Feb. 14, 1956 R. D. JESSEE ET AL 2,735,077

PANEL RELEASE MECHANISM

Filed May 29, 1952 2 Sheets-Sheet 1

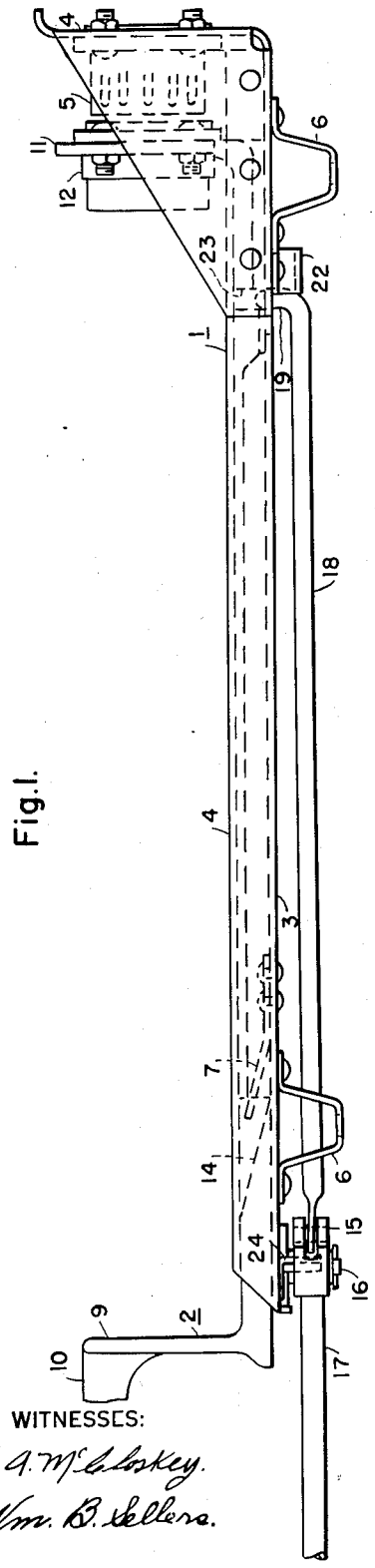


Fig. 1.

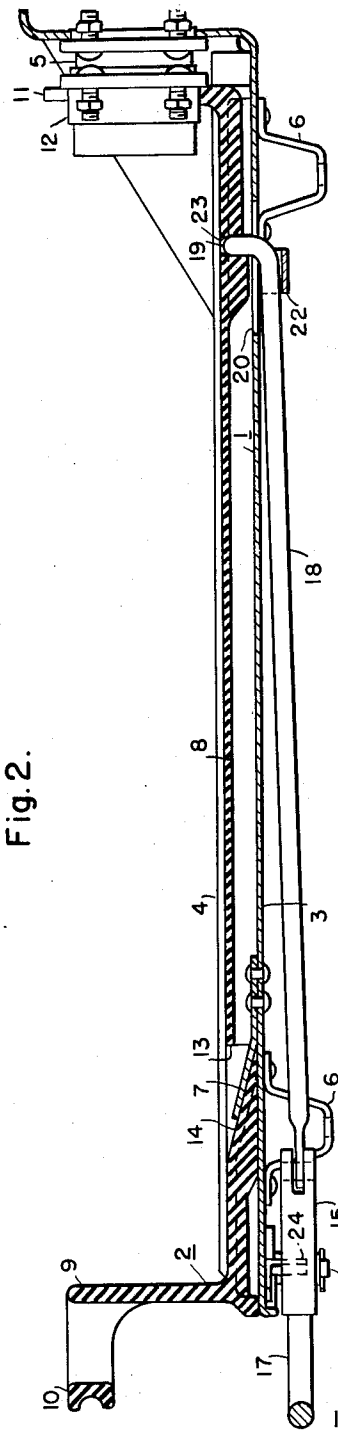


Fig. 2.

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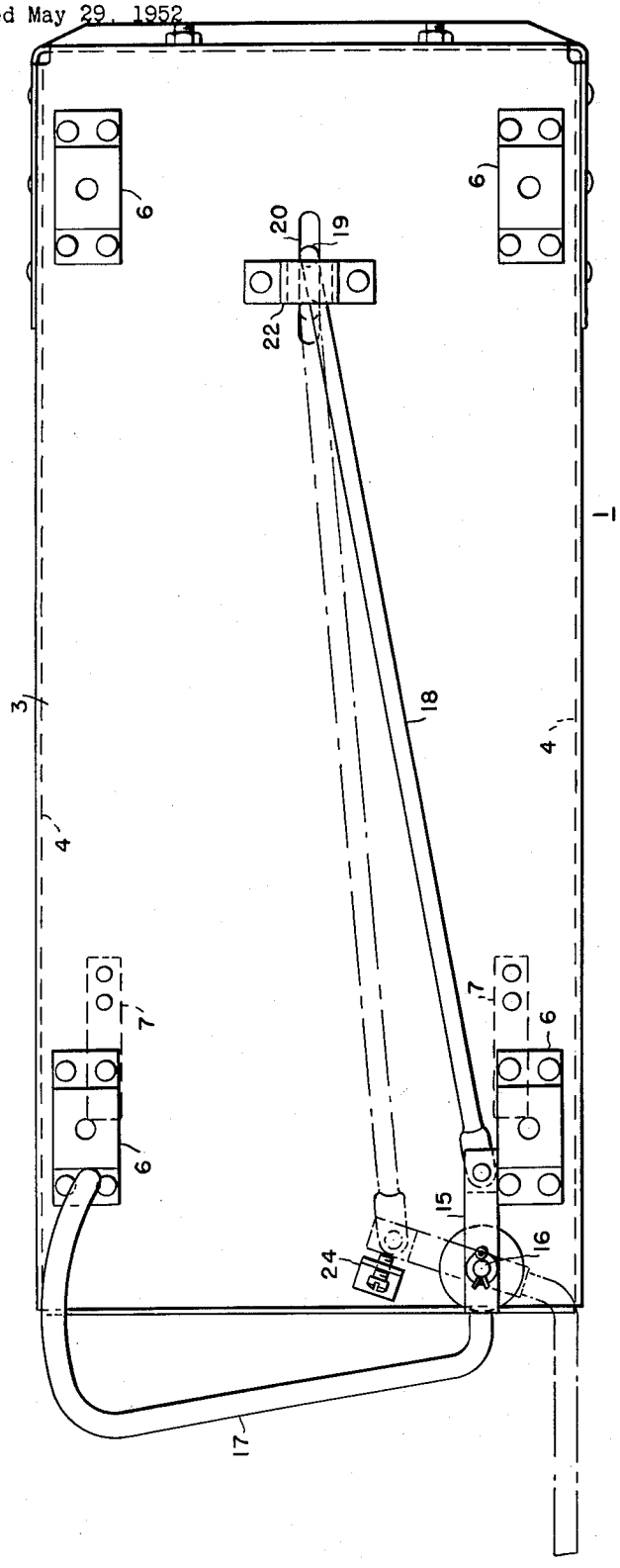


Fig. 3.

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PANEL RELEASE MECHANISM

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8 Claims. (Cl. 339—75)

The present invention relates to electrical control panels of the removable or plug-in type, and more particularly to means for quickly and easily mounting a removable panel on a stationary mounting tray and for releasing or ejecting it from the tray.

In some types of electrical systems, such as those used on aircraft, for example, the voltage regulators, relays, contactors and other control and protective devices of the system are frequently mounted on a removable control panel which is mounted on a stationary mounting tray and provided with one member of a separable electrical connector which is plugged into a cooperating connector member or receptacle on the tray to effect connection of the devices carried by the panel into the circuit. Such an arrangement facilitates installation of the equipment carried on the panel since it provides a compact assembly which is easily installed as a unit, and maintenance is also greatly facilitated since the entire panel can be removed to permit easy access to the relays and other devices carried on it for inspection and adjustment or replacement.

Removable control panels of this type have heretofore been held in place on their mounting trays by means of screw clamps, or similar devices, and were removed by releasing the clamps and manually pulling the panel away from the tray. In many cases, the separable connectors which connect the devices on the panel to the external circuit have a relatively large number of contacts and considerable force, which may be as much as fifty pounds or more, is required to separate the members of the connector. This large force which must be exerted frequently makes it very difficult to remove a conventionally mounted panel, especially where it is installed in a restricted space as is often the case in aircraft use, and in many instances, it has been necessary to pry the connector apart with a screwdriver or similar tool, which is frequently very awkward and is undesirable because it may damage the connector.

The principal object of the present invention is to provide a mounting tray and removable control panel with means for quickly and easily mounting the panel on the tray and locking it in place and for quickly and easily releasing the panel from the tray and ejecting it.

Another object of the invention is to provide a mounting tray and removable control panel with simple and inexpensive means for releasing the panel and ejecting it from the tray without any possibility of damage to the separable connector.

A further object of the invention is to provide a mounting tray having means for engaging a removable panel to move the panel into mounted position on the tray and to lock it in place, and also operable to release the panel and eject it from the tray, and which may be used with removable panels of any desired type or construction.

Other objects and advantages of the invention will be apparent from the following detailed description, taken in connection with the accompanying drawing, in which:

Figure 1 is a view in side elevation showing a mounting tray and removable panel, with the panel in released position;

Fig. 2 is a longitudinal sectional view of a mounting tray and removable panel, showing the panel in the mounted or engaged position; and

Fig. 3 is a bottom view of the mounting tray.

The drawing shows the invention applied to a stationary mounting tray 1 adapted to receive a removable panel 2. The tray 1 may be made of sheet metal and has a longitudinal body portion 3 with upwardly extending sides 4 between which the panel 2 is received. The tray 1 also has an upwardly extending end portion and one member 5 of a separable electrical connector is mounted on the end portion of the tray. The tray preferably has feet 6 of any suitable type for mounting the tray on a stationary supporting structure. The tray is also provided with two spring clips 7 which extend upwardly from the body portion 3 near the end opposite the connector 5 for engagement with the panel.

The removable panel 2 may be of any desired construction and is shown as being molded of insulating material, although it might be formed of sheet metal or made in any other desired manner. The panel has a longitudinal body portion 8 on which may be mounted a voltage regulator, relays or other control or protective devices, which have not been shown in order to avoid unnecessary complication of the drawing. The panel has an upwardly extending end 9 which may have a handle 10 thereon to facilitate handling the panel, and it has an upwardly extending end portion 11 at the opposite end. A connector member 12, which may be the receptacle portion of a separable connector, is mounted on the end portion 11 in position to cooperate with the connector member 5 on the tray 1. The panel 2 has openings 13 adjacent one end corresponding in position with the spring clips 7 on the tray, and the panel is formed with downwardly inclined surfaces 14 in these openings to cooperate with the spring clips 7, as shown in Fig. 2, when the panel is in mounted position, to hold the front end of the panel to the tray. It will be obvious that the surfaces 14 might be provided by separate spring clips attached to the lower surface of the panel, if desired, instead of being molded in the panel itself, as shown.

It will be seen that the panel 2 is mounted in place on the mounting tray 1 by moving it longitudinally of the tray to engage the members 5 and 12 of the separable connector, and the surfaces 14 and clips 7. In accordance with the present invention, means are provided on the tray for mounting the panel and locking it in place and for quickly and easily releasing the panel and ejecting it from the tray, thus avoiding the difficulties described above. For this purpose, a lever 15 is pivotally mounted on the lower surface of the tray 1 at one end thereof. The lever 15 is mounted on a pin 16, or other pivot means, for rotational movement relative to the tray, and one end of the lever 15 is extended beyond the tray and bent as shown in Fig. 3 to form a handle 17. A second lever member 18 is pivotally connected at one end to the other end of the lever 15 and is arranged to move longitudinally of the tray when the lever 15 is rotated about its pivot. The free end of the lever 18 is bent upwardly, as indicated at 19, and extends through an elongated slot 20 in the tray 1. A guide 22 is mounted on the tray 1, extending across the slot 22, and the end 19 of the lever 18 engages the guide 22 when the lever is in the position of Fig. 1, so that the lever 18 is held in the proper position. The panel 2 is provided with a hole or opening 23 in position for the end 19 of the lever 18 to enter the hole 23.

The open or released position of the mechanism is

shown in Fig. 1 and in dotted lines in Fig. 3. In this position, the panel 2 may be placed on the tray 1 between the sides 4 of the tray, which properly position it laterally, and the panel is moved manually to the position shown in Fig. 1, in which the panel merely rests on the tray and the connectors 5 and 12 have not started to engage. To move the panel 2 to its mounted or engaged position, the handle 17 is rotated to the full line position of Fig. 3. This rotates the lever 15 and moves the lever 18 longitudinally to the position shown in full lines. In so moving, the end of the lever 18 rides up in the guide 22 so that the upwardly extending end 19 of the lever is raised into the hole 23 in the panel. Longitudinal movement of the lever 18, therefore, moves the panel longitudinally of the tray to engage the members 5 and 12 of the connector and force the panel into its mounted position. The lever system is arranged to provide a large mechanical advantage and relatively little force has to be applied to the handle 17 to completely engage the connector. As the panel moves to its mounted position, the surfaces 14 engage under the spring clips 7 to hold the front of the panel down to the tray.

After the panel has reached its engaged position, further movement of the handle 17 to the final closed position shown in Fig. 3 causes the lever 18 to buckle or yield slightly until the lever 15 goes "over center." The longitudinal force or reaction exerted by the lever 18 on the lever 15 is then in a direction to urge the handle 17 to the closed position so that the panel is locked in position and there is no danger of the mechanism opening and moving the panel accidentally, since a definite force must be applied to the handle 17 to move it back to the open position.

To release the panel and eject it from the tray, the handle 17 is moved back to the open position. This rotates the lever 15 and moves the lever 18 longitudinally to draw the panel longitudinally of the tray, separating the members 5 and 12 of the connector and disengaging the surfaces 14 and spring clips 7. After the connector has separated, the lever 18 rides off the guide 22, which allows the end 19 of the lever to drop out of the hole 23 in the panel 2. An adjustable stop 24 for the lever 15 is provided to prevent moving the lever too far, so that the end of the lever 18 will bear against the guide 22, as shown in Fig. 1, in position to readily ride up on the guide when the mechanism is again actuated to closed position. After the end 19 of the lever 18 has dropped out of the panel 2, the parts have returned to the position shown in Fig. 1 and the panel is free of the tray. The panel can then be removed simply by lifting it out of the tray or by pulling it from the tray, the end of the panel adjacent the hole 23 being formed as shown in Fig. 1, so that it will clear the end 19 of the lever to permit the tray to be withdrawn longitudinally, or, if desired, the edge of the hole might be beveled sufficiently to allow the panel to ride over the lever without entirely clearing it.

It will be seen that a simple mechanism has been provided which makes it possible to quickly and easily move a removable control panel to its mounted position and lock it in place, and to quickly and easily release the panel from the mounting tray and eject it therefrom. This arrangement has many advantages since it is simple to design and manufacture, and any type or design of removable plug-in panel can be used in a tray provided with this mechanism. Relatively little force is needed to operate the device to engage and disengage the panel and the arrangement is such that damage to the connectors is positively prevented. It will also be noted that it is impossible to engage the connector if the mechanism is in the closed position because the end 19 of the lever 18 will be projecting upward so that the panel cannot be moved into position. The mechanism must therefore be in the open position before the panel can be put in place on the tray and the connector engaged.

A specific embodiment of the invention has been shown and described for the purpose of illustration, but it will be apparent that various other embodiments are possible within the scope of the invention, and it is to be understood that the invention is not limited to the specific details of construction shown, but includes all equivalent embodiments and modifications.

We claim as our invention:

1. In combination, a stationary, elongated, flat mounting tray, a removable panel adapted to be mounted on said tray, a lever mounted on the tray for movement longitudinally thereof, one end of said lever extending transverse to the direction of movement of the lever, the panel having an opening therein to be engaged by said end of the lever, means for moving the lever, and means for effecting transverse movement of said end of the lever to engage it in the opening in the panel when the lever is moved longitudinally of the tray in one direction to move the panel into mounted position, the lever moving the panel into released position and dropping out of said opening when the lever is moved in the other direction.

2. In combination, a stationary, elongated, flat mounting tray, a removable panel adapted to be mounted on said tray, securing means for securing the panel to the tray, a lever mounted on the tray for movement longitudinally thereof, one end of said lever extending transverse to the direction of movement of the lever, the panel having an opening therein to be engaged by said end of the lever, means for moving the lever, and means for effecting transverse movement of said end of the lever to engage it in the opening in the panel when the lever is moved longitudinally of the tray in one direction to move the panel into mounted position, with the securing means engaged, the lever moving the panel into released position with the securing means disengaged and dropping out of said opening when the lever is moved in the other direction.

3. In combination, a stationary, elongated, flat mounting tray, a removable panel adapted to be mounted on said tray, a separable electrical connector having two cooperating members, one of said members being mounted on the tray and the other of said members being mounted on the panel, a lever mounted on the tray for movement longitudinally thereof, one end of said lever extending transverse to the direction of movement of the lever, the panel having an opening therein to be engaged by said end of the lever, means for moving the lever, and means for effecting transverse movement of said end of the lever to engage it in the opening in the panel when the lever is moved longitudinally of the tray in one direction to move the panel into mounted position, with the two members of the separable connector engaged, the lever moving the panel to disengage the members of the separable connector and dropping out of said opening when the lever is moved in the other direction.

4. In combination, a staionary, elongated, flat mounting tray, a removable panel adapted to be mounted on said tray, a separable electrical connector having two cooperating members, one of said members being mounted on the tray and the other of said members being mounted on the panel, interengaging means on the panel and on the tray for securing the panel to the tray, a lever mounted on the tray for movement longitudinally thereof, one end of said lever extending transverse to the direction of movement of the lever, the panel having an opening therein to be engaged by said end of the lever, means for moving the lever, and means for effecting transverse movement of said end of the lever to engage it in the opening in the panel when the lever is moved longitudinally of the tray in one direction to move the panel into mounted position, with the members of the separable connector and said interengaging means engaged, the lever moving the panel to disengage the members of the separable connector and the interengaging

means and dropping out of said opening when the lever is moved in the other direction.

5. A flat, elongated mounting tray adapted to receive a removable panel member on one side thereof, said mounting tray having a first lever member movably mounted thereon on the opposite side, a second lever member rotatably mounted on the tray and connected to the first lever to move the first lever longitudinally of the tray when the second lever is rotated, the first lever having a portion extending through an opening in the tray and adapted to engage a panel and move it relative to the tray, and means on the tray for engaging a panel and holding it against the tray.

6. A flat, elongated mounting tray adapted to receive a removable panel member, said mounting tray having a first lever member movably mounted thereon, a second lever member rotatably mounted on the tray and connected to the first lever to move the first lever longitudinally of the tray when the second lever is rotated, the first lever having an end portion extending transverse to the direction of movement of the first lever, said end portion being adapted to engage a panel and move it relative to the tray, means on the tray for effecting transverse movement of the first lever to move it to panel-engaging position when it is moved in one direction, and means on the tray for engaging a panel and holding it against the tray.

7. In combination, an elongated, flat mounting tray, a removable panel member adapted to be mounted on said tray, a separable electrical connector having a member mounted on one end of the tray and a cooperating member mounted on the corresponding end of the panel, a lever mounted on the tray for movement longitudinally thereof, said lever having means for engaging the panel, means on the tray adjacent the end thereof remote from said connector for actuating the lever to move the panel to mounted position with the members of the separable connector engaged and to move the panel to released position with the members of the separable connector disengaged, and interengaging means on the tray and the panel remote from the separable connector for securing the panel to the tray when the panel is in mounted position.

8. In combination, an elongated, flat mounting tray, a removable panel member adapted to be mounted on said tray, a separable electrical connector having a member mounted on one end of the tray and a cooperating member mounted on the corresponding end of the panel, a lever mounted on the tray for movement longitudinally thereof, said lever having means for engaging the panel, means on the tray adjacent the end thereof remote from said connector for actuating the lever to move the panel to mounted position with the members of the separable connector engaged and to move the panel to released position with the members of the separable connector disengaged, the panel having an inclined surface thereon adjacent the end of the panel remote from the connector, and the tray having means providing a cooperating inclined surface, said surfaces being positioned to engage each other to secure the panel to the tray when the panel is moved to mounted position and to be disengaged when the panel is moved to released position.

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