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Couch

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(54) **MODULAR ENGINE SHIPPING SKID**

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B65D 85/68 (2006.01)
B65D 19/38 (2006.01)
B65D 19/44 (2006.01)

(52) **U.S. Cl.**
CPC ***B65D 85/68*** (2013.01); ***B65D 19/385*** (2013.01); ***B65D 19/44*** (2013.01); *B65D 2519/00323* (2013.01); *B65D 2519/00542* (2013.01); *B65D 2519/00676* (2013.01); *B65D 2519/00815* (2013.01); *B65D 2519/0097* (2013.01); *B65D 2585/6877* (2013.01)

(58) **Field of Classification Search**
CPC B65D 85/68; B65D 2585/68; B65D 2585/6802; B65D 2585/6875; B65D 2585/6877; B65D 19/44; B65D 19/385
USPC 206/319, 386
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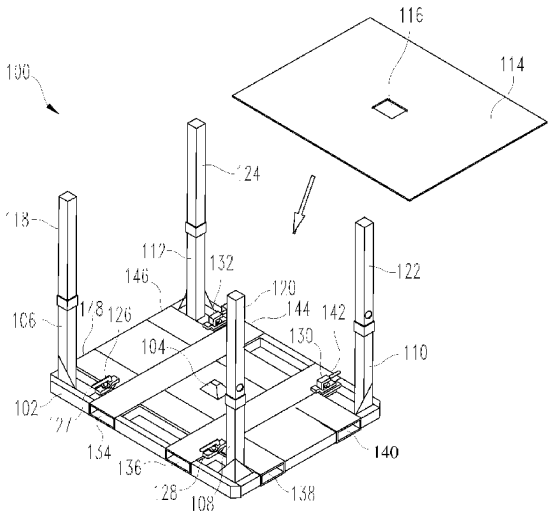
Primary Examiner — Steven A. Reynolds

(57) **ABSTRACT**

A modular shipping skid for an engine is provided. The skid includes a base sized to receive an engine thereon, at least one alignment member projecting from the base, and a plurality of vertically extending support members extending from the base. The skid includes a fixture plate having an opening to fit a profile of the at least one alignment member and secure the fixture plate onto the base. The engine is mounted to a fixture on the fixture plate, and different fixture plates are provided with different fixtures to accommodate different sized engines on the same base.

19 Claims, 7 Drawing Sheets



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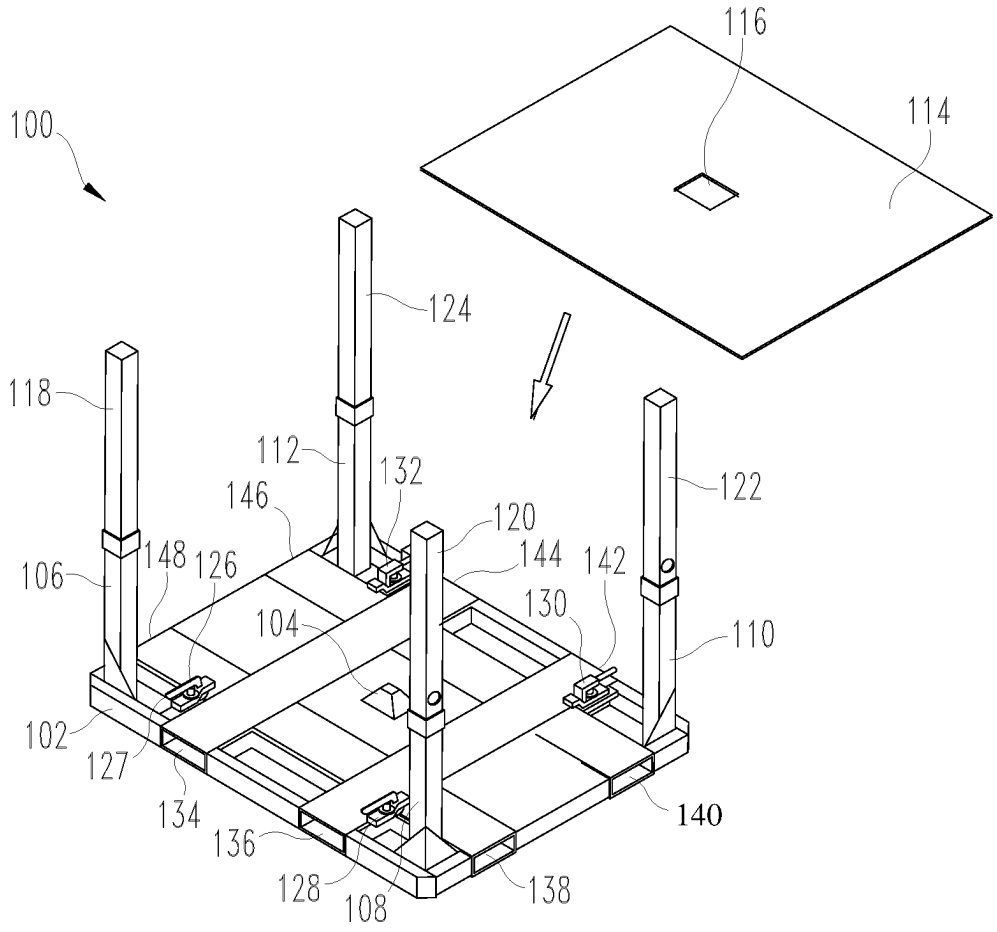
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Fig. 1

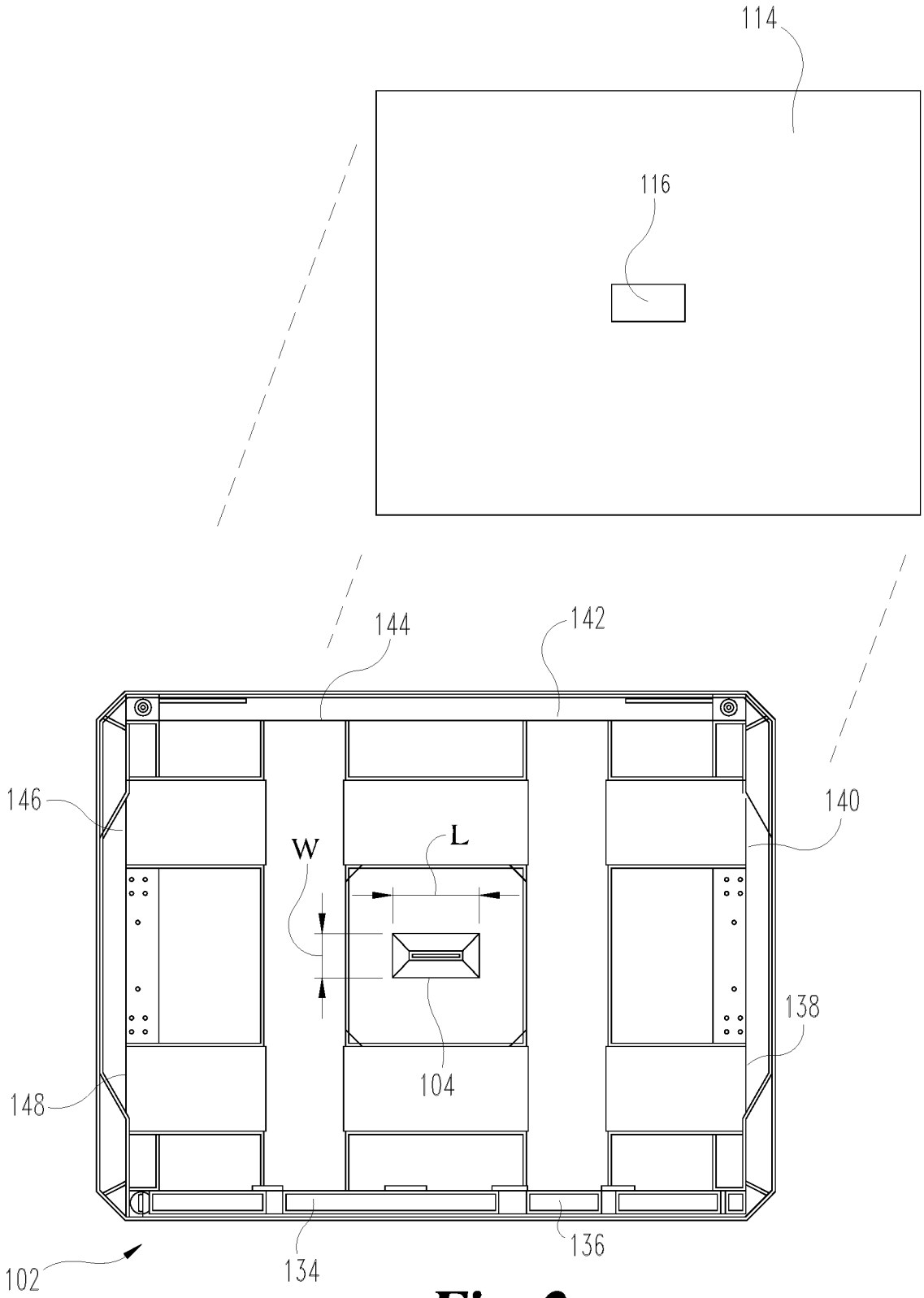
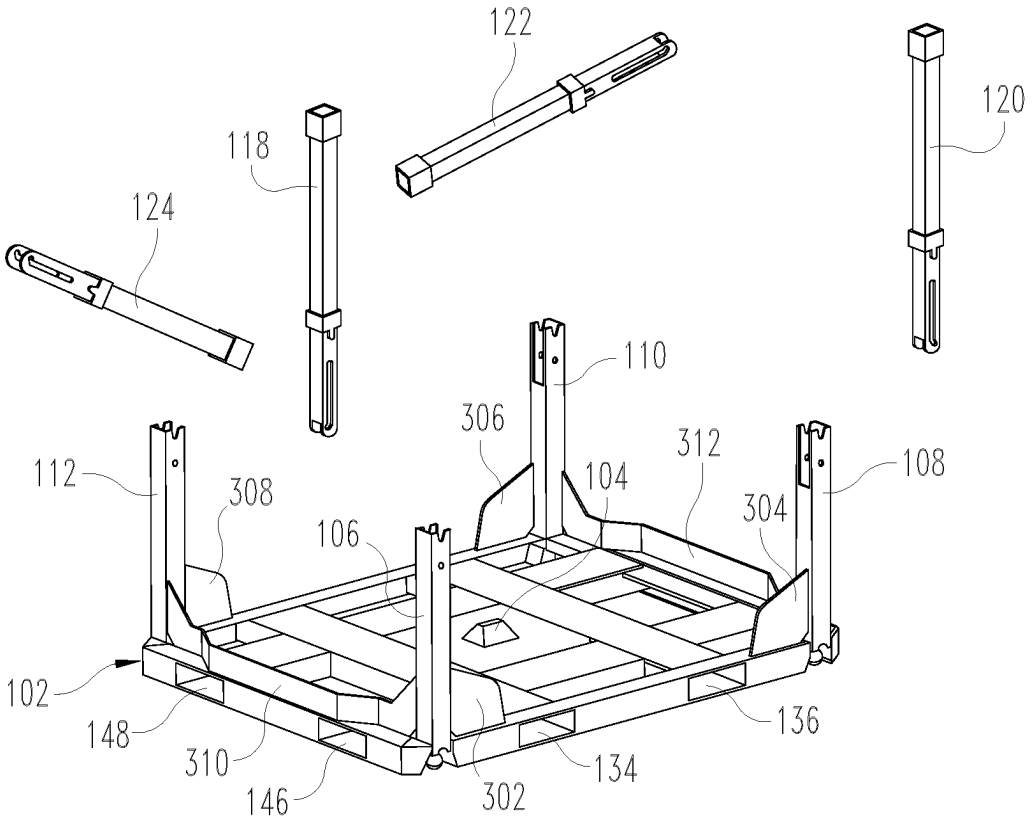


Fig. 2


122
120
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312
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104
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102
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302
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136

Fig. 3A

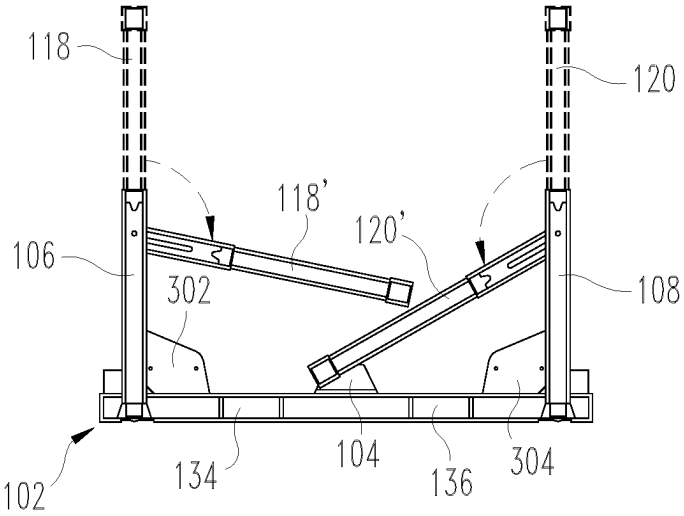


Fig. 3B

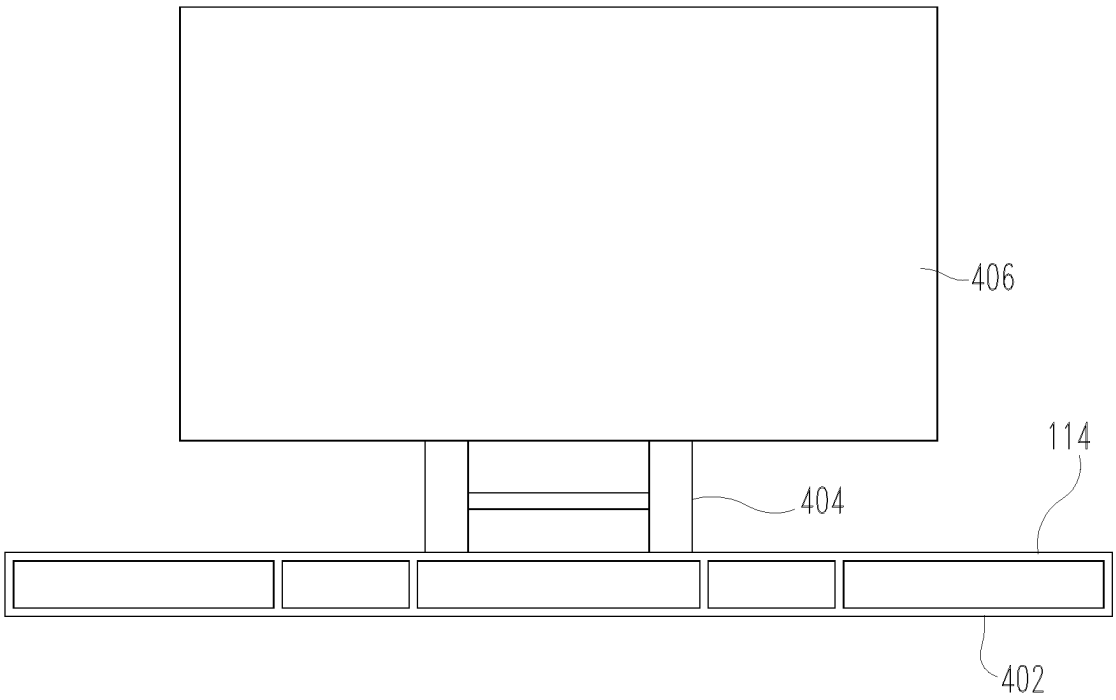
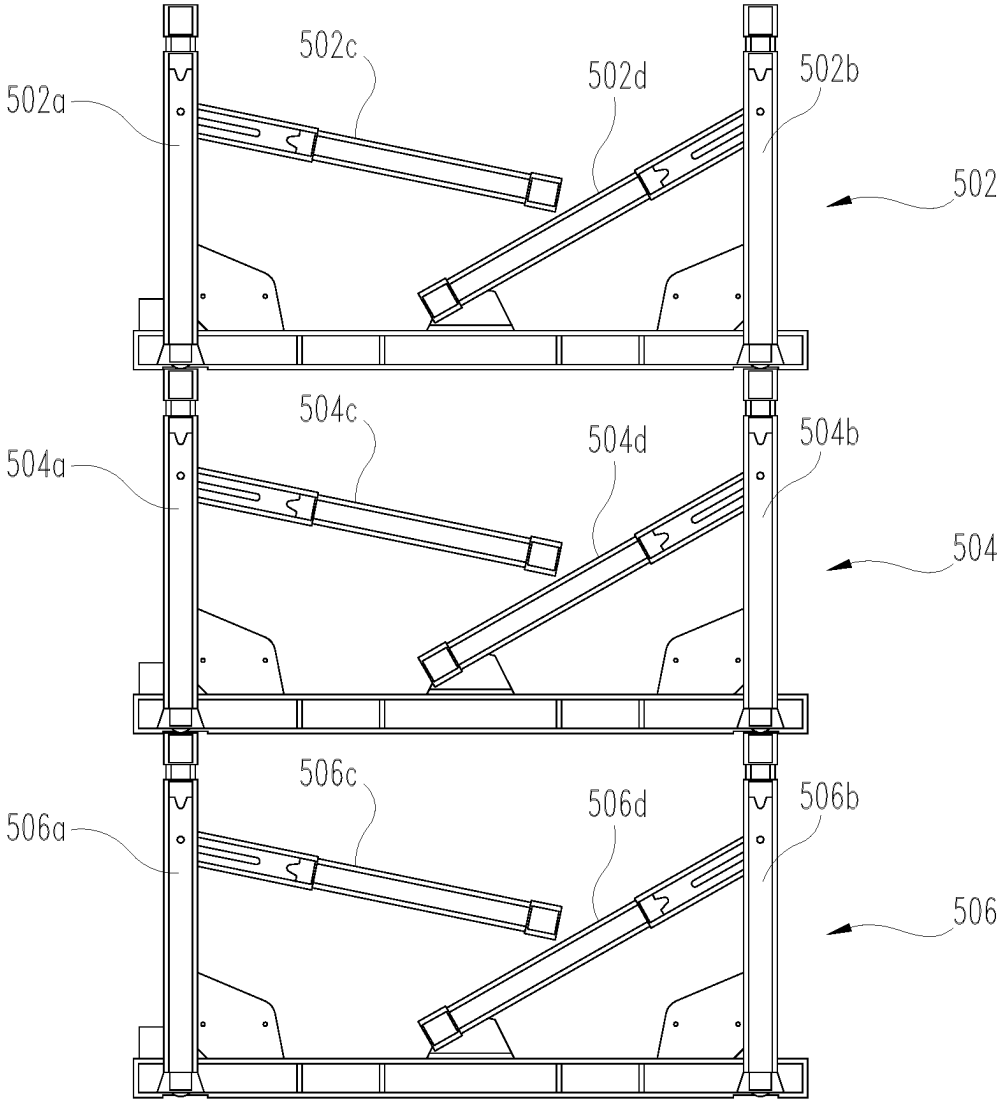


Fig. 4


502c
502d
502b
502a
502
504c
504d
504b
504a
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506c
506d
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506a
506

Fig. 5A

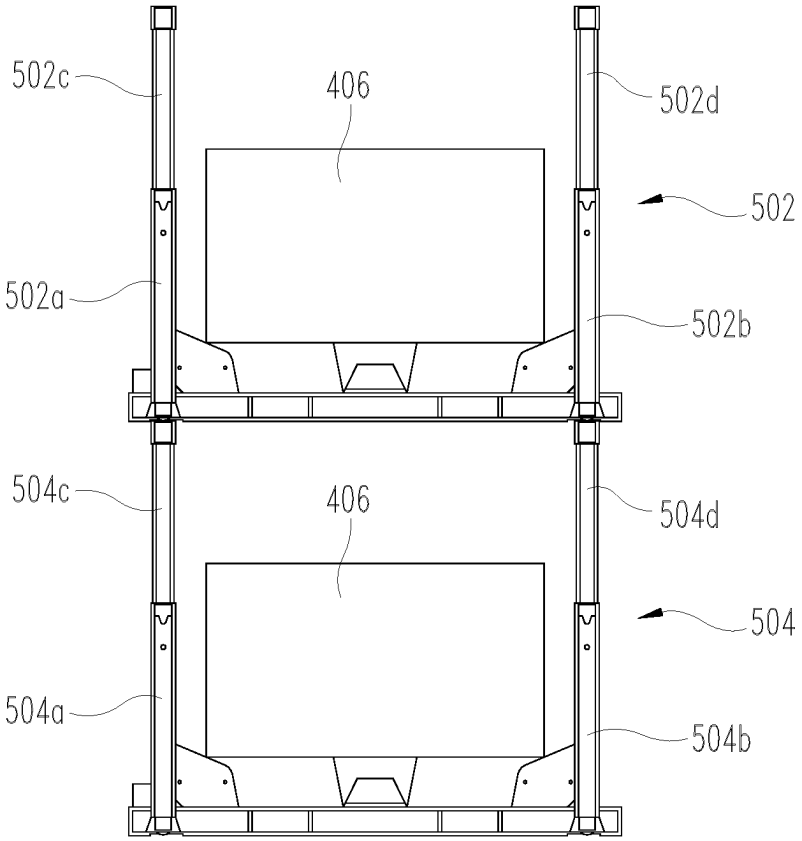

Fig. 5B

MODULAR ENGINE SHIPPING SKID

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation of PCT Application No. PCT/US20/55212 filed on Oct. 12, 2020, which claims the benefit of the filing date of U.S. Provisional App. Ser. No. 62/933,629 filed on Nov. 11, 2019, each of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates generally to internal combustion engines, and more particularly, but not exclusively, to a modular engine shipping skid. Generally, skids are product specific with limited use, particularly when product demands shift and undergo changes from year to year. Product specific skids may require excessive skid redesign or replacement due to limited flexibility in accommodating different products. Current skid proliferation has created gaps in engine delivery packaging solutions, forcing the use of wood pallets. The current drawbacks are causing a deviation in finish goods shipping methods based on customer demand and volume. Therefore, further improvements in this technology area are needed to address these issues, among others.

SUMMARY

The present disclosure includes a unique arrangement for a modular shipping skid configured to support internal combustion engines having a range of various sizes. In one embodiment, the skid includes a base sized to receive the engine thereon, at least one alignment member projecting from the base, and a plurality of vertically extending support members extending from the base. The skid includes a fixture plate having an opening provided thereon to fit a profile of the at least one alignment member and secure the fixture plate onto the base.

This summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting the scope of the claimed subject matter. Further embodiments, forms, objects, features, advantages, aspects, and benefits shall become apparent from the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The description herein makes reference to the accompanying drawings wherein like numerals refer to like parts throughout the several views, and wherein:

FIG. **1** is an exploded perspective view of a shipping skid, according to an embodiment of the present disclosure.

FIG. **2** is an exploded plan view of the shipping skid.

FIGS. **3**A and **3**B are a perspective view and a plan view, respectively, of a modular base of the shipping skid, including vertically extending support members and their respective detachable vertical post members.

FIG. **4** is a schematic elevation view of an engine mounted to a fixture on the fixture plate.

FIGS. **5**A and **5**B are schematic elevation views of a number empty stacked skids and stacked skids with engines, respectively.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

For the purposes of clearly, concisely and exactly describing illustrative embodiments of the present disclosure, the manner and process of making and using the same, and to enable the practice, making and use of the same, reference will now be made to certain exemplary embodiments, including those illustrated in the figures, and specific language will be used to describe the same. It shall nevertheless be understood that no limitation of the scope of the invention is thereby created, and that the invention includes and protects such alterations, modifications, and further applications of the exemplary embodiments as would occur to one skilled in the art.

The present disclosure relates to a modular shipping skid for an engine. In certain embodiments, a modular skid may be used with various product ranges as compared to current product specific skid designs. The modular skids may reduce current lead times to manage shipping needs, model year change, product redesign, and skid maintenance or rework.

The modular shipping skid may include a modular base and a fixture plate removeably attached to the base. The fixture plate is provided with a fixture that is configured to support a specific sized engine. If a different sized engine is to be shipped, a different fixture plate and fixture can be provided that is used on the same base. Therefore, a single base can be employed to ship engines of various sizes by changing out the fixture plate on the base.

With reference to FIG. **1**, there is illustrated an exploded perspective view of a shipping skid **100**. The shipping skid **100** includes a base **102** sized to receive an engine (not shown), an alignment member **104** projecting from the base **102**, vertically extending support members **106**, **108**, **110**, **112** extending from the base **102**, and a fixture plate **114** configured with an opening **116** provided thereon to fit a profile of the alignment member **104** and secure the fixture plate **114** onto the base **102**. In the example implementation, the base **102** may be rectangular with a plurality of outer corners that each include a support member. Other example implementations of the base **102** may be contemplated such as, but not limited to, a square in which all four sides of the base may be the same length, and non-rectangular shapes.

The outer corners of the base **102** may each include a respective one of the vertically extending support members **106**, **108**, **110**, **112**. The base **102** includes four sides and each of the four sides may include one or more of the entry slots **134**, **136**, **138**, **140**, **142**, **144**, **146**, **148** each having an entrance that is parallel to the fixture plate **114** to receive a lifting plate (not shown) for lifting the base **102**. For example, the slots of base **102** may be configured to receive forks from a forklift to provide access capability for lifting and moving the shipping skid **100** and/or base **102**.

The shipping skid **100** may include a number of locking mechanisms **126**, **128**, **130**, and **132** to lock the fixture plate **114** to the base **102**. The locking mechanisms **126**, **128**, **130**, and **132** may each include a pin, such as pin **127** of locking mechanism **126**, or similar attaching device that attaches to the base **102** and is configured to move from a first position, allowing the fixture plate **114** to be placed on the base **102**, to a second position that extends over the fixture plate **114** to secure the fixture plate **114** to the base **102**. For example, the pin **127** may be spring-loaded toward a locking position that projects outwardly from the outer frame of base **102** to extend over an upper surface of the fixture plate **114** to secure the fixture plate **114** to the base **102**. The pin **127** can be retracted from the locking position to allow placement of the fixture plate **114** on base **102**. In one embodiment, the locking mechanisms **126**, **128**, **130**, **132** are latches with a spring-loaded plunger type pin that is movable into a retracted position in a housing for placement of fixture plate **114** and then is biased to extend outwardly when released to

secure the fixture plate **114** on base **102**. Locking mechanisms **126**, **128**, **130**, **132** can also be moved to other locations on base **102**, such as on the ends of base **102** between entry slots **138**, **140** and between entry slots **146**, **148**.

With reference to FIG. **2**, there is illustrated an exploded plan view of the base **102** and the fixture plate **114**. The base **102** is configured to accept a range of engines of different sizes from light to heavy-duty engines to increase automated process efficiency and freight optimization. According to an aspect of the present disclosure, different fixture plates **114** may be provided for each of various sizes of engines, and used with the same base **102**. In one implementation, a range of engine sizes for light-duty engines may extend from 2.8 L to 4.5 L that are used with different fixture plates **114** and are able to be mounted on a common base **102** configured for light-duty engines. A mid-range of engine sizes according to another implementation may extend from 5.9 L to 9 L that are used with different fixture plates **114** and are able to be mounted on a common base **102** configured for mid-range engines. In yet another implementation, a range of heavy-duty engine sizes may extend from 12 L to 19 L that are used with different fixture plates **114** and are able to be mounted on a common base **102** configured for heavy duty engines.

In FIG. **2**, the alignment member **104** is shown in the center of the base **102** and is configured to provide consistent engine orientation. The fixture plate **114** includes the opening **116** to align with the alignment member **104** and secure the fixture plate **114** onto the base **102**. The alignment member **104** may include a length L extending along the base **102**, a width W extending across the base **102**, and a height H (FIG. **3**A) extending vertically from the base **102**. In one implementation, at least one of the width W and the length L tapers upwardly along the height H. In another implementation, each of the width W and the length L tapers upwardly along the height H. Other embodiments contemplate more than one alignment member **104** is provided. The alignment member **104** may be, for example, frusto-conically shaped, cone-shaped member, dowel or pin shaped, or other suitable shape for receiving and securing fixture plate **114** on the base **102** so that fixture plate **114** does not slide or rotate on base **102**.

With reference to FIGS. **3**A and **3**B, there are illustrated an exploded perspective view and an elevation view of the vertically extending support members **106**, **108**, **110**, **112** extending from the base **102**. As shown in FIG. **3**A, each of the support members **106**, **108**, **110**, **112** includes a detachable or pivotal vertical post member **118**, **120**, **122**, **124** that is adjustable relative to the respective vertical support member **106**, **108**, **110**, **112** to one or more positions. The post members **118**, **120**, **122**, **124** may be collapsible, pivotal, or otherwise moveable relative to the respective support member **106**, **108**, **110**, **112** to improve packaging and shipping needs. In FIG. **3**B, vertical post members **118'** and **120'** are illustrated in a collapsed position. The vertically extending support members **106**, **108**, **110**, **112** may also include respective gusset plates **302**, **304**, **306**, **308** or a similar fastening member to maintain the vertically extending support members **106**, **108**, **110**, **112** in an upright position.

With reference to FIG. **4**, there is illustrated a schematic view of a fixture **404** mounted on fixture plate **114**. The example implementation in FIG. **4** includes a number of features and aspects which are the same as or similar to the features of the base **102** in FIG. **1**, designated as reference numeral **402** in FIG. **4**. The fixture plate **404** may be mounted on a fixture plate (e.g., fixture plate **114**) for supporting an engine **406** when the fixture plate is secured to the base **402**.

With reference to FIGS. **5**A and **5**B, there are illustrated schematic views of skids **502**, **504**, **506** in stacking and shipping positions. The example implementations in FIGS. **5**A and **5**B include a number of features and aspects which are the same as or similar to the features of the skid **100**, designated as reference numerals **502**, **504**, **506** in FIGS. **5**A and **5**B. It should be understood one skilled in the art that FIGS. **5**A and **5**B are side views and that the skids are supported by all of the vertically extending support members of the respective skid and/or their respective detachable vertical post members. In FIG. **5**A, skids **502**, **504**, **506** are stacked and supported on top of one another by vertically extending support members of a lower placed skid, without engines on the skid and with vertical post members in a collapsed position to allow stacking of three or more skids **502**, **504**, **506**. For example, skid **502** having vertically extending support members **502***a*, **502***b* and vertical post members **502***c*, **502***d*, is stacked on top of skid **504** and supported by the respective vertically extending support members **504***a*, **504***b* of skid **504** when the respective vertical post members **504***c*, **504***d* of the support members **504***a*, **504***b* are in the collapsed position. Similarly, skid **504** is stacked on top of skid **506** and supported by the respective vertically extending support members **506***a*, **506***b* of skid **506** when the respective vertical post members **506***c*, **506***d* of the support members **506***a*, **506***b* are in the collapsed position. Additional empty skids may be stacked as may be allowed by the shipping container and allowable load for the vertical support members.

In FIG. **5**B, skids **502**, **504** are stacked and supported on top of one another by vertically extending support members of a lower placed skid, with engines **406** on the skids and with vertical post members in an upright position to provide the necessary height for stacking of skids with engines for shipping. For example, skid **502** is stacked on top of skid **504** and supported by the vertical post members **504***c*, **504***d* of respective vertically extending support members **504***a*, **504***b* of skid **504**. Additional loaded skids may be stacked as may be allowed by the shipping container and allowable load for the vertical support members.

Various aspects and embodiments of the present disclosure are contemplated. One or more aspects and/or embodiments may be combined with one or more other aspects and/or embodiments.

For example, one aspect includes a modular shipping skid for supporting an engine. The modular skipping skid includes a base sized to receive the engine thereon, at least one alignment member projecting from the base, and a plurality of vertically extending support members extending from the base. The modular shipping skid also includes a fixture plate having an opening provided thereon to fit a profile of the at least one alignment member and secure the fixture plate onto the base.

In one embodiment, each of the plurality of vertically extending support members includes a post member that is adjustable along a portion of the respective vertically extending support member to one of a plurality of positions. In one embodiment, the post member is collapsible relative to the vertically extending support member. In one embodiment, the base is rectangular with a plurality of outer corners and each of the corners includes a respective one of the plurality of support members.

In one embodiment, the modular shipping skid includes at least one locking mechanism to lock the fixture plate to the

base. In one embodiment, the at least one locking mechanism includes a pin that is attached to the base and is movable from a first position allowing the fixture plate to be placed on the base to a second position in which the pin extends over the fixture plate to secure the fixture place to the base. In one embodiment, the pin is spring-loaded toward the second position. In one embodiment, the at least one locking mechanism includes a plurality of locking mechanisms positioned around the base.

In one embodiment, the base includes at least four sides, each side including at least one entry slot with an entrance parallel to the fixture plate to receive a lifting device. In one embodiment, the at least one alignment member includes a length extending along the base, a width extending across the base, and a height extending vertically from the base. In one embodiment, at least one of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member. In one embodiment, each of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member.

In one embodiment, the fixture plate includes a fixture for supporting the engine on the fixture plate with the fixture plate is secured to the base. In one embodiment, the plurality of support members are configured to support a second modular engine skid positioned on outer ends of the plurality of support members. In one embodiment, the base is sized to accept a range of engines having different sizes, and wherein a different fixture plate is provided for each size of engine within the range of engines.

According to another aspect of the present disclosure, a method for supporting an engine for shipping comprises: providing a base sized to receive the engine thereon, wherein the base includes at least one alignment member projecting from the base, and the base includes a plurality of vertically extending support members extending therefrom; positioning a fixture plate over the at least one alignment member to secure the fixture plate to the base, the fixture plate including an opening to interfit with a profile of the at least one alignment member; and supporting the engine on the fixture plate with the fixture plate secured to the base.

In one embodiment, the at least one alignment member includes a length extending along the base, a width extending across the base, and a height extending vertically from the base, and at least one of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member. In one embodiment, the engine is supported on a fixture that is secured to the fixture plate.

In one embodiment, the method includes selecting the fixture plate from a first fixture plate and a second fixture plate that are each configured to interfit with the profile of the at least one alignment member. The first fixture plate supports a first engine having a first size and the second fixture plate supports a second engine having a second size greater than the first size.

In one embodiment, the method includes stacking a second base including a second fixture plate secured thereto that supports a second engine on the plurality of vertically extending support members.

While illustrative embodiments of the disclosure have been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only certain exemplary embodiments have been shown and described and that all changes and modifications that come within the spirit of the claimed inventions are desired to be protected. It should be understood that while the use of words such as preferable, preferably, preferred or more preferred utilized in the description above indicate that the feature so described may be more desirable, it nonetheless may not be necessary and embodiments lacking the same may be contemplated as within the scope of the invention, the scope being defined by the claims that follow. In reading the claims, it is intended that when words such as "a," "an," "at least one," or "at least one portion" are used there is no intention to limit the claim to only one item unless specifically stated to the contrary in the claim. When the language "at least a portion" and/or "a portion" is used the item can include a portion and/or the entire item unless specifically stated to the contrary.

What is claimed is:

1. A modular shipping skid for supporting an engine, comprising:

a base sized to receive the engine thereon;

an alignment member integrally formed with and projecting from the base, the alignment member including a profile configured to provide a predetermined orientation;

a plurality of vertically extending support members extending from the base; and

a plurality of fixture plates, each of the plurality of fixture plates having a different type of fixture for supporting the engine, and each of the plurality of fixture plates having an opening provided thereon that is configured to fit the profile of the alignment member projecting from the base in the predetermined orientation in order to secure the fixture plate onto the base.

2. The modular shipping skid of claim **1**, wherein each of the plurality of vertically extending support members includes a post member that is adjustable along a portion of the respective vertically extending support member to one of a plurality of positions.

3. The modular shipping skid of claim **2**, wherein the post member of each of the plurality of vertically extending support members is collapsible relative to the respective vertically extending support member.

4. The modular shipping skid of claim **2**, wherein the base is rectangular with a plurality of outer corners and each of the corners includes a respective one of the plurality of support members.

5. The modular shipping skid of claim **1**, further comprising at least one locking mechanism to lock the fixture plate to the base.

6. The modular shipping skid of claim **5**, wherein the at least one locking mechanism includes a pin that is attached to the base and is movable from a first position allowing the fixture plate to be placed on the base to a second position in which the pin extends over the fixture plate to secure the fixture place to the base.

7. The modular shipping skid of claim **6**, wherein the pin is spring-loaded toward the second position.

8. The modular shipping skid of claim **5**, wherein the at least one locking mechanism includes a plurality of locking mechanisms positioned around the base.

9. The modular shipping skid of claim **1**, wherein the base includes at least four sides, each side including at least one entry slot with an entrance parallel to the fixture plate to receive a lifting device.

10. The modular shipping skid of claim **1**, wherein the at least one alignment member includes a length extending along the base, a width extending across the base, and a height extending vertically from the base.

11. The modular shipping skid of claim 10, wherein at least one of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member.

12. The modular shipping skid of claim 10, wherein each of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member.

13. The modular shipping skid of claim 1, wherein the alignment member is a single alignment member located at a center of the base.

14. The modular shipping skid of claim 1, wherein the plurality of support members are configured to support a second modular engine skid positioned on outer ends of the plurality of support members.

15. The modular shipping skid of claim 1, wherein the base is configured to receive a range of engines of different sizes, and wherein a different one of the plurality of fixture plates is provided for each size of engine within the range of engines and configured to be mounted on the base.

16. A method for supporting an engine for shipping, comprising:

providing a base sized to receive the engine thereon, wherein the base includes an alignment member integrally formed with and projecting from the base, the alignment member including a profile configured to provide a predetermined orientation and the base includes a plurality of vertically extending support members extending therefrom;

providing a plurality of fixture plates, each of the plurality of fixture plates having a different type of fixture for supporting the engine;

positioning one of the plurality of fixture plates over the alignment member to secure the one of the plurality of fixture plates to the base, each of the plurality of fixture plates including an opening to interfit with the profile of the alignment member projecting from the base in the predetermined orientation; and

supporting the engine on the one of the plurality of fixture plates with the fixture plate secured to the base.

17. The method of claim 16, wherein the at least one alignment member includes a length extending along the base, a width extending across the base, and a height extending vertically from the base, and at least one of the width and the length of the at least one alignment member tapers along the height of the at least one alignment member.

18. The method of claim 16, further comprising:

wherein the plurality of fixture plates comprises a first fixture plate and a second fixture plate that are each configured to interfit with the profile of the at least one alignment member, wherein the first fixture plate supports a first engine having a first size and the second fixture plate supports a second engine having a second size greater than the first size.

19. The method of claim 16, further comprising:

stacking a second base including a second fixture plate secured thereto that supports a second engine on the plurality of vertically extending support members.

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