

ELECTRICAL EQUIPMENT ENCLOSURE

This invention relates to an electrical equipment enclosure, principally but not exclusively a consumer unit for use in an electrical wiring system of, for example, a domestic dwelling.

A consumer unit is in effect an enclosure containing a power distribution and control arrangement. Taking a domestic house as a convenient example, then the mains power supply entering the house will pass through the metering arrangement of the electrical supply company, and three incoming lines identified as live, neutral, and earth respectively, will enter the casing of the consumer unit from the metering arrangement. The live and neutral lines will be connected to the input live and neutral terminals of the main switching device of the consumer unit, the main switching device typically being a high current capacity, manually operable isolator. The output live terminal of the isolator will be connected to a live supply busbar through which connections will be made to the input (live) terminals of other devices of the consumer unit such as miniature circuit breakers, fuse units, and residual current devices, the output terminals of which are connected to the live leads of respective wiring circuits of the house. The output neutral terminal of the isolator will be connected to a neutral connector block through which connections will be made to the neutral leads of respective wiring circuits of the house.

Connections between the incoming earth line and the respective earth leads of the house circuits, are also made by way of respective connector blocks within the consumer unit. Each connector block is a rectangular section metal bar having a plurality of

through bores for receiving bared ends of electrical leads and each bore being intersected by a screw threaded bore containing a clamping screw. Tightening of the clamping screw clamps the respective bared lead against the wall of the respective through bore of the block.

Different sizes and arrangements of connector blocks will be required for different applications, and it is an object of the present invention to provide a consumer unit wherein the basic structure of the consumer unit can accommodate a range of different sizes and arrangements of connector blocks.

According to the present invention there is provided an electrical equipment enclosure including at least one connector block, the connector block being retained in position in the enclosure, at least in part, by a clip member formed separately from the enclosure and attached thereto, the enclosure being arranged to receive said clip member at any one of a plurality of spaced locations whereby different connector block lengths can be accommodated by choice of the appropriate location for the clip member.

Preferably the enclosure is arranged to incorporate two separate neutral connector blocks for association respectively with different sets of electrical circuits, the two neutral connector blocks being aligned with one another, one end of one of the blocks being received in a retaining recess of the enclosure, the opposite end of said one block being retained by a first clip member, one end of the second block also being retained by said first clip member, and the other end of said second block being retained by a second clip member, the enclosure incorporating a plurality of spaced locations for said

first clip member so as to be able to accommodate pairs of neutral connector blocks of predetermined different lengths.

One example of the invention is illustrated in the accompanying drawings wherein,

Figure 1 is a plan view of the chassis of a consumer unit,

Figure 2 is a sectional view on the line 2-2 in Figure 1,

Figure 3 is an enlargement of part of Figure 1,

Figure 4 is an enlargement of part of Figure 3,

Figure 5 is a front elevational view of a clip member,

Figure 6 is a sectional view on the line 6-6 in Figure 5,

Figure 7 is a side elevational view of the clip member seen in Figure 5,

Figure 8 is a sectional view of a connector block retainer for use in an alternative form of consumer unit,

Figure 9 is a plan view of the retainer seen in Figure 8,

Figure 10 is a front elevational view of a connector block,

Figures 11, 12 and 13 are views similar to Figure 10 of three different connector block arrangements, and

Figure 14 is an end view, to an enlarged scale, of the connector blocks illustrated in Figures 10 to 13.

Referring to the drawings, a consumer unit includes a chassis 11 whereby the consumer unit is mounted on, for example, the wall of a building. The various electrical control devices of the consumer unit are mounted on a rail (not shown) secured to the

chassis and a casing encloses the chassis and the devices carried thereby. The chassis 11 is a synthetic resin moulding, conveniently nylon 6, or the like. The chassis 11 is generally rectangular in plan view, and rather than being solid, is actually a combination of integrally formed pillars, beams, and supporting and bracing walls. The exact structure is not of importance, although it will be noted that in the arrangement illustrated in Figures 1 and 2 the rear edges of the various parts of the chassis are generally coplanar so that the chassis can seat against a flat wall. One of the beams constituting the chassis, identified at 12 in the drawings, is spaced from, but parallel to the rear face of the chassis and defines one side of the rectangular form of the chassis. The beam 12 has an integral upstanding wall 13 extending along one edge thereof and the outermost face of the beam 12 constitutes a supporting surface for the earth and neutral connector blocks of the consumer unit.

In the arrangement illustrated in Figure 1 there is provision for earth connector blocks and neutral connector blocks to be described in more detail hereinafter. Whether a block is intended for use as an earth connector block or as a neutral connector block its basic construction is that of an elongate brass bar 14 (Figure 10) of rectangular cross section, having a plurality of through bores 15 equidistantly spaced along its length. The bores 15 are of the same diameter, and are parallel. Moreover, the bores 15 have their axes disposed in a common plane extending lengthwise of the block 14, and each bore 15 is intersected on one side by a screw threaded bore receiving a clamping screw 16. It will be understood that a bared conductor of an electrical lead inserted into a bore 15 and clamped in place by tightening the

respective screw 16 is electrically connected thereby to the block, and thus is electrically connected to leads secured in corresponding bores 15 along the length of the block. It is convenient to refer to the length of a particular block by reference to the number of bores 15, and therefore to the number of connections which can conveniently be made. In Figure 10 the block is a twelve connection block, in Figure 11 a pair of six connection blocks is illustrated and in Figure 12 an eight connection block and a four connection block are illustrated. In Figure 13 there is a ten connection block and a two connection block

It is convenient first to consider the earth block of the construction illustrated in Figure 1. The beam 12 in Figure 1 is intended to receive a twelve connection block in the region indicated at 17. At its opposite longitudinal ends the beam 12 terminates in integral, upstanding, end walls 18, the end walls 18 having mutually presented faces each containing a recess 19 (see Figure 2). Each recess 19 is rectangular and dimensioned to receive the end of a connector block with the heads of the screws 16 thereof presented upwardly away from the beam 12, and the bores 15 thereof lying with their axes parallel to the plane of the surface of the beam 12.

The region 17 of the beam 12, where the earth connector block is received, is bounded at one end by a wall 18, and by an aperture 21 at its opposite end, the aperture 21 being spaced from the wall 18 by a distance equal to the length of a twelve connection block. The aperture 21 is defined at the upper end of a passage extending downwardly through the beam 12. The passage, and therefore the aperture 21 is rectangular, and is illustrated in more detail in Figure 4. The passage is

intended to receive a clip 22 of the kind illustrated in Figures 5, 6 and 7.

The clip 22 is moulded in synthetic resin material and comprises a flat plate-like portion 23 one end region of which is bifurcated by a slot 24. The slot 24 divides the plate like portion 23, at one end, into a pair of parallel legs 25, 26 each of the legs having an integral outwardly projecting barb indicated by the suffix a at its free end. The barb 25a protrudes to one side of the plane of the plate like portion 23 while the barb 26a projects to the opposite side of the plane. Extending around the region of the portion 23 which is not bifurcated by the slot 24 is an integral wall 27 which protrudes above and below the plane of the portion 23. When the clip is viewed in plan then the wall 27 appears as a U-shape with its open end presented to the closed end of the slot 24. In effect therefore both faces of the clip 22 have a rectangular recess similar to the recess 19 of the end walls 18 of the beam 12.

The clip 22 is engaged with the beam 12 by introducing the legs 25, 26 into the aperture 21. The opposite walls of the passage defining the aperture 21 have respective ramp surfaces 21a, 21b which cooperate respectively with the barbs 25a, 26a of the clip. Thus as the legs 25, 26 of a clip are introduced into the passage of the beam the sloped surface of the barb 25a cooperates with the ramp surface 21a at the same time that the sloped surface of the barb 26a cooperates with the ramp surface 21b thereby flexing the legs 25, 26 to opposite sides of their natural plane. Both the barbs 25a, 26a and the ramp surfaces 21a, 21b terminate in right angled shoulders, and when the shoulders of the barbs align with the shoulders of the ramp surfaces

then the legs 25, 26 can spring back to their natural plane, under the action of their inherent resilience, to interengage said shoulders and so lock the clip 22 in the passage 21. This point is reached simultaneously with the lower edge 28 of the wall 27 of the clip abutting the surface of the beam 12 around the aperture 21.

In use a twelve connection earth block is placed on the surface 17 of the beam and is slid lengthways to engage its end in the recess 19 of the end wall 18. By virtue of the positioning of the aperture 21 in relation to the length of the block, the opposite end of the block will be adjacent the aperture 21, and thus as a clip 22 is introduced into the aperture 21 the wall 27 at one face of the clip will engage around the end of the block so that thereafter the block is held in position on the beam 12 by the combined action of the wall 18 and the clip 22.

It will be noted that there is an aperture 29 in the beam 12 identical to the aperture 21, and spaced along the length of the beam therefrom. The aperture 29 can, if desired, be used to receive a further clip 22, and the two clips 22 can retain between them a short earth connector block, for example of two connection lengths. Such a short connection block may be used in the earth circuit where the incoming earth line is of a greater cross-sectional area, and therefore current carrying capacity, than the outgoing earth leads. Thus rather than provide a twelve connection block wherein all of the bores 15 are large enough to receive the large diameter incoming line, there is provided a short connector block arranged to receive the incoming line, and the short connector block is connected by means of a bridging link with the

twelve connection block retained between the wall 18 and the first mentioned clip 22.

The opposite end region 31 of the beam 12 is designated as the neutral connection bar region, and its length is such that it could accommodate a thirteen connection block. As illustrated the region 31 commences at one end with the wall 18, and has three apertures 32, 33 and 34 each identical to the aperture 21. The aperture 32 is positioned in relation to the wall 18 such that a six connector block can be retained between the wall 18 and a clip 22 engaged in the aperture 32. The aperture 34 is so positioned in relation to the wall 18 that a thirteen connector block could be retained by the wall 18 and a clip engaged in the aperture 34. Since a clip 22 takes up the space required for one connection region of a block, then it will be recognised that clips 22 inserted into the apertures 32 and 34 could serve to support a pair of six connector blocks, one six connector block being supported between the wall 18 and the clip engaged in the aperture 32, and the other six connector block being supported between the clip engaged in the aperture 32 and the clip engaged in the aperture 34. It will be understood that the two blocks will be electrically insulated from one another since the beam 12, the wall 13, and the clips 22 are all formed from electrically insulating material.

The aperture 33 is positioned between the apertures 32 and 34 in such a position in relation to the wall 18 that a ten connector block could be supported between the wall 18 and a clip engaged in the aperture 33 and simultaneously a two connector block could be supported between the clip engaged in the aperture 33 and a clip engaged in the aperture 34.

Moreover by using clips in the apertures 32 and 33 a six connector block and a three connector block can be supported and by using clips in all three apertures or six connector block and a two connector block or a three connector block and a two connector block can be accommodated. As will become clear hereinafter the application of the consumer unit will determine which of the apertures is in use. Moreover, although the positionings shown in Figure 1 are convenient, it will be recognised that the construction illustrated in Figure 1 could not accommodate the block arrangement shown in Figure 12 which consists of an eight connector block and a four connector block. Thus it is to be understood that the apertures may be positioned differently to that shown in Figure 1 to suit different applications of the consumer unit. Moreover, one or more additional apertures may be incorporated if desired.

Figures 8 and 9 illustrate an arrangement wherein there is an additional aperture in the neutral bar location region. Figures 8 and 9 illustrate a neutral bar moulding for use with a consumer unit formed from metal. Thus rather than the neutral bar region being an integral part of the chassis of the consumer unit, in the case of Figures 8 and 9 the neutral bar location region is a separate moulding for attachment to the chassis or casing of the consumer unit. It can be seen however that the moulding 31a has an elongate flat surface 12a equivalent to the beam 12, and an upstanding rear wall 13a equivalent to the wall 13. Moreover, at one end there is an upstanding wall 18a equivalent to the wall 18 and disposed along the surface 12a are apertures 32a, 33a and 34a equivalent to the apertures 32, 33 and 34 of the arrangement illustrated in Figure 1. It will be noted however that

there is an additional aperture 35 identical to the other apertures, but positioned at a location such that a clip 22 engaged therein would be spaced from the wall 18 by a distance such as to be able to support an eight connector block therebetween. Simultaneously a four connector block could be engaged between a clip mounted in the aperture 35 and a clip mounted in the aperture 34a.

The consumer unit making use of the chassis illustrated in Figures 1 and 2 is intended to be able to accommodate up to twelve control modules (isolator, M.C.B. and the like) for use in the supply of electricity to a plurality of different circuits of the house. It may be required that certain of the circuits are supplied with power directly from a double pole isolator switch of the consumer unit, that is to say an isolator switch which simultaneously switches both the live and neutral lines. However, further circuits may be required to be supplied from the double pole isolator switch through the intermediary of the double pole switching unit of a residual current device (R.C.D.) the sensor arrangement of which, in a fault condition, effectively monitors the earth fault currents of those circuits to detect and respond to such a fault condition. In such an arrangement, when the isolator switch is moved to its off position then all of the circuits will be de-energised, and their live and neutral leads will be isolated from the live and neutral incoming lines to the consumer unit. However assuming that the isolator switch stays in its closed position then when the R.C.D. operates then only those circuits controlled through the R.C.D. will be de-energised and will have their live and neutral leads isolated from the live and neutral incoming lines. The remaining circuits will of course still be live. In

order to provide the required degree of isolation, those circuits fed directly from the isolator switch will need to have a neutral connector block separate from the neutral connector block associated with the circuits controlled by the R.C.D.

Consumer units are constructed, ab initio, to meet a particular design standard. Thus there may be a requirement for a consumer unit which can accommodate one or more circuits controlled through R.C.D.'s and one or more circuits controlled directly from the isolator. In such an arrangement the construction of the consumer unit, in the factory, will be chosen to suit the exact requirements and may, for example, entail the use of two six connector blocks in the neutral side, and therefore a first clip 22 engaged in the aperture 34 and a second clip 22 engaged in the aperture 32 (in the Figure 1 construction). However, the requirements of the unit may be such that using the same basic chassis clips 22 will instead be introduced into the apertures 33 and 34 in order to hold in position a ten connector block and a two connector block forming the neutral connection arrangement. It will be recognised therefore that the provision of the different apertures, in the neutral bar location region, for accommodating one or more clips 22, permits the use of a large number of common components in the production of a range of consumer units intended to meet different design specifications. It will also be recognised that the block mounting arrangements disclosed above can be employed in enclosures for electrical equipment other than those known specifically as consumer unit, for example switching units and distribution units.

CLAIMS.

1. An electrical equipment enclosure including at least one connector block, the connector block being retained in position in the enclosure, at least in part, by a clip member formed separately from the enclosure and attached thereto, the enclosure being arranged to receive said clip member at any one of a plurality of spaced locations whereby different connector block lengths can be accommodated by choice of the appropriate location for the clip member.
2. An electrical equipment enclosure arranged to incorporate two separate neutral connector blocks for association respectively with different sets of electrical circuits, the two neutral connector blocks being aligned with one another, one end of one of the blocks being received in a retaining recess of the enclosure, the opposite end of said one block being retained by a first clip member, one end of the second block also being retained by said first clip member, and the other end of said second block being retained by a second clip member, the enclosure incorporating a plurality of spaced locations for said first clip member so as to be able to accommodate pairs of neutral connector blocks of predetermined different lengths.
3. An electrical equipment enclosure substantially as hereinbefore described with reference to any one of the accompanying drawings.
4. An enclosure as claimed in any one of claims 1 to 3 in the form of a consumer unit.

