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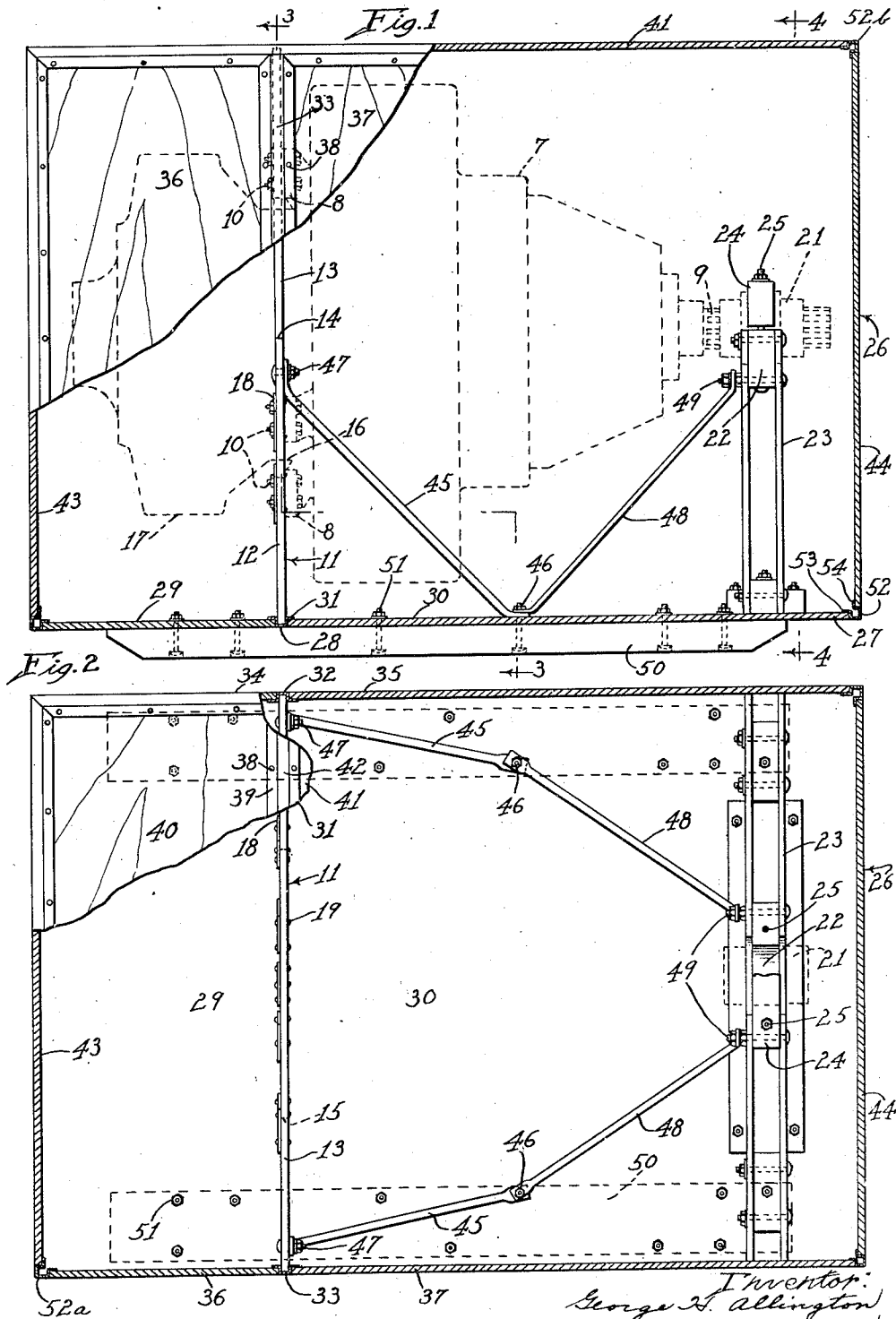
G. H. ALLINGTON

2,460,797

ENGINE SHIPPING CASE

Filed June 19, 1944

2 Sheets-Sheet 1



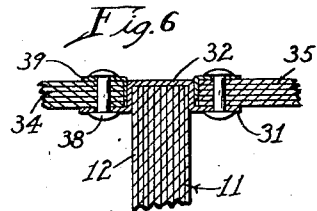
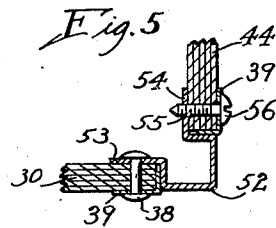
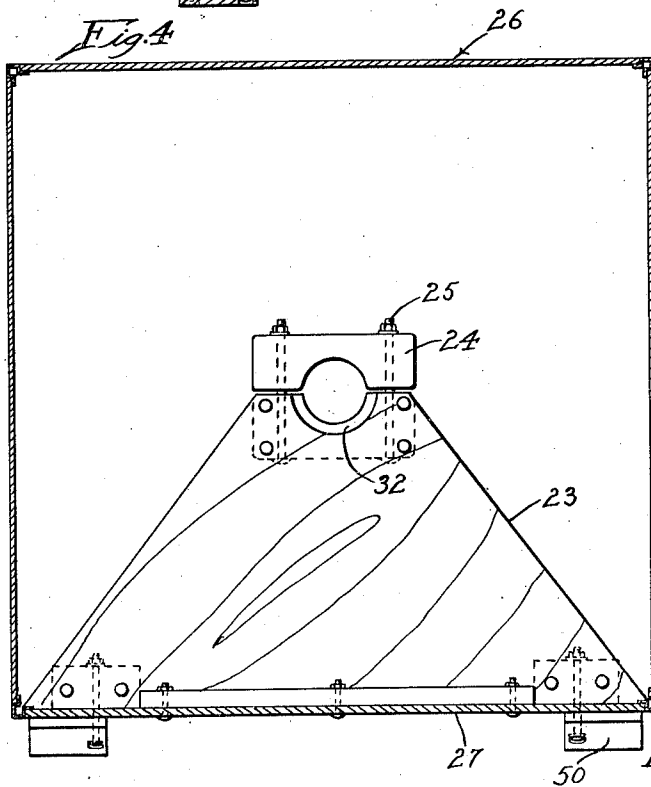
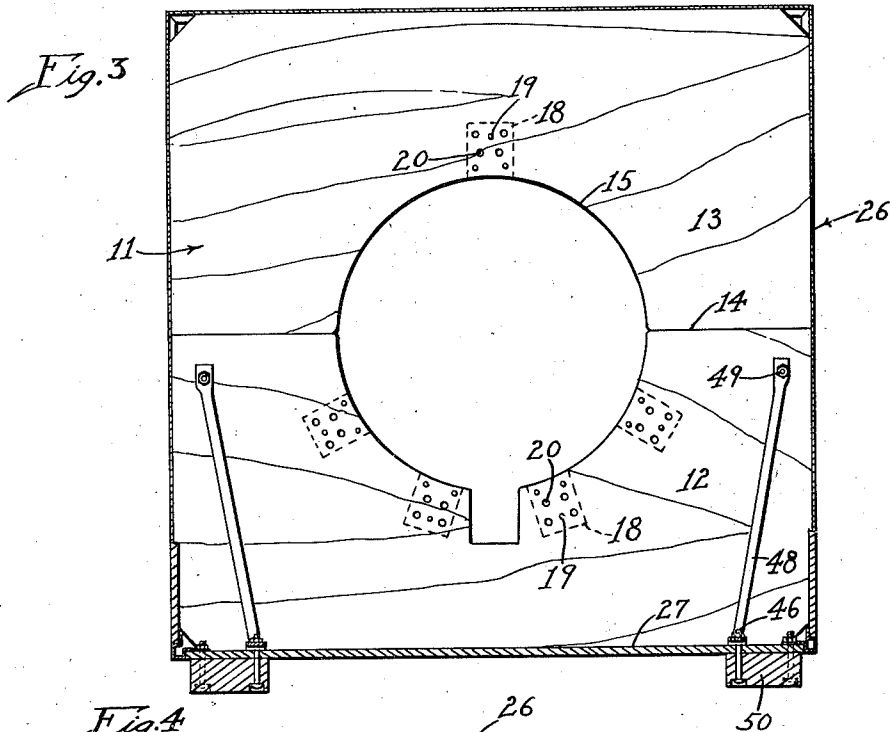
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UNITED STATES PATENT OFFICE

2,460,797

ENGINE SHIPPING CASE

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Continuation of application Serial No. 504,572,
October 1, 1943. This application June 19,
1944, Serial No. 541,133

14 Claims. (Cl. 206—46)

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This application is a continuation of my application Serial No. 504,572, filed October 1, 1943 now abandoned.

This invention relates to an improved shipping case especially designed and adapted for use in the shipment of radial type aircraft engines.

The principal object of my invention is to provide a shipping case in which a two-piece mounting panel is provided that is securely braced by interlocking engagement on all four sides in a channel recess provided therefor in the four walls of the case, the lower or main half section of the panel being attached to and suitably braced with respect to the bottom of the case to permit mounting the engine thereon before the case-cover is dropped over the engine in interlocked relation to said panel section and secured to the case-bottom, and the upper panel half section being put in place on the lower section and fastened to the engine and interlocked with the case-cover when it is dropped over the engine, thereby lending additional rigidity for the engine mounting.

Another object consists in the provision of a second support in spaced parallel relation to the lower panel half section adapted to receive and support a bushing that is slipped over the propeller shaft of the engine for rigid support of the engine in the case, the support being tied in relation to the lower panel half section and braced with it relative to the case-bottom for maximum all around rigidity.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view partly in side elevation and partly in vertical longitudinal section of an engine shipping case made in accordance with my invention;

Fig. 2 is another view of the case partly in plan and partly in horizontal section;

Figs. 3 and 4 are cross-sections on the lines 3—3 and 4—4 of Fig. 1; and

Figs. 5 and 6 are sectional details on a larger scale.

The same reference numerals are applied to corresponding parts throughout the views.

A radial type aircraft engine is indicated in dotted lines at 7 in Fig. 1, having the usual bosses 8 in circumferentially spaced relation around the longitudinal axis of the engine and its propeller shaft 9 for use ultimately in the mounting of the engine in the aircraft for which it is designed. Bolts 10 are entered in these bosses to mount the engine in the shipping case on the panel 11, provided in accordance with my invention. The panel 11 is substantially square and comprises a lower main half section 12 of rectangular form and an upper half section 13 of rectangular form,

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the parting line 14 coinciding with a diagonal line passing through the center of the circular opening 15 for reception of the reduced crank case portion 16 of the engine, half of the opening being cut out of the panel section 12 and the other half from the panel section 13. The reason the panel 11 is made in two halves is because the enlarged rear portion 17 of the crank case cannot be passed through an opening of the diameter of the opening 15, and, hence, the two halves 12 and 13 of the panel 11 have to be brought into position from opposite sides of the reduced portion 16, which is of approximately the diameter of the opening 15. The panel sections 12 and 13 are preferably, though not necessarily, made of plywood, like the rest of the case, and for that reason metal plates 18 are riveted, or otherwise suitably secured, to the one face of the panel sections 12 and 13, as indicated at 19, for protection of the wood against splintering when the bolts 10 are entered through registering holes 20 in the plates and panel sections for anchorage and support of the engine. The holes 20 are, of course, located in the same relationship as the holes in the mounting place on the aircraft fuselage and are of the same size, so that the bolts 10 can be of the same size as those used in the ultimate mounting of the engine on the aircraft, and the engine is accordingly supported substantially as well on the panel 11 in the shipping case as when it is mounted on the aircraft. The engine, supported by a hoist, is first bolted to the lower main panel section 12 on which there are four places for clusters of bolts to fasten the engine, as illustrated in Fig. 3. A bushing 21 slipped over the splined portion of the propeller shaft 9 is received in a bearing 22 on another support 23 in the case to provide outboard support for the engine to insure the desired rigidity, and a bearing cap 24 is bolted to the bearing 22, as indicated at 25, to clamp the bushing 21 firmly. As soon as the engine has been fastened to the lower main panel section 12 and the bushing 21 on its propeller shaft has been clamped on the support 23, the hoist can be disconnected from the engine, because it is supported well enough at that stage. Then the upper panel section 13 is positioned over the lower panel section 12 and bolted to the upper boss 8 on the engine crank case, and everything is then in readiness for the dropping of the case-cover 26 over the engine and the fastening of the cover to the case-bottom 27 to complete the packing of the engine, ready for shipment.

The two-piece panel 11, in accordance with my invention, has the bottom edge thereof received in a sheet metal channel-member 28,

which extends the full width of the plywood case-bottom 27 and is secured to the sections 29 and 30 of the case-bottom by its outwardly directed flanges 31 suitably by rivets in the manner illustrated in Fig. 6 for the channel-member 32. The opposite side edges of the panel 11 are slidably received in two other sheet metal channel-members 32 and 33 which extend the full height of the case-cover 26, the channel-member 32 being disposed between the sections 34 and 35 of the one plywood side wall of the case-cover, and the channel-member 33 being disposed between the sections 36 and 37 of the other plywood side wall of the case-cover. The channel-members 32 and 33 are secured by their outwardly projecting flanges 31 to the adjacent wall sections by rivets 38, as most clearly appears in Fig. 6, reinforcing metal strips 39 of angular cross-section being placed over the edges of the plywood wall sections, and the rivets being passed through registering holes in these strips and in the plywood and flanges, as shown. In that way there is no danger of the rivets splintering the plywood, the angular metal strips 39 affording the desired amount of bearing surface to distribute the load sufficiently to prevent splintering. The top wall of the case-cover is made in two sections like the two side walls, as indicated at 40 and 41 in Fig. 2, and a sheet metal channel-member 42 is disposed between these sections and riveted thereto by its outwardly directed flanges 31, as indicated at 38, annular sheet metal strips 39 being provided over the edges of the plywood sections 40 and 41, similarly as in the other portions of the cover. The end walls 43 and 44 of the case-cover 26 are also of plywood like the rest of the cover. It should be clear that when the case-cover 26 is dropped down over the engine, the two-piece panel 11 enters the channels 32, 33, and 42 and is, therefore, interlocked along all four edges with the case-cover 26 and case-bottom 27, inasmuch as the lower edge of the two-piece panel 11 is entered in the channel-member 28. In that way the panel 11 is assured of maximum rigidity without, however, interfering with the relatively easy removal and replacement of the case-cover. The lower main panel section 12 has a pair of brace rods 45 disposed diagonally between the case-bottom and the panel and bolted to the case-bottom at 46 and to the panel section 12 at 47, whereby to give the desired rigidity to the panel section 12 for support of the engine when the case-cover is not in place over the engine and fastened to the case-bottom. Another pair of brace rods 48 extends diagonally between the case-bottom 27 and the support 23, these rods being bolted to the bottom 27 by the same bolts 46 used in connection with the brace rods 45 and being secured to the support 23 by other bolts 49. The support 23 is, therefore, connected with the panel section 12 through the brace rods 45 and 48 against displacement in addition to being braced with the panel section 12 relative to the case-bottom 27. Two skids 50 extend lengthwise of the underside of the case-bottom 27 and are bolted to the two sections 29 and 30 thereof, as indicated at 51, for protection of the case in shipment and also to provide a good place for connecting a hoist to the case in the handling thereof. The skids have the bolts 46 extended therethrough as well as through the case-bottom 27, so that whatever loads are imposed on the bolts 46 in the shipment of the engine are not apt to splinter the case-bottom or

cause any enlargement of the bolt holes, although it will, of course, be clear that due to the interlocked relationship of the two-piece panel 11 and the case-cover 26 and bottom 27, the bolts 46 are not called upon to assume any great load in the shipment of an engine. The brace rods 45 and 48 being all disposed in acute angular relationship to the side walls of the case and in acute angular relationship to one another, as clearly appears in Fig. 2, instead of in parallel relationship, give compound reinforcement to the engine mounting. These rods 45 and 48 are furthermore disposed most advantageously with relation to the engine 7, so that maximum working clearance is left on both sides of the engine, which, of course, is of advantage both in packing and unpacking.

When the case-cover is slipped down over the engine, it may be fastened at the bottom to the case-bottom 27 along all four sides thereof, there being hollow sheet metal frame members 52 of square cross-section, as shown in Fig. 5, permanently secured to the edges of the plywood pieces 29 and 30 by their inwardly projecting flanges 53, as by means of rivets 38 entered through sheet metal strips 39 of angular form, similarly as in Fig. 6. The other flange 54 on each of these frame members has holes 55 punched therein to receive self-tapping screws 56, which are entered through holes in sheet metal strips 39 of angular cross-section and through holes provided therefor in the lower edge portions of the side and end walls of the case-cover. The side and end walls, it should be clear from Fig. 2, are secured together at the corners by sheet metal frame members 52a of similar form to the frame members 52, but all of these corners are riveted together, and the same is true in regard to the top corners where frame members 52b of similar form are provided, as indicated in Fig. 1, there being no necessity for detachable connections at any of these corners, and, hence, no necessity for the use of screws.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a lower generally rectangular case section and a hollow generally rectangular cover section adapted to be assembled on the lower case section to enclose an engine supported on the latter, an engine of the kind mentioned, and engine supporting means comprising a rectangular panel made in two rectangular halves, namely, a lower panel half rigidly secured to the lower case section and cut out to receive and being rigidly secured to a portion of the crank case of the engine for support, and an upper panel half also cut out to receive and being rigidly secured to another portion of the crank case of the engine for support, the panel halves being held together in coplanar relationship by the engine secured thereto, whereby to form an integral panel, and means including grooves in the lower case section and hollow cover section closely receiving edge portions of said panel halves to support the panel in rigid relation to the assembled case.

2. An engine shipping case as set forth in claim 1, wherein the engine has a power shaft project-

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ing from the crank case in parallel relation to the longitudinal axis thereof, the shipping case including an outboard support in spaced relation to the engine supporting panel carrying a bearing whose longitudinal axis is substantially longitudinally aligned with the engine receiving opening in the panel receiving the power shaft of the engine to provide auxiliary support for the engine, and means for securing said support in rigid relation to the lower case section.

3. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a lower generally rectangular case section and a hollow generally rectangular cover section adapted to be assembled on the lower case section to enclose an engine supported on the latter, an engine of the kind mentioned, and engine supporting means comprising a rectangular panel having an opening provided therein receiving a portion of the engine, means for securing the engine to the panel when disposed in the opening, said engine having a power shaft projecting from the crank case in parallel relation to the longitudinal axis thereof, an outboard support receiving the power shaft of the engine, means for securing said panel and outboard support in rigid relation to the lower case section, and means including a groove in the hollow cover section closely receiving the upper edge portion of the panel when the hollow cover section is lowered into assembled relation to the lower case section, whereby to support the panel in rigid relation to the assembled case.

4. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a lower generally rectangular case section and a hollow generally rectangular cover section adapted to be assembled on the lower case section to enclose an engine supported on the latter, an engine of the kind mentioned, and an engine supporting panel split in the middle where an opening receiving the crank case portion of the engine is provided, whereby to permit placing and fastening the engine first on one half of the panel and then placing the other half in coplanar relation to the first half and fastening the same to the engine, means for rigidly securing the engine to the coplanar panel halves when disposed in the opening serving to hold said panel halves together to form an integral panel and means including grooves in the side portions of the lower case section and in the top wall of the cover section closely receiving edge portions of said panel for support thereof in rigid relation to the assembled case.

5. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, an engine of the kind mentioned, and engine supporting means comprising a substantially rectangular panel disposed substantially in right angle relation to the case-bottom, means for rigidly securing said engine on said panel, means for rigidly supporting the panel on the case-bottom independently of the case-cover, and means providing a channel on the inner side of the case on the top thereof to close-

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ly receive the upper edge portion of said panel for support of the panel against lateral displacement with respect to the case-cover, the panel supporting means and last mentioned means cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

6. An engine shipping case as set forth in claim 5, wherein the engine has a power shaft projecting from the crank case in parallel relation to the longitudinal axis thereof, the shipping case including an outboard support in spaced relation to the engine supporting panel carrying a bearing whose longitudinal axis is substantially longitudinally aligned with the engine receiving opening in the panel receiving the power shaft of the engine to provide auxiliary support for the engine, and means for securing said support in rigid relation to the case-bottom independently of the cover.

7. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, an engine of the kind mentioned, engine supporting means comprising a substantially rectangular panel on which said engine is rigidly secured disposed substantially in right angle relation to the case-bottom, means for rigidly supporting the panel on the case-bottom independently of the case-cover, and means providing channels on the inner sides of the case-cover on opposite sides of the panel and across the top thereof slidably receiving the opposed edge portions and top portion of said panel for support of the panel against lateral displacement with respect to the case-cover, the panel supporting means and last mentioned means cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

8. An engine shipping case as set forth in claim 7, wherein the engine has a power shaft projecting from the crank case in parallel relation to the longitudinal axis thereof, the shipping case including an outboard support in spaced relation to the engine supporting panel carrying a bearing whose longitudinal axis is substantially longitudinally aligned with the engine receiving opening in the panel receiving the power shaft of the engine to provide auxiliary support for the engine, and means for securing said support in rigid relation to the case-bottom independently of the cover.

9. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, an engine of the kind mentioned, engine supporting means comprising a substantially rectangular panel on which said engine is rigidly secured disposed substantially in right angle relation to the case-bottom, means providing a channel in the case-bottom for supporting engagement therein of the lower edge portion of the panel, bracing means for rigidly supporting the panel relative to the case-bottom independently of the case-cover, and means providing channels on the inner sides of the case-

cover on opposite sides of the panel slidably receiving the opposed edge portions of said panel for support of the panel against lateral displacement with respect to the case-cover, the bracing means and channel means cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

10. In an engine shipping case for a radial aircraft engine having a generally cylindrical crank case portion projecting from the center of the group of cylinders, said shipping case comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, an engine of the kind mentioned, engine supporting means comprising a substantially rectangular panel on which said engine is rigidly secured disposed substantially in right angle relation to the case-bottom, means providing a channel in the case-bottom for supporting engagement therein of the lower edge portion of the panel, bracing means for rigidly supporting the panel relative to the case-bottom independently of the case-cover, and means providing a channel on the inner side of the case on the top thereof to receive the upper edge portion of said panel for support of the panel against lateral displacement with respect to the case-cover, the bracing means and channel means cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

11. In an engine shipping case, comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, engine supporting means comprising a substantially rectangular panel disposed substantially in right angle relation to the case-bottom, said case-bottom comprising two panels of non-metallic sheet material interconnected in co-planar relation by a sheet metal channel member in which the lower edge portion of the engine supporting panel is adapted to be engaged for support, bracing means for rigidly supporting the panel relative to the case-bottom independently of the case-cover, and said case-cover having a top wall comprising two panels of non-metallic sheet material interconnected in co-planar relation by a sheet metal channel member in which the upper edge of the engine supporting panel is adapted to be engaged for support against lateral displacement with respect to the case-cover, the bracing means and channel means cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

12. In an engine shipping case, comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose an engine supported on the case-bottom, engine supporting means comprising a substantially rectangular panel disposed substantially in right angle relation to the case-bottom, bracing means for rigid support of the panel relative to the case-bottom independently of the case-cover, and said case-cover having opposed side walls each made of two panels of non-metallic sheet material interconnected in coplanar relation by a sheet metal channel member in which the adjacent edge portion of the engine supporting panel sections is adapted to be engaged for support of the panel against lateral displacement with respect to the case-cover, the bracing means and channel means

cooperating when the case-cover is secured to the case-bottom to provide rigid support for the engine supporting panel.

13. In an engine shipping case, comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose a radial aircraft engine supported on the case-bottom, an engine of the kind mentioned, engine supporting means comprising a substantially rectangular panel on which said engine is rigidly secured disposed substantially in right angle relation to the case-bottom, brace rods connected to said panel and disposed diagonally between said panel and the case bottom, and an outboard support for the engine mounted on the case-bottom in spaced relation to the aforesaid panel and adapted to provide support for the propeller shaft of the engine, and brace rods connected to said outboard support and disposed diagonally between said outboard support and the case-bottom and interconnected with the brace rods for the aforesaid panel and fastened to the case bottom to prevent displacement of said outboard support relative to said panel and maintain the same in rigid relation to the case-bottom.

14. In an engine shipping case, comprising a substantially rectangular case-bottom and a four-sided case-cover detachably securable to the case-bottom to enclose a radial aircraft engine supported on the case-bottom, an engine of the kind mentioned, engine supporting means comprising a substantially rectangular panel on which said engine is rigidly secured disposed substantially in right angle relation to the case-bottom, brace rods connected to said panel and disposed diagonally between said panel and the case bottom, and an outboard support for the engine mounted on the case-bottom in spaced relation to the aforesaid panel and adapted to provide support for the propeller shaft of the engine, brace rods, connected to said outboard support and disposed diagonally between said outboard support and the case-bottom and having their lower ends in overlapping relation to the lower ends of the brace rods for the aforesaid panel, bolts interconnecting the overlapping lower ends of the two sets of brace rods and fastening the same to the case bottom, to prevent displacement of said outboard support relative to said panel and maintain the panel and outboard support in rigid relation to the case-bottom, and skids secured to the underside of the case-bottom having the said bolts extended therethrough and through the case-bottom and projecting upwardly from the case-bottom for interconnection of said brace rods.

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