

PATENT SPECIFICATION

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(54) INSTALLATIONS COMPRISING ELECTRIC CABLES, PIPES OR THE LIKE

(71) We, BICC LIMITED, a British Company, of 21 Bloomsbury Street, London WC1B 3QN, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to installations in which a number of electric cables and/or pipes or the like are run generally parallel to one another, and more especially (though not exclusively) to industrial installations in which the cables, pipes etc. together have a considerable weight, e.g. approaching 100 kg per metre run.

More especially it relates to installations of the kind in which the cables, pipes etc. are attached at intervals to elongate support members that are themselves supported at (normally much greater) intervals.

Presently available supports of this kind are of two classes, ladders and trays.

Ladders, as their name implies, have separate side members (stiles) and cross-members (rungs). They are normally used with the rungs in a horizontal position with the cables laid on top, but a few designs can be used with the rungs vertical and the cables fixed to one or rarely both sides.

Trays are made of sheet metal, usually perforated to facilitate fixings. Flanges are provided on the longitudinal edges of the tray and are usually integral with the sheet-metal web of the tray, though in a few designs separately-rolled flanges have been used. Trays are also designed primarily for use in a horizontal position, and the flanges are arranged to project in the normally-upward direction so as to offer some protection to the cables laid on the web. Trays are sometimes used in a vertical position, that is with the longitudinal edges one above the other, but except for light-duty work it is difficult to support them in this position, especially if it is desired to fix cables on both sides of the tray.

The installation in accordance with the in-

vention comprises a vertically-mounted support web of sheet metal, a reinforcing member extending along the upper edge of the web and attached to it substantially continuously along the length of the web, and a number of cables, pipes or the like attached to the web, some on each side thereof, substantially the full weight of the web, the reinforcing member and the cables and/or pipes and/or the like being supported by attachments engaging the reinforcing member at points spaced along its length.

By arranging the web vertically, the inherent stiffness of the sheet metal in its own plane is utilised to good effect and therefore the load:weight ratio is improved, and by hanging the web from its reinforced top edge, both faces remain easily accessible for installation of the cables, pipes etc.; the balancing of load between the two faces of the web minimises transverse bending loads and may lead to further weight saving. In addition the overall packing density may be higher than with conventional horizontal supports.

Moreover changes of direction, either in the horizontal plane or in terms of gradient, can be made using sheet metal curve members, of heavier gauge if necessary, without edge reinforcement; such curve members can be made on site according to requirement, and so the need to stock a variety of specially designed and prefabricated curve members is avoided. Branching is also simplified in many cases.

Although the gravitational load is taken by the upper-edge attachments, it may be desirable to fix the lower edge after the cables, pipes etc. are in position, in order to inhibit swinging on the main attachments. To simplify such fixing, and/or to stiffen the installation against lateral flexing, a further reinforcing member preferably extends along the lower edge of the web. The two reinforcing members are preferably identical.

Preferably the or each reinforcing member is symmetrical about the plane of the web. Preferably also the or each reinforcing member

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is of channel section, with the open side of the channel facing away from the web. More especially, it is preferable for the open side of the channel to be a slot narrower than the underlying part of the channel and defined either by plain flanges extending inwards towards one another from the free ends of the limbs of the channel, or by angled flanges extending at first upwards and inwards, and then inwards and downwards (as, for example, in the "Leprack" channelling sold by the applicant company.) Attachments are preferably made, as is often done with such channelling, by means of rectangular nuts or other members inserted through the slot and rotated to engage behind the flanges defining it, so avoiding any drilling of the reinforcing member.

If required, e.g. in a longer-than-usual span, an auxiliary stiffening member can be bolted (preferably in the manner just described) to the reinforcing member (or to one or both of them). For example a horizontal flat plate can be used to increase lateral stiffness (and may in some installations serve as a cat-walk).

The web may have preformed perforations to facilitate attachment of cables, pipes etc. by any conventional type of clip, cleat strip or bracket, but more especially by means of the support brackets described and claimed in the Complete Specification of our copending application No. 27595/76 (Serial No. 1,577,726.)

A development of the invention provides an installation comprising a vertically-mounted support web of sheet metal, a reinforcing member extending along each of the upper and lower edges of the web, and each attached to the web substantially continuously along the length of the web, each reinforcing member including an outwardly extending horizontal flange on each side thereof so that the flanges and the web define an open-sided duct (which may be completed by a two-part detachable sidewall of resilient plastics material) on each side of the web, and a number of cables, pipes or the like attached to the web, some in each of the ducts, substantially the full weight of the web, the reinforcing members and the cables and/or pipes and/or the like being supported by attachments engaging the upper reinforcing member at points spaced along its length.

A preferred form of web with perforations and with reinforcing members on both edges is the subject of our application No. 31762/76 (serial No. 1,580,214).

The invention is further illustrated by a description, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a support for use in making an installation in accordance with the invention;

Figure 2 shows an installation in accordance with the invention;

Figure 3 is an enlarged detail of a part of that installation;

Figure 4 shows another installation;

Figure 5 shows a stiffening member bolted to the reinforcing member;

Figure 6 shows an alternative form of support; and

Figures 7 to 15 show accessories for use in installations in accordance with the invention.

The support 1 shown in figure 1 has a sheet metal web 2 made with perforations 3 and reinforcing members 4 along the edges of the web. Each reinforcing member is of channel section with a slot 5 defined by angled flanges 6 extending at first upwards and inwards, and then inwards and downwards.

The cable installation shown in figure 2 comprises several of the supports 1 shown in figure 1 arranged with their webs vertical and attached to cantilever arms 7 which are mounted on any suitable supports 8. Figure 3 shows an enlarged detail of part of this installation. The perforations 3 in the web 2 receive brackets or strips 9 for fixing cables and/or pipes 10 to both sides of the web. The upper surfaces of the cantilever arms 7 are useful for temporarily supporting the cables during the positioning thereof.

Figure 4 shows an installation in which one of the supports 1 is attached to structural steel-work 11 using a clamp 12 of the kind sold under the trade mark "Lindaptor".

Figure 5 shows an auxiliary stiffening member in the form of a plate 13 bolted to the upper reinforcing member 4. This increases the moment of inertia about neutral axis XX which may be required depending upon load factor and distance between supports.

Figure 6 illustrates another form of installation in which the inwardly extending flanges 14 of the reinforcing members 15 at the top and bottom of the support web 2 are doubled back and extend outwards to provide the roof 16 and floor 17 of ducting which if desired may be completed by fitting a detachable sidewall 18 made of resilient plastics material in two parts 19 and 20 which push-fit onto the flanges at edges 21 and 22, and push-fit together at edges 23 and 24. Apertures 25 may be formed in one or more of the flanges to provide ventilation holes and/or as an auxiliary cable-fixing means.

Figures 7, 8 and 9 show clamps for joining four, three and two supports respectively meeting at appropriate angles. The clamps fit over the upper reinforcing members of each support and bolt shanks pass through the holes 26 and the slot in the reinforcing member and cooperate with rectangular nuts which engage behind the flanges defining the slots in the usual way. Figure 10 shows a bracket 27 which may be bolted to the reinforcing member to fix an auxiliary cable tray to the sup-

port if required. Figure 11 shows a universal hinge-link 28 which fits between walls 29 on a hinge-link clamp 30. Bolts pass through holes 31 in the hinge-link and the clamp and engage nuts inserted in the reinforcing member as usual. By positioning another hinge-link in the same way on another support, the two supports can be linked by passing a pin through the holes 32 of the two hinge-links. This permits the supports to be arranged in any required angular relation about a vertical axis YY; by turning the hinge-links through 90° in their respective brackets and using the alternative holes 33, changes of gradient can be correspondingly accommodated. Figure 12 shows a 2-flanged suspension link-clamp for hanging the support from a suspension link or chain by passing a bolt through holes 34 in the flanges 35 and through the link or chain inserted between them. Figure 13 shows a 1-flange suspension clamp 35 which can be bolted to any suitable support. Figure 14 shows a clamp for attaching a support to a flanged girder without the need to drill the girder. A slot 37 on each part fits around a flange. A similar clamp is fitted to the opposite side of the same or another girder.

An alternative clamp to that shown in figure 9 is shown in figure 15. The extensions 38 fit inside the channel sections of the reinforcing members the sides 39 of the upward extension 40 fit between the flanges of the reinforcing member and bolt heads engage the top surface of the flanges with the threaded shanks screwing into the tapped holes 41 in the clamp.

In a specific example of the installation shown in figures 2, 3 and 4 a mild-steel web 305 mm wide and 1.6 mm thick is reinforced by welding to each edge a slotted channel of the kind sold by the applicant company as Leprack channel. This channel is rolled from mild steel 2.6 mm thick and has a base 41.2 mm wide bounded by limbs 20.6 mm high with semi-cylindrical inturned flanges with a radius of 4.7 mm. Groups of slots are present in the web at intervals of 15.24 mm. Cables to a total weight of 100 kg/m are attached to the web using the brackets shown in the drawings of Complete Specification No. 27595/76 on both sides of the web. With this loading the assembly safely bridges a span of six metres between attachments when required.

Wherever appropriate screws may be, and preferably are, pre-inserted in the fittings in the manner described in the Provisional Specification of our copending application No. 4467/77 (serial No. 1,579,941).

WHAT WE CLAIM IS:—

1. An installation comprising a vertically mounted support web of sheet metal, a reinforcing member extending along the upper edge of the web and attached to it substantially continuously along the length of the

web, and a number of cables, pipes or the like attached to the web, some on each side thereof, substantially the full weight of the web, the reinforcing member and the cables and/or pipes and/or the like being supported by attachments engaging the reinforcing member at points spaced along its length.

2. An installation as claimed in Claim 1 wherein an additional reinforcing member extends along the lower edge of the web.

3. An installation as claimed in Claim 2 wherein the two reinforcing members are identical.

4. An installation as claimed in any one of the preceding Claims wherein the or each reinforcing member is symmetrical about the plane of the web.

5. An installation as claimed in any one of the preceding Claims wherein the or each reinforcing member is of channel section, with the open-side of the channel facing away from the web.

6. An installation as claimed in Claim 5 wherein the open side of the channel is a slot narrower than the underlying part of the channel and defined by angled flanges extending at first upwards and inwards and then inwards and downwards.

7. An installation as claimed in Claim 5 wherein the open side of the channel is a slot narrower than the underlying part of the channel and defined by plain flanges extending inwards towards one another from the free ends of the limbs of the channel.

8. An installation comprising a vertically-mounted support web of sheet metal, a reinforcing member extending along each of the upper and lower edges of the web and each attached to the web substantially continuously along the length of the web, each reinforcing member including an outwardly extending horizontal flange on each side thereof so that the flanges and the web define an open-sided duct on each side of the web, and a number of cables, pipes or the like attached to the web, some in each of the ducts, substantially the full weight of the web, the reinforcing members and the cables and/or pipes and/or the like being supported by attachments engaging the upper reinforcing member at points spaced along its length.

9. An installation comprising a vertically-mounted support web of sheet metal, a reinforcing member extending along each of the upper and lower edges of the web and each attached to the web substantially continuously along the length of the web, each reinforcing member including an outwardly extending horizontal flange on each side thereof so that the flanges, the web and a two-part detachable sidewall of resilient plastics material define an enclosed duct on each side of the duct and a number of cables, pipes or the like attached to the web, some in each of the ducts, substantially the full weight of the web, the

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port, if required. Figure 11 shows a universal hinge-link 28 which fits between walls 29 on a hinge-link clamp 30. Bolts pass through holes 31 in the hinge-link and the clamp and engage nuts inserted in the reinforcing member as usual. By positioning another hinge-link in the same way on another support, the two supports can be linked by passing a pin through the holes 32 of the two hinge-links. This permits the supports to be arranged in any required angular relation about a vertical axis YY; by turning the hinge-links through 90° in their respective brackets and using the alternative holes 33, changes of gradient can be correspondingly accommodated. Figure 12 shows a 2-flanged suspension link-clamp for hanging the support from a suspension link or chain by passing a bolt through holes 34 in the flanges 35 and through the link or chain inserted between them. Figure 13 shows a 1-flange suspension clamp 35 which can be bolted to any suitable support. Figure 14 shows a clamp for attaching a support to a flanged girder without the need to drill the girder. A slot 37 on each part fits around a flange. A similar clamp is fitted to the opposite side of the same or another girder.

An alternative clamp to that shown in figure 9 is shown in figure 15. The extensions 38 fit inside the channel sections of the reinforcing members the sides 39 of the upward extension 40 fit between the flanges of the reinforcing member and bolt heads engage the top surface of the flanges with the threaded shanks screwing into the tapped holes 41 in the clamp.

In a specific example of the installation shown in figures 2, 3 and 4 a mild-steel web 305 mm wide and 1.6 mm thick is reinforced by welding to each edge a slotted channel of the kind sold by the applicant company as Leprack channel. This channel is rolled from mild steel 2.6 mm thick and has a base 41.2 mm wide bounded by limbs 20.6 mm high with semi-cylindrical intumed flanges with a radius of 4.7 mm. Groups of slots are present in the web at intervals of 15.24 mm. Cables to a total weight of 100 kg/m are attached to the web using the brackets shown in the drawings of Complete Specification No. 27595/76 on both sides of the web. With this loading the assembly safely bridges a span of six metres between attachments when required.

Wherever appropriate screws may be, and preferably are, pre-inserted in the fittings in the manner described in the Provisional Specification of our copending application No. 4467/77 (serial No. 1,579,941).

WHAT WE CLAIM IS:—

1. An installation comprising a vertically mounted support web of sheet metal, a reinforcing member extending along the upper edge of the web and attached to it substantially continuously along the length of the

web, and a number of cables, pipes or the like attached to the web, some on each side thereof, substantially the full weight of the web, the reinforcing member and the cables and/or pipes and/or the like being supported by attachments engaging the reinforcing member at points spaced along its length.

2. An installation as claimed in Claim 1 wherein an additional reinforcing member extends along the lower edge of the web.

3. An installation as claimed in Claim 2 wherein the two reinforcing members are identical.

4. An installation as claimed in any one of the preceding Claims wherein the or each reinforcing member is symmetrical about the plane of the web.

5. An installation as claimed in any one of the preceding Claims wherein the or each reinforcing member is of channel section, with the open-side of the channel facing away from the web.

6. An installation as claimed in Claim 5 wherein the open side of the channel is a slot narrower than the underlying part of the channel and defined by angled flanges extending at first upwards and inwards and then inwards and downwards.

7. An installation as claimed in Claim 5 wherein the open side of the channel is a slot narrower than the underlying part of the channel and defined by plain flanges extending inwards towards one another from the free ends of the limbs of the channel.

8. An installation comprising a vertically-mounted support web of sheet metal, a reinforcing member extending along each of the upper and lower edges of the web and each attached to the web substantially continuously along the length of the web, each reinforcing member including an outwardly extending horizontal flange on each side thereof so that the flanges and the web define an open-sided duct on each side of the web, and a number of cables, pipes or the like attached to the web, some in each of the ducts, substantially the full weight of the web, the reinforcing members and the cables and/or pipes and/or the like being supported by attachments engaging the upper reinforcing member at points spaced along its length.

9. An installation comprising a vertically-mounted support web of sheet metal, a reinforcing member extending along each of the upper and lower edges of the web and each attached to the web substantially continuously along the length of the web, each reinforcing member including an outwardly extending horizontal flange on each side thereof so that the flanges, the web and a two-part detachable sidewall of resilient plastics material define an enclosed duct on each side of the duct and a number of cables, pipes or the like attached to the web, some in each of the ducts, substantially the full weight of the web, the



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- reinforcing members the sidewalls and the cable and/or pipes and/or the like being supported by attachments engaging the upper reinforcing member at points spaced along its length.
10. An installation as claimed in any one of Claims 8 and 9 wherein each reinforcing member is symmetrical about the plane of the web.
11. An installation as claimed in any one of Claims 8 to 10 wherein each reinforcing member includes a channel section, with the open side facing away from the web.
12. An installation as claimed in Claim 11 wherein the open side of the channel is a slot narrower than the underlying part of the channel and defined by angled flanges extending at first upwards and inwards and then inwards and downwards.
13. An installation as claimed in Claim 11 wherein the open-side of the channel is a slot narrower than the underlying part of the channel and defined by plain flanges extending inwards towards one another from the free ends of the limbs of the channel.
14. An installation as claimed in any one of Claims 6, 7, 12 and 13 wherein the attachments engaging the upper reinforcing member are made by means of members inserted through the slot and rotated to engage behind the flanges defining it.
15. An installation as claimed in any one of the preceding claims wherein an auxiliary stiffening member is bolted to the or at least the upper reinforcing member of at least one support.
16. An installation as claimed in any one of the preceding Claims wherein the web has preformed perforations.
17. An installation as claimed in any one of Claims 8 to 16 wherein one or more of the outwardly extending horizontal flanges have perforations.
18. An installation substantially as hereinbefore described with reference to and as shown in figures 2 and 3 of the accompanying drawings.
19. An installation comprising a support substantially as hereinbefore described with reference to and as shown in figure 6 of the accompanying drawings and a number of cables, pipes or the like attached to the web thereof, some on each side of the web.
20. A support installation as claimed in any one of Claims 1, 8 and 9 including at least one accessory substantially as hereinbefore described with reference to and as shown in one of figures 4, 5 and 7 to 15 of the accompanying drawings.

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