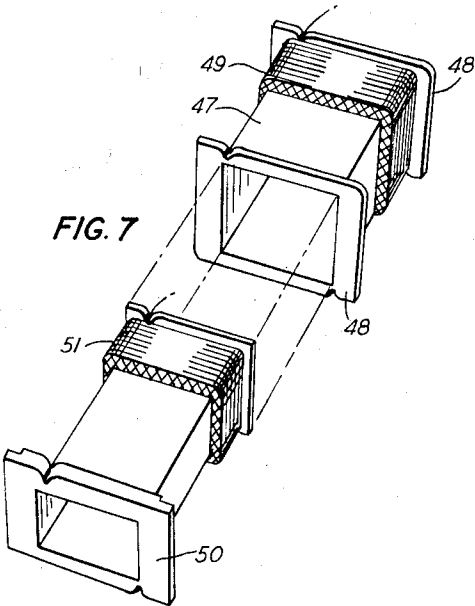
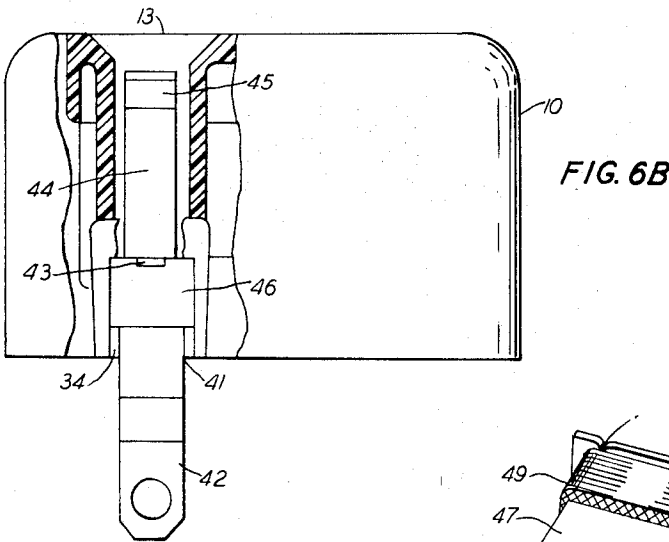
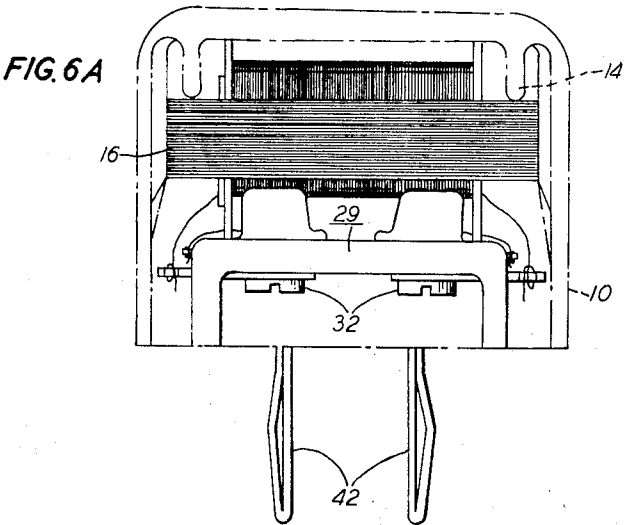
J. A. KLATTE ETAL

3,403,366

PLUG-IN TRANSFORMER STRUCTURE

Filed Aug. 29, 1966

4 Sheets-Sheet 4



1

3,403,366

PLUG-IN TRANSFORMER STRUCTURE

John A. Klatte, Dover, N.J., and Joseph C. Dill, Indianapolis, Ind.; said Klatte assignor to Bell Telephone Laboratories Incorporated, Murray Hill, N.J., a corporation of New York, and said Dill assignor to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

Filed Aug. 29, 1966, Ser. No. 575,798

7 Claims. (Cl. 336—92)

ABSTRACT OF THE DISCLOSURE

A plug-in transformer consists of a one-piece molded casing with a raised interior portion at one end containing an auxiliary outlet. The winding is supported on ribs molded into the sides and floor of the casing, and includes a telescoping secondary to facilitate assembly and packaging. The device is low in profile and hence suitable for use in home and office wall outlets.

This invention concerns plug-in transformers and particularly those used on telephone customer's premises to supply reduced voltage from a standard 110 volt outlet to power special features of certain telephone sets.

Plug-in transformers are used routinely today with sets having dial lamps, recall circuitry, home interphone or other special features whose power needs cannot be provided readily through the central office connection. Such transformers are plugged into a nearby receptacle on the premises and a power cord is run from the transformer to the set.

While seemingly a simple enough device, this type transformer has been found troublesome in use in several respects. Their profile, for example, has interfered in many instances with the customer's use of the adjacent outlet or even with use of his furniture space. Reductions in size heretofore proposed which correct the profile, however, have required the components to be so tightly packed as to risk their eventual malfunction. Any such risk in respect to a telephone company-provided item plugged into a 110 volt customer's circuit fused typically at 20 amperes is, of course, intolerable.

A further problem with earlier plug-in transformers is that they monopolize at least one outlet and, in some instances, owing to undue overlap, they effectively rule out use of the adjacent outlet in a double receptacle.

There is, in addition to the problem of transformer configuration, the closely related problem of production costs. These costs usually are reduced when fewer components are needed to achieve a desired function. In many prior art plug-in transformers, a large number of components have contributed to a relatively high unit cost.

Accordingly, one object of this invention is to reduce the volume occupied by plug-in type transformers without increasing the risk of malfunction.

Another object of this invention is to reduce the number of components in such transformers and therefore their unit cost also.

A further object of this invention is to eliminate the objectionable monopolizing of customer's electrical outlets by such transformers.

These and other objects are realized pursuant to the invention, broadly, by employing a core with unsymmetrical windows and by incorporating a combination plug and receptacle in the larger window. The plug-receptacle is mounted in a unitary terminal block molding that fits at one end onto a projecting support in the interior of the transformer casing. The core itself rests

2

on a ridge on the bottom perimeter of the casing. The second end of the terminal block engages the casing's side wall above the adjacent end of the core. The core windings are square and disposed below the terminal block, between its second end and the casing's support for its plug-receptacle end.

A feature of the invention resides in a unique spatial integration of a molded transformer casing and a mating one-piece block that supports all electrical terminals.

Another feature of this invention concerns use of a core with unsymmetrical windows, the larger one accommodating a plug-receptacle.

An added feature of the invention involves disposing the transformer core on a ridge in the bottom of the casing, insulated from the transformer top by a space and from the transformer rear—the part adjacent the customer's wall—by a non-heat conducting molding.

A further feature of the invention is the mounting of the plug-receptacle prongs through the mentioned protruding interior support of the casing.

Another feature of the invention relates to the one-piece molding both of the casing with all supports and of the terminals, making for a very small number of assembly parts.

Still another feature of the invention relates to the combination of the above features with a telescoping, space-saving transformer winding spool.

These and other objects and features of the invention are implicit in the detailed description to follow of an illustrative embodiment thereof and in the drawing in which:

FIG. 1 is a perspective view in partial section of the transformer assembly;

FIG. 2 is a perspective view of the transformer casing;

FIG. 3 is a top perspective view in partial section of the transformer;

FIG. 4A is a front section view of the casing;

FIG. 4B is a side section view of the casing;

FIG. 5A is a rear view of the terminal block and core assembly;

FIG. 5B is a top view of the casing;

FIG. 6A is a side view of the terminal block and core assembly;

FIG. 6B is a front view in partial section, showing the prong assembly; and

FIG. 7 is a schematic of the transformer core.

The transformer casing 10, seen in FIGS. 1 through 4B, comprises an open rear 11 and a closed front 12 with inlets 13 for receiving a conventional male plug. A ridge 14 rises from the periphery of floor 15 of casing 10, forming a closed loop on which transformer core 16 rests. Casing 10 also includes on all four interior sides a plurality of braces 17, and also a plurality of floor braces 18 running between the long sides of ridge 14.

Molded integrally with casing 10 is support 19 which rises from one end of floor 15, just inside of the adjacent span of ridge 14 and symmetrically with respect to the long sides thereof. This is best seen in FIGS. 4A and 4B. Support 19 includes a central core 20 defining two passages 21, 22 with respective end shelves 23, 24, and which open onto inlets 13. The outer top side of support 19 culminates in a raised edge 25, with a lower offset shelf 26 around the other three sides of support 19.

A notch 27 in the far side of casing 10 provides entry for power leads (not shown). Surrounding notch 27, an inset 28 serves as one support of a one-piece terminal block 29.

Terminal block 29, as best shown in FIGS. 1, 3 and 5A, comprises an end 30 with a recess 31 for mounting a pair of terminal strips 32. The opposite sides of end 30 are winged to fit snugly within inset 28 of casing 10. The

other end 33 of block 29 comprises a pair of rectangular through slots 34, 35, and notches 36, 37 between the sides of end 30 and the respective slots 34, 35. A lip 38 on the underside mates with edge 25 of core 20, and a flange 39 running along the other three undersides of end 33 seats over the offset shelf 26 of core 20. As seen in FIG. 6B, the underside surface of end 33 rests on the planar surface that includes core 20. A neck 40 joins ends 30 and 33 of terminal block 29.

Fitting into slots 34, 35 of block 29 are two-prong assemblies 41, shown in FIGS. 1 and 6B. Each assembly 41 comprises a conductive male plug end 42, a terminal 43, a leg 44 with an offset end 45, and an insulative tapered mounting block 46. Notches 34, 35 are tapered to accommodate blocks 46, with the legs 44 thereby extending down into the passages 21, 22 so that the offset ends 45 are adjacent inlets 13 as seen in FIGS. 5B and 6B.

Transformer core 16 is comprised of conventional laminations characterized, in accordance with one aspect of the invention, by one window being wider than the other. Core 16 rests on ridge 14, as seen in FIG. 6A; and its wider window accommodates itself around the support 19 as seen in FIG. 1. Core 16 is thus raised off of floor 15 but is well away from the open side of casing 10.

FIG. 7 shows a telescoping spool arrangement for the transformer windings. Outer spool 47 is box-like with flanges 48 at both ends. The outer windings 49 are wound thereon. Inner spool 50 is a smaller box that mounts inner windings 51 and fits into outer spool 47 in the manner shown. The core laminations are then assembled with the windings disposed on the center leg as seen in FIG. 1. Connections 52 are made between the terminals 43 of each prong assembly 41 and opposite ends of outer winding 49. Connections 53 are made between the terminal strips 32 and opposite ends of inner winding 51.

The top surface of ends 30, 33 of terminal block 29 are generally lower than the edges of open rear 11 of casing 10 as illustrated in FIG. 1. As thus assembled, the unoccupied interior volume of casing 10 is filled with a non-heat conductive substance 54 such as epoxy, to the level of the ends 31, 33 top surfaces.

Transformers made in accordance with the above-described invention need have as little as 1" of protruding profile as contrasted to the 1.5" profiles of the prior art. Although inconsequential at first glance, this difference makes possible the flush positioning of desk furniture against a wall where heretofore the desk abutted the transformer. The volume reduction over the previously used transformer amounts to almost 50 percent, which accounts for the new transformer's unobtrusiveness and non-interference with adjacent outlets. Yet it is seen readily that the components are not unduly packed together. Importantly, the receptacle built in to the new transformer pursuant to the invention restores to the customer's premises the use of the outlet that once was lost to the telephone transformer. Despite these advantages, the new transformer's unit production costs are substantially less than known predecessors, owing to the inventive packaging arrangement and to the integration of many components into a one-piece casting.

It is to be understood that the embodiment described herein is merely illustrative of the principles of the invention. Various modifications may be effected by persons skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A plug-in transformer comprising a one-piece casing having an open side and an interior floor; a core support extending upwardly adjacent the perimeter of said floor; an elevated support extending upwardly from one end of said floor inwardly of and substantially higher than said core support; a core resting on said core support and comprising two unsymmetrical windows, the larger window being disposed around said elevated support; a one-piece terminal block comprising a first end including means mounting a pair of prong connectors therein each extending out of said open side and into one of said passages, a second end including an output terminal pair, means supporting said first end on said elevated support, and means supporting said second end on an interior wall of said casing; and windings centrally mounted on said core and connected to said prong connectors and said output terminals, said windings and core being disposed beneath said terminal block.

2. A transformer in accordance with claim 1, wherein said prong connector mounting means comprises a pair of slots and a notched cavity between each said slot and the adjacent side surface of said terminal block first end, said slots being aligned with the passages of said elevated support.

3. A transformer in accordance with claim 2, wherein each said prong connector further comprises an intermediate offset terminal extending through and supported in the adjacent notched cavity; and a mounting block located intermediate said offset terminal and the outwardly-extending prong end and frictionally fitting into one of said slots.

4. A transformer in accordance with claim 3, wherein said means for supporting said terminal block first end comprises a raised outer edge upon the top of said elevated support, an offset ridge beneath said top, a groove on the underside edge of said first end for engagement with said raised outer edge and a lip beneath said groove for engagement with said offset ridge, the top of said first end thereby being situated slightly lower than the adjacent rear rim of said casing.

5. A transformer in accordance with claim 4, wherein said terminal block second end comprises a recessed interior bounded by a pair of wings and wherein said means for mounting said second end on said casing comprises an inset in the end interior wall of said casing for accommodating said wings.

6. A transformer in accordance with claim 5, wherein said casing further comprises a notched entrance adjacent said recessed interior of said terminal block second end, serving as a wire outlet.

7. A transformer in accordance with claim 5, wherein the unoccupied interior volume is filled with an epoxy or the like.

References Cited

UNITED STATES PATENTS

2,583,353	1/1952	Bishofberger	336—92 X
2,641,743	6/1953	Bonanno	336—92 X
3,201,617	8/1965	Pacoroni et al.	321—8 X
3,255,399	6/1966	Panks	174—52 X

LEWIS H. MYERS, *Primary Examiner.*

T. J. KOZMA, *Assistant Examiner.*