



ELECTRICAL INSTALLATION EQUIPMENT

The present invention relates to electrical installation equipment, in particular automatic switch boxes, cutout boxes, small feeder boxes and the like, having a box-shaped casing exhibiting an upper section and a lower section, which has bearing flanges for holding fuses, automatic switches, switchgear and the like, also having terminal strips fitted in the interior of the equipment, and having provided on at least one end face of the casing cable entries through which the connecting cables are threaded into the interior of the casing. Such equipment is preferred on account of its easy installation; further, the connecting cables as well as the fuses and switchgear are easy to join up. The disadvantage is that the patching and inserting of the cables creates an unsightly appearance, even when they are laid in cable channels or electrical wiring conduits.

The object of the present invention is to develop equipment of the type initially described in such a way that installation and/or feeding of the cables into electrical wiring conduits does not impair the visual appearance of the equipment. In addition, manufacture and assembly should be time-saving. This task is solved according to the present invention by a recess being provided on the casing in the vicinity of the cable feeds, which is open on the side near the feeding cables, which is sealed off to the interior of the casing by a plate with cable feed seals, also by these cable feed seals being extruded from a soft, elastic synthetic material, whereas the carrier plate is constructed of a hard material, and by the cable feed seals being extruded from both sides of the plates through a throughhole in the plate. Use of a part of the box-shaped casing for taking up the cable or channels results in easy assembly and a pleasing appearance; additionally, use of a part of the box-shaped casing ensures that the size of the installation equipment does not increase to accommodate cables, cable channels and/or electrical wiring conduits.

The seals, which comprise a soft, elastic synthetic material, are easily adapted to the individual cables, although the hard synthetic plate ensures that the seals are gripped firmly with the cables. Double-sided extrusion-coating ensures that the seal itself remains firmly in place when the connecting cables are fed through. By way of advantage, in a plan view of the installation equipment the recess space is arranged below the terminal strips, because this is where the individual feed cables can easily be wired through. To further increase the size of the recess space open to the cable side, it is recommended that an extra cover part lengthen the

recess space. For this purpose, the extra cover part protrudes into the recess space to better emphasise the uniformity of the casing and for the cables guided easily into cable channels or electrical wiring conduits to be covered on the outside, but to remain invisible. So that this extra cover part is better held in place and for sealing purposes, it is recommended to have the extra cover part gripped laterally on the casing with adjoining tabs. These tabs create a U-shaped recess for the cable, such that they can be linked securely to the installation equipment. By way of recommendation, the extra cover part has, on the side of the feed cables, push-out parts so that they can be inserted into the extra cover part and so that there is protection against impurities entering the recess of the installation equipment.

For easy attachment the extra cover part can be snap-locked onto the installation equipment.

In a particular embodiment of the invention the plate can be attached to the cable feed seals by means of snap-locking in the interior of the installation equipment. In this way, there is sure protection against penetration into the box-shaped casing interior by any impurities such as dust and damp, even when the individual cables are already connected. Here it is recommended that the snap-locking for holding in place the cable feed plate on the installation casing comprise a plurality of catches and latches, where the catches or latches are disposed along the edge of the casing opening or plate to be sealed. Consequently, the plate can lie evenly against the casing. The seal between plate and casing is evenly stressed and complete sealing is guaranteed.

Here it is especially favourable if both sides of the cable feed seal are interconnected by means of a web of soft material going through the plate, effectively leading to a secure seat for the cable feed seal, while during the extrusion procedure the extrusion mass for the cable feed seal can be fed in from one side of the plate, simplifying overall manufacture. It is recommended that the webs are provided in ring form in a plan view of the cable feed opening to guarantee secure attachment of the cable feed seal on the plate.

In a particular embodiment the cable feed seal is designed as a connecting piece. On one side the connecting piece has a sealing membrane and on the other side a guide piece, which is designed to hold and guide a connecting cable and which has, at a distance from the sealing membrane, material areas which engage on the cable sheath of the cable. It is ensured by the distance between sealing membrane and cable guide piece that the connecting cable is attached precisely relative to the sealing membrane, thus resulting in a secure and firmer seal than provided by known embodiments. With this kind of sealing, it is easy to achieve seals according to protection class JP 65. In this case the sealing membrane is disposed on the side on which the

cables are guided to the installation equipment. In this particular embodiment it is an advantage when the guide region of the cable feed seal has a thickened material surface opposite the sealing membrane and the sealing membrane has a thin material surface acting as breakthrough points for the cables. Secure attachment and orientation of the cables is achieved by the thickened material surfaces, whereas the thin membrane areas achieve a secure seal, as they can be adapted to the cable. In another embodiment the guide piece is designed to be tubular for taking up an installation conduit holding the cable, whereby the tubular guide piece exhibits on its side facing the sealing membrane a stop which decreases the internal diameter, which restricts the entry of the installation conduit into the guide piece. This guarantees secure attachment and orientation of the installation conduit. The cable can be guided precisely to the sealing membrane.

The individual cable guide connections are in contact on one side of the plate by means of material areas to facilitate manufacture, as again it is guaranteed that during the extrusion procedure the material for the cable feed seal can be fed through from one side.

In a further advantageous embodiment of the invention at least one bearing flange provided in the box interior can be attached with its mounting for the fuses, automatic switch boxes, cutout boxes or the like at different levels relative to the inner floor of the box to guarantee that the same installation equipment box can be used for fuses or automatic switch boxes — which are of a greater height — as for fuses which are not so high. Here it is recommended that the bearing flange can be set by rotation through 180° in two different height positions on the internal box floor. Now, fuses or the like of varying height can easily be attached in the same installation equipment without any additional parts.

It is also recommended for the bearing flange to exhibit mounting cover plates and/or bulges angled towards the internal box floor, which are disposed asymmetrically to the bearing flange and which can be fixed in various positions on the box floor after rotation of the bearing flange, as in this way the bearing flange can easily be attached to the installation equipment casing and different attachment levels for the fuses of the automatic cutout devices and the like are possible.

To further increase the applicability of the installation equipment and to further facilitate assembly, it is recommended that the box casing has on its lower front end a storage space for accommodating a fuse link, operating instructions, accessories and similar, required by operating personnel or the installation itself. In this case the storage space is disposed such that it uses up the interior of the box-shaped casing, which is free of any devices, wiring or cables. The storage

space preferably lies on the upper section of the casing, since here there are no additional devices attached.

In order to prevent components from the storage space entering the interior of the box casing, the latter is closed off to the inside.

In a first embodiment the storage space is designed in the manner of a drawer. This allows easy access to the storage space.

In yet another embodiment the storage space can be closed off by a cover component, so that the space is accessible to the user only when this cover component is opened. It is especially significant here if the cover component of the storage space can be opened only when the door covering the fuses, automatic switch boxes, switchgear and the like is open, for complete protection to be offered and to prevent unintentional access to the storage space. It should be noted here that the door of the installation equipment casing can be sealed with lead with the casing or bolted, to block access to the installation equipment casing to unauthorised personnel. To further simplify assembly it is recommended for the cover component covering the storage space to be able to be set on the upper section of the casing by means of snap-locking, as this would guarantee both secure fastening and easy assembly. It is also helpful if the snap-locking for holding the cover component in place in the closed position is accessible only when the door is open for transfer to its release position. This requires a simple design of the opening lock. And for added simplification of manufacture it is advisable for the swivelling cover component to be formed on the upper section of the box by a sheet hinge. In this way there is no need for any special axle journal for the cover component to hinge back and forth.

The object of the present invention is illustrated in the diagram in several embodiment, in which :

- Figure 1 is a side view of the installation equipment,
- Figure 2 is a partial side view in section and on an enlarged scale,
- Figure 3 is a cross-section through the installation equipment casing,
- Figure 4 is a plan view of the lower section of the installation equipment casing,
- Figure 5 is a first position of the bearing flange for the connecting equipment,
- Figure 6 is a first position of the bearing flange,

- Figure 7 is a plan view of the bearing flange according to the position shown in Figure 5,
- Figure 8 is a partial side view of the casing upper section in section,
- Figure 9 shows a swivelling cover component,
- Figure 10 shows the swivelling cover component with casing upper section,
- Figure 11 is a plan view of the rear of a plate with cable feed connections,
- Figure 12 is a plan view of the feed side of the cable feed plate according to Figure 11,
- Figure 13 is a section through the cable feed plate according to line XIII-XIII of Figure 11,
- Figure 14 shows the cable feed plate in a further embodiment in partial side elevation,
- Figure 15 shows the cable feed plate seen in the direction of the feed cable,
- Figure 16 is a section along line XVI-XVI of Figure 15,
- Figure 17 is a section along line XVII-XVII of Figure 16.

The installation equipment has a box-shaped casing 20 exhibiting a lower section 21 an upper section 22. Fuses, automatic switches, switchgear and the like are disposed in its interior.

The casing upper section has a door which is swivel-mounted on the casing upper section in known manner and which can be locked in its closed position.

The electrical installation equipment is usually attached vertically to a wall, as shown in figure 1. The cables reach the installation equipment casing either from the upper or lower section.

The cables may be arranged in a cable channel 24, as shown by dotted lines in Figure 1. Figure 1 also shows an extra cover part 25 provided on the cable feed side. This extra covering part is generally disposed on one side only, not on both, as illustrated here. This covering part has cover plates 26 which are supported on the outside of the casing lower section. Engaging on the inside of the casing wall is a small clip (not illustrated) of the extra cover part such that the wall surfaces of the casing wrap around in a U-shape. The extra cover part is connected by means of snap-locking 27, not described further. The object of the extra cover part is to cover the incoming cable and also to cover cable channel or channels 24 or electrical wiring conduits. For this purpose extra cover part 25 has, on the cable feed side, breakthrough points (not illustrated),

through which, after these points are removed, the cable from the wiring conduit or the cable channel can be fed into the interior of the extra cover part. As shown in Figure 2, the lower section of the box is provided with a recess space 28 open to the outside, which takes up the cable channels, wiring conduits and the cables themselves. This recess space lies below terminal strips 29. The cables lying in recess space 28 are fed partially to these terminal strips and connected there. It should be mentioned here that recess space 28 is lengthened additionally by extra cover part 25. Wiring conduits or cable channels and cables can project into the extra cover part or storage space. The cables are then fed further through into interior 30 of the casing. The recess space is closed off by a cable feed plate 31. This plate is set on casing lower section 21 by means of snap-locking 32, with a seal 33 being provided between the plate and the casing.

It should be added here that a seal 34 is provided between casing lower section and casing upper section, effectively guaranteeing sealing of interior of casing 20.

As is further evident from Figure 2, cable feed plate 31 bears at least one cable feed connection 35 with a sealing membrane 36 and a guide piece 37. Here the material surfaces of guide piece 37 are thicker than those of sealing membrane 36. When a cable is inserted it is held by guide piece 37 and oriented to the membrane, while sealing membrane 36 adapts to and is sealed on the cable sheathing. To this end the sealing membrane has thin material surfaces 38 resulting in a break-off duct, whereby the diameter of the break-off point corresponds approximately to the cable diameter.

It has already been pointed out that sealing membrane 36 can be bulged behind guide piece 37, as clearly illustrated by Figure 13.

Provided laterally on the walls in recess 28 are recesses 39 which serve as fastening and connection with the installation casing for the extra cover part.

As Figure 2 also demonstrates, this has a bearing flange 40, on which is fastened a safety cutout. This projects with a section through opening 42 through the casing upper section which has at this point a recess 43 seen as V-shaped in cross-section (in Figure 2 only one half of the V is visible). This V-shaped recess is closed off by door 23.

Figure 3 shows a cross-section through lower section 21 of casing 20, at the point where bearing flanges 40 can be attached. Provided in the casing lower section at the point of the bearing flange according to Figure 5 are two screw recesses 44, into which are screwed self-tapping screws. Here bearing flange 40 has a cavity 45 which comes to rest on one of screw

recesses 44, whereby boring 45 is penetrated by the fastening screw and the screw is then screwed into screw recess 44. For precise orientation of the bearing flange right angle notches 46 and 47 are provided on the bearing flange. These right angle notches 46 are in the form of square holes, whereas right angle notches 47 are in the form of partial right angles. When inserted into connections, these right angle notches 46 and 47 come into contact with correspondingly shaped bosses 48 on floor 49 of box interior 20. Here, in the position illustrated in Figure 5, right angle notch 46 is connected with boss 48, while in the position of the bearing flange illustrated in Figure 6, right angle notch 47 is connected with boss 48.

As evident from Figures 5 and 6, the bearing flange has outward angled clips 50 opposite floor 49. In the position according to Figure 5 this clip 50 comes into corresponding floor recesses 51. In the position shown in Figure 6, the clips arrive at a higher screw recess 44 and there they are connected to a self-tapping screw; right angle notches 47 engage in corresponding bosses 48 of one screw recess, such that in this position too the bearing flange is ensured secure fastening and orientation. With this step simple rotation of the bearing flanges through 180° ensures that they are arranged at different heights from floor 49; in other words, the bearing flange and its lateral angles 52 with fuse, automatic switch boxes and switchgear move closer behind door 23 and can be deeper or lower than smaller without additional parts, even though one and the same means are available. Larger objects or fuses can be attached more deeply or lower with additional parts, although one and the same means are present.

As already mentioned, cable feed connection 35 is arranged on a plate 37. This is illustrated in section in Figures 11 to 13. The cable feed connections here can be of various sizes and on both sides lie with a flange 53, 54 on the feed side or the rear side of cable feed plate 31. Running between both flanges are material ridges 55 which penetrate different shaped throughholes, whether square holes or round holes, arranged around actual opening 57. Here material ridges 55 are arranged so closely to one another that when the connecting cables are inserted, the flanges securely hold the cable feed connections in place on cable feed plate 31.

On the rear side the individual flanges of the cable feed connections are interconnected by means of material bridges 58. During the extrusion procedure these material bridges and material ridges 55 result in simple extrusion of cable feed connections 35 onto cable feed plate 31.

As is evident from Figure 8, casing upper section 22 has a storage space 59 which is formed directly on the casing upper section, whereby it is provided at a position on the casing which does not usually hold any wiring components or equipment. Replacement fuses, operating instructions

or sundry accessories such as switchgear, operating instructions and the like, which are required by installation personnel, may be stored in this storage space. Storage space 59 is locked by a V-shaped cover component 60 which is swivel-mounted on casing upper section 22 and with journal axles engages in corresponding journal recesses 61 on upper section 22 in the vicinity of storage space 50, as in Figure 8. This duct-like V-shaped cover component 60 has catches 62 on its second leg, which engage in corresponding latches 63 on upper section 22 to hold the cover component in a closed position. As seen in dotted lines in Figures 8 and 10 snap-locking 62, 63 of cover component 60 in the closed position is arranged such that when door 23 is shut the snap-locking cannot be actuated or released.

Figures 15 to 17 illustrate another embodiment of cable feed plate 31. In contrast to the previous embodiment cable feed connection 35 is designed such that in place of guide piece 37 for guiding and orienting the cable, a guide piece 64 is provided which can accommodate an end of the wiring conduit for the cable. Provided inside this guide piece 64 is a boss 66 which ensures that the wiring conduit can be pushed only as far as plate 31. In this particular embodiment the cable is not oriented or held directly to sealing membrane 36, rather the wiring conduit accommodating the cable is.

It should also be noticed that in this embodiment sealing membranes 36 can be provided without guide pieces, as shown in Figures 15 and 17.

In this embodiment it is also shown how cable feed plate 31 is held in place on box-like casing 20 by means of snap-locking 32. To form snap-locking 32 cable feed plate 31 has a circular edge 67. Provided in this edge are openings which form catches 65 for snap-locking 32. Engaging in these open catches 65 are bosses which are provided on box-like casing 20 (not illustrated), by means of which cable feed plate 31 is held firmly on casing 20. Distribution of catches 65 and thus of the latches is selected such that the cable feed plate can be set like a seal in the opening of the box-like casing and indeed such that seal 33, which is provided between plate 31 and the opening edge of casing 20, is held evenly under tension, whenever plate 31 is pushed in and fastened. As already shown, U-shaped recess 68 is provided for the seal, whereby the seal is either a sealing ring, or can be extruded into the recess.

It is also suggested here that flange 53 and 54 of the individual cable feed connections, with the closely arranged individual feed openings, can merge into one another, as is shown in both lower cable guides. With the other flanges of the cable feed connections material surfaces 28 are provided. Compared to those illustrated in Figure 12, these are essentially wider. It should be

restated here that ridges penetrating through plate 31 between both flanges can be present in this embodiment also. And further, a wiring conduit can be pushed into guide piece 64, not illustrated here. With its inner end this impacts on boss 66.

It remains to be mentioned that catches 65 designed as openings are provided at an even distance around the plate, as illustrated in Figure 14.

As already explained, the illustrated embodiment is only an exemplary realisation of the invention. It is not limited, rather many deviations and modifications are possible. Accordingly, the abovedescribed V-shaped cover component could also be swivel-mounted on the cover upper section by means of a sheet hinge, instead of the bearing axles and bearing recesses. The catches for holding in the closed position could be designed at any distance and of any size such that they come to rest under the door, which covers the V-shaped recess, so that the cover component would be accessible only when the door is open. Furthermore, the extra cover part is usually disposed only on one side, as the cables are mainly fed in from one side only. The cable channels leading to the extra cover part could also extend in the recess space in the box-like casing. Also, there could be several bearing flanges so that different rows of safety cutouts and the like could be arranged. In this case one row could be arranged higher than another row, merely by means of the different application possibilities of the bearing flange. Instead of the storage space, which is closed off by the cover component, there could also be a drawer-shaped recess for accommodating extra parts and wiring plans. In conclusion, the cable feed plate could carry guide pieces for the cables and guide pieces for wiring conduits. These could be formed jointly or selectively on the cable feed seal.

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CLAIMS :



1. Electrical installation equipment, in particular automatic switch boxes, cutout boxes, small feeder boxes and the like, having a box-shaped casing exhibiting an upper section and a lower section, which has in its interior bearing flanges for holding fuses, automatic switches, switchgear and the like, also having terminal strips fitted in the interior of the equipment, and having provided on at least one end face of the casing cable entries through which the connecting cables are threaded into the interior of the casing, **characterised in that** a recess (28) is provided on casing (20) in the vicinity of the cable feeds, which is open on the side near the feeding cables, which is sealed off to interior (30) of the casing by a plate (31) with cable feed seals (35), **in that** cable feed seal (35) comprises a soft, elastic synthetic material, whereas plate (31) is made of a hard material, and **in that** cable feed seals (35) are extruded from both sides of plate (31) around a throughhole (57) in plate (31).
2. Electrical installation equipment as claimed in Claim 1, **characterised in that** in a plan view of the installation equipment recess space (28) is arranged below terminal strips (29).
3. Electrical installation equipment as claimed in Claim 1 or 2, **characterised in that** open recess space (28) can be lengthened by an extra covering part (25).
4. Electrical installation equipment as claimed in any one of Claims 1 to 3, **characterised in that** extra cover part (25) protrudes into recess space (28).
5. Electrical installation equipment as claimed in any one of Claims 1 to 4, **characterised in that** extra cover part (25) has cover plates (26) laterally adjoining the casing.
6. Electrical installation equipment as claimed in any one of Claims 1 to 5, **characterised in that** extra cover part (25) has, on the cable feed side, breakthrough points for the cable channels and/or cable conduits for feeding through the channels and conduits.



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7. Electrical installation equipment as claimed in any one of Claims 1 to 6, **characterised in that** extra cover part (25) can be set in installation casing (20) by means of snap-locking (27).
8. Electrical installation equipment as claimed in any one of Claims 1 to 7, **characterised in that** plate (31) with cable feed seals (35) can be attached in the interior of the installation equipment casing in sealing manner by means of snap-locking (32).
9. Electrical installation equipment as claimed in Claim 8, **characterised in that** snap-locking (32) for holding in place cable feed plate (31) on installation casing (20) comprises a plurality of catches (65) and latches, where catches (65) or the latches are disposed along the edge of the casing opening or plate (31) to be sealed.
10. Electrical installation equipment as claimed in any one of Claims 1 to 9, **characterised in that** cable feed seals (35) are designed as a connection, where the seal on one side of the plate is in the form of a sealing membrane (36) and on the other side of plate (31) is designed as a guide piece (37; 64).
11. Electrical installation equipment as claimed in Claim 10, **characterised in that** guide piece (37) is designed to hold and guide a connecting cable and has, at a distance from sealing membrane (36), material surfaces which engage on the cable sheath of the cable.
12. Electrical installation equipment as claimed in Claim 10, **characterised in that** guide piece (37) is in the form of a conduit for accommodating wiring conduits holding the cables.
13. Electrical installation equipment as claimed in Claim 12, **characterised in that** tubular guide piece (37) exhibits on its side behind sealing membrane (36) a stop (66) which decreases the internal diameter.

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14. Electrical installation equipment as claimed in any one of Claims 1 to 13, **characterised in that** both sides of cable feed seals (35) are interconnected by means of webs (55) of soft material going through plate (31).
15. Electrical installation equipment as claimed in Claim 14, **characterised in that** webs (55) are provided in ring form in a plan view of the cable feed.
16. Electrical installation equipment as claimed in any one of Claims 1 to 15, **characterised in that** guide piece (37) of the cable feed seal exhibits opposite sealing membrane (36) thickened material surfaces.
17. Electrical installation equipment as claimed in any one of Claims 1 to 16, **characterised in that** sealing membrane (36) has thin material surfaces as breakthrough section for a cable.
18. Electrical installation equipment as claimed in any one of Claims 1 to 17, **characterised in that** individual cable feed connections (35) are interconnected by means of material surfaces (58) on one side of cable feed plate (31).
19. Electrical installation equipment as claimed in any one of Claims 1 to 18, **characterised in that** at least one bearing flange (40) provided in the box interior can be attached with its mounting for the fuses, automatic switch boxes, cutout boxes or the like without extra parts at different levels relative to inner floor (49) of the box.
20. Electrical installation equipment as claimed in any one of Claims 1 to 19, **characterised in that** bearing flange (40) can be set by rotation through 180° in two different height positions on inner box floor (49).
21. Electrical installation equipment as claimed in any one of Claims 1 to 20, **characterised in that** bearing flange (40) has clips (50) and/or bulges (45) angled towards box floor (49) which are

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disposed asymmetrically to bearing flange (40) and which can be fixed in various positions (44) on box floor (49) after rotation of bearing flange (40).

22. Electrical installation equipment as claimed in any one of Claims 1 to 21, **characterised in that** box-like casing (20) has on its lower front end a storage space (59) for accommodating fuse links, fuses, accessories and the like.

23. Electrical installation equipment as claimed in any one of Claims 1 to 22, **characterised in that** storage space (59) is arranged on casing upper section (22).

24. Electrical installation equipment as claimed in any one of Claims 1 to 23, **characterised in that** storage space (59) is closed off to interior (30) of box-like casing (20).

25. Electrical installation equipment as claimed in any one of Claims 1 to 24, **characterised in that** storage space (59) is designed in the form of a drawer.

26. Electrical installation equipment as claimed in any one of Claims 1 to 25, **characterised in that** storage space (59) can be closed off by a cover component (60).

27. Electrical installation equipment as claimed in any one of Claims 1 to 26, **characterised in that** storage space (59) can be accessed only when door (23) covering fuses, automatic switch boxes, switchgear and the like is open.

28. Electrical installation equipment as claimed in any one of Claims 1 to 27, **characterised in that** cover component (60) can be attached to the casing upper section by means of snap-locking (62, 63).

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29. Electrical installation equipment as claimed in Claim 28, **characterised in that** snap-locking (62, 63) for holding cover component (60) in place in the closed position is accessible only when door (23) is open for transfer to its release position.

30. Electrical installation equipment as claimed in any one of Claims 1 to 29, **characterised in that** swivel-mounted cover component (60) is attached to casing upper section (22) by means of a sheet hinge.

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