

SUPPORT PANEL FOR AN OUTDOOR UNIT OF AN AIR- CONDITIONING APPARATUS

FIELD OF INVENTION

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The present invention relates to an apparatus for supporting a mounting platform of terminal block on an air conditioner outdoor unit panel. In particular, the apparatus has a spring effect characteristic that allows the platform to be extended to a certain bending angle by regular sheet metal stamping process.

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BACKGROUND ART

Generally a split-type air conditioning unit operates by establishing connection between both indoor unit and outdoor unit. The connection between indoor unit and outdoor unit includes power cord installation from the indoor unit to the outdoor unit or vice versa.

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To establish the connection on the outdoor unit there is a need for a mounting platform with a terminal panel to mount the connection from the indoor unit to the outdoor unit. This terminal panel is required especially for fixing a terminal block for the connection. The connection includes all electrical components like terminal block, capacitors and harness wires mounted on to a sheet metal part which may indicate as terminal panel. The mounting platform is positioned at certain angle within the outdoor unit to provide or accommodate the connection for the electrical components of outdoor unit at the terminal panel. Usually, the mounting platform is formed from the body of the outdoor unit panel and the terminal panel is formed from using a separate or addition material.

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Typically to reduce unit's material cost of production of the outdoor unit, the terminal panel of the outdoor unit will be proposed to be removed from the unit. So, terminal block is designed to be mounted on a new platform which is

the mounting platform formed from the body of the outdoor unit panel. The panel generally is located on the side of the outdoor unit body. As mounting platform for terminal block, it will have to withstand a push force generated during fastening the component with screw. As a result, this terminal block
5 mounting platform will deviate from its original position without sufficient part strength.

To overcome this deviation of the mounting platform, an additional sheet metal plate is required to be attached at another side of platform to provide a
10 support to the platform and also to hold when force is applied to mount the terminal connection or during fastening process at the air conditioner outdoor unit panel. However, this additional sheet metal plate incurs additional cost and does not serve the purpose to reduce unit's material cost of production of the outdoor unit.

15 Another, alternative would be to create the support without adding a new sheet metal plate, where the sheet metal material at both side of the component mount area is connected. However, this can be only achieved by metal stamping process on that particular area. Hence, during the metal
20 stamping process it is observed that both wall features which joined with the platform are cracked or broken after stamping process, especially with low cost sheet metal material.

Therefore a solution is proposed to provide a mounting platform without
25 adding a new sheet metal plate that can withstand a push force generated when fastening the component with screw.

SUMMARY OF INVENTION

One of the objectives of the invention is to remove an additional terminal panel using a metal sheet plate such that it is able to reduce unit's material
5 cost of the outdoor unit of an air conditioner by using the existing panel of the outdoor unit to form the terminal panel.

Another objective of the invention is to fabricate an apparatus that is able to connect the mounting platform for terminal block firmly to the panel, and its
10 characteristic allow the platform to be extended to a certain bending angle by using a metal sheet stamping process.

Another objective of the invention is to overcome the cracked or broken sides of the platform during or after metal stamping process by providing at least
15 one opening or slit between the panel and the platform of the outdoor unit of an air conditioner, which allows the flexi movement of the platform for mounting or fastening of the terminal connection or when the force is applied to the platform of the service panel having flap like characteristic.

20 The present invention provides an outdoor unit of an air-conditioning apparatus having a support panel, the support panel comprising a cut-away portion defining a flap portion, the flap is flexed inwardly into the outdoor unit; and at least one bridge member extending from any free end portion of the flap to a corresponding edge of the support panel.

25 Further, the bridge member has a curved configuration such that it can be extended by unfurling when force is applied to the flap.

Preferably, the curved configuration extends inwardly into the outdoor unit by
30 unfurling when force is applied to the flap.

Preferably, the bridge member has a spring portion such that it can be extended when force is applied to the flap.

Preferably, the cut-away portion of the bridge member is formed into a sinuous shape to accommodate the bridge member to extend when force is applied to the flap.

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Further, the cut-away portion of the bridge member is formed into a folded angle to accommodate the bridge member to extend when force is applied to the flap.

- 10 Preferably, the bridge member is shaped in such a way that the bridge member can be extended from one angle to another angle when force is applied to the flap.

Further, the flap is flexed inwardly to form a platform within the outdoor unit.

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Further, the support panel is configured to provide at least one terminal connection for electrical component of the outdoor unit.

- 20 Preferably, the support panel is formed at a casing body of the outdoor unit of the air-conditioning apparatus.

- 25 The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF PREFERRED EMBODIMENT

To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by
5 references to specific embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

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Figure 1 illustrates the split-type air conditioning unit.

Figure 2 illustrates the service panel for an outdoor unit of air conditioning unit.

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Figure 3 illustrates one embodiment of the bridge feature and the flap on the outdoor unit panel.

Figure 4 illustrates detailed design of features surrounding the support panel
20 after the process of cutting or fabrication.

Figure 5 illustrates detailed design of features surrounding the support panel after the flap bend to a certain angle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A split-type air conditioning unit generally operates by connecting both indoor unit (101) and outdoor unit (102). As illustrated in figure 1, the connection in
5 between indoor unit (101) and outdoor unit (102) includes the location of the power cord (103) installation on outdoor unit, preferably on one surface of the side panel for the outdoor unit body. The present invention in particularly focuses on a bridge feature which is fabricated from a thin sheet metal panel (104). One embodiment of the bridge feature has a foldable characteristic, in
10 which it can be folded or unfolded to provide a flexi movement bridge feature or spread out the bridge feature from a folded state. The unfolded state can also be described as a state where the bridge feature is unfurled, unwrapped, or straightened-up from its initial shape.

15 Another embodiment of the bridge feature includes a spring-like characteristic which is fabricated from a thin sheet metal panel (104). When bridge feature with the spring-like characteristic is compressed or stretched slightly, the force exerted is approximately proportional to its change in length or distance from its original position. The panel (104) may be identified as right
20 panel or service panel for outdoor air conditioning unit (102). The detailed feature of the panel (104) for outdoor air conditioning unit (102) having one of the said embodiments is shown in figure 2.

As illustrated in figure 2, at least one function of the bridge feature (202) is to
25 provide connection or support for at least one flap portion (203) of the panel (201), which generally defines a mounting platform for mounting the terminal block (204) firmly on the flap portion (203) of the panel (201). Further, the spring-like or folded characteristic on the bridge feature (202) allows the flap portion (203) or platform to be flexed or deviated to a certain bending or slant
30 angle. The process of fabricating the flap portion (203) having the flexing or deviating or bending function, can be achieved by using standard sheet metal, which is commonly used in the process of metal stamping. The process of metal stamping comprises several different press forming operations such as

punching, bending, flanging, coining, blanking etc. However, the process does not only limit to the stamping process as it may be formed by using other process such as piercing, cutting, molding and any other process than can be used to form such shape as the material of outdoor air conditioning unit (102) may not limit to metal sheet, but sheet or plastic also can be used as a substitute.

The results of this process or fabrication on one portion of a support panel (201) for the outdoor unit air-conditioning provides a flap portion (203) or a platform having generally rectangular in shape, which is formed to enable the flap (203) to flex inwardly into the outdoor unit and away from the non-flap portion of support panel (201). The flap (203) is connected to a bridge feature (202) or bridge member extending from one portion of the flap (203) to one edge of the non-flap portion of support panel (201).

The flap (203) is able to provide mounting platform for terminal block (204), aperture or screw hole (205,206,207,208) for fastening terminal block (204), aperture or screw (205,206,207,208) to the cable or power cord, electrical connector such as terminal block (204), wire harness and other connection means to any electrical components. The flap (203) is also able to provide an aperture (205,206,207,208) for fastening at least one component located within the outdoor unit. The electrical components include electronic components needed by the various air conditioner functions such as capacitors and harness wires mounted on to a sheet metal part which may be indicated as terminal panel.

The bridge feature (202) is fabricated or designed in such a way that the linkage in between the flap (203) and its adjacent connecting counterparts are not broken and strength is maintained strong such that bridge feature (202) is able to support the force toward the platform. The bridge feature (202) pattern profile allows it to have spring-like characteristic, which allows the flap portion (203) or mounting platform to be bent deeper or flexed into the outdoor unit so that the terminal block (204) can be fixed or mounted inside the unit.

Figure 3 illustrates one embodiment of the bridge feature (301,302) which is fabricated at both left and right side of the flap (303) on the outdoor unit panel (304). In addition, an open cut profile is also designed together with the feature to eliminate any crack formation during the stamping or cutting process. Further, the fabricated bridge feature (301,302) is able to bend the flap (303) inwardly or towards inside of the outdoor unit panel (304) with a certain tolerance or bent angle while the bridge features (301,302) remain attached. The stamping process refers to manufacturing process of forming a thin metal sheet into final parts with stamping dies. It is a cascade process where semi-finished steel sheet material produced at each stage will be transferred to subsequence stage following defined sequence until final part produced. The outdoor panel (304) is fabricated from raw material, in the form of structural steel shapes and sheet steel. As the metal sheet is processed into fabrication cells, it is cut, formed, punched, drilled, sheared, and/or bent into a useful shape or form. The metal sheet is usually made of galvanized sheet metal that uses a zinc coating to provide protection against corrosion. The sheet metal is also used to form the bottom pan, face plates, and various support brackets throughout an outdoor unit of air conditioner.

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Figure 4 illustrates the detailed design of features surrounding the support panel (401) at initial process after the process of cutting or fabrication, where the surface of the bridge feature (402,403) and the flap (404) is in a straight or upright position. The upright position is positioned before it is forced to bend or flexed to a certain angle for assembling the connection for the outdoor unit having aperture or hole (408) on the flap (404). One embodiment of the cut-away portion (405) is to enable the connection from indoor unit (101) to outdoor unit (102) and vice-versa. Preferably, the first cut-away portion (405) is in the form of inverted 'U' or 'n', which corresponds or is able to form the flap (404) portion on the service panel (401). Preferably, the first cut-away portion (405) is in an upright position corresponding to the outdoor unit, as this position of cut-away portion (405) is able to ease the mounting process of the terminal connection. Another cut-away portion (406,407) also enables the

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- bridge features (402,403) to achieve the folded or unfolded characteristic which allows the flexi movement for bridge feature (402,403) or spread out the bridge feature (402,403) from a folded state. Preferably, the second cut-away portion (406,407) is in the form of 'Y', which corresponds or able to form the bridge features (402,403) on the service panel (401). Preferably, the second cut-away portion (406,407) is located on each side of the corresponding flap (404) portion. The second cut-away portion (406,407) is able to avoid the crack on the side of the flap (404) during the mounting or fastening of the terminal connection or even when the force is applied to the flap (404) or platform of the service panel (401). The top end of the 'Y' cut-away portion (406,407) is able to define the length or characteristic of the bridge features (402,403), where the bottom end of the 'Y' cut-away portion (406,407) is able to define the length of the flap (404) or platform of the service panel (401).
- Figure 5 illustrates the details design of features surrounding the panel (501) after the flap (502) of the proceeded bend to a certain angle for assembling the connection for the outdoor unit. One embodiment of the invention relates to the bridge features (503) designed in a 'U' shape and located at at least one edge of platform or flap (502), in which the flap (502) has a free-end formed on the edge of the flap (502) by a cut-away portion (405,406,407) as illustrated in figure 4. The cut-away or cut-off portion to form the platform (502), where at least one portion of the support panel (501) is cutaway to form at least one opening (504) or cavity that enables the bridge features (503) to fold and unfold, as well as a flap portion (502) or platform flexed or deviated to a certain bending or slant angle. The 'U' shape design permits the bridge feature (503) to extend or unfold when the platform (502) is bending into an angle by still retaining the link together. Another embodiment of the invention relates to the bridge features (503) designed in an 'S' or 'Z' or 'N' or inverted 'U' shape and located at at least one edge of platform or flap (502) having a free-end, in which the free-end is formed on the edge of the flap (502) by a cut-away portion. The 'S' or 'Z' or 'N' or inverted 'U' shape design permits the bridge features (503) to unfurl or unfold when the platform (502) is bending into an angle by still retaining the link together. The shape of the bridge

features (503) may also be a folded angle or sinuous or any other shape that is able to accommodate the bridge member (503) to extend or flexed when force is applied to the flap (502).

- 5 The present invention may be embodied in other specific forms without departing from its essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore indicated by the appended claims rather than by the foregoing description. All changes, which come within the
- 10 meaning and range of equivalency of the claims, are to be embraced within their scope.

CLAIMS

1. An outdoor unit of an air-conditioning apparatus having a support panel (201), the support panel (201) comprising a cut-away portion (405,406,407) defining a flap (203) portion, the flap (203) is flexed inwardly into the outdoor unit; and at least one bridge member (202) extending from any free end portion of the flap (203) to a corresponding edge of the support panel (201), wherein the bridge member (202) has a curved configuration such that it can be extended by unfurling when force is applied to the flap (203).

2. An outdoor unit according to claim 1, wherein the curved configuration extends inwardly into the outdoor unit by unfurling when force is applied to the flap (203).

3. An outdoor unit according to claim 1, wherein the bridge member (202) has a spring portion such that it can be extended when force is applied to the flap (203).

4. An outdoor unit according to claims 1 to 2, wherein the cut-away portion (405,406,407) of the bridge member (202) is formed into a sinuous in shape to accommodate the bridge member (202) to extend when force is applied to the flap (203).

5. An outdoor unit according to claims 1 to 2, wherein the cut-away portion (405,406,407) of the bridge member (202) is formed into a folded angle to accommodate the bridge member (202) to extend when force is applied to the flap (203).

6. An outdoor unit according to claims 1 to 2, wherein the bridge member (202) is shaped in such a way that the bridge member (202) can be extended from one angle to another angle when force is applied to the flap (203).

7. An outdoor unit according to claims 1 to 5, wherein the flap (203) is flexed inwardly to form a platform within the outdoor unit.

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8. An outdoor unit according to claims 1 to 7, wherein the support panel (201) is configured to provide at least one terminal connection for electrical component of the outdoor unit.

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9. An outdoor unit according to claims 1 to 8, wherein the support panel (201) is formed at a casing body of the outdoor unit of the air-conditioning apparatus.