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(54) REFRIGERANT SYSTEM FRAME INCLUDING COMPRESSOR LIFTING SUPPORT MEMBERS

(57) An illustrative example refrigerant system includes at least one refrigerant circuit including a plurality of compressors. A frame supports the compressors and includes a plurality of structural support members, at least one base supported by the structural support members and at least one lifting support member situated above or below one of the compressors. The lifting support member is configured to support a load of the compressor and configured to facilitate movement of the compressor relative to the base when the compressor is off the base. At least some of the plurality of structural support members bear at least a portion of the load of the compressor when the load of the compressor is supported by the at least one lifting support member.

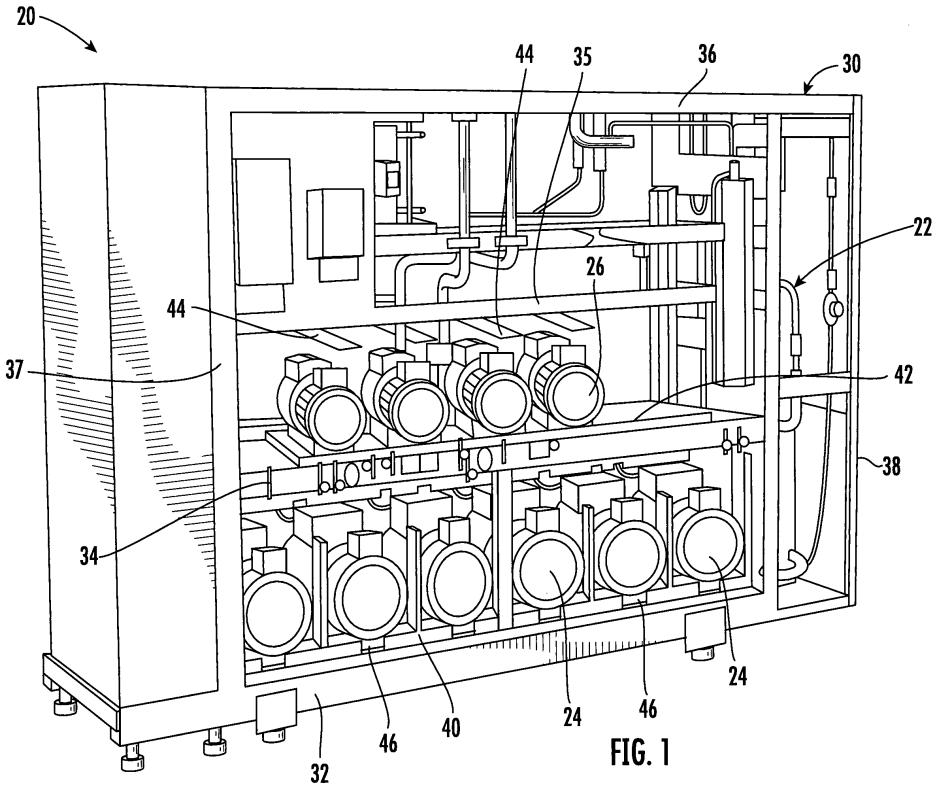

FIG. 1

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Description

BACKGROUND

[0001] Refrigerant systems are in widespread use for preserving perishable items and providing air conditioning or refrigeration capacity within buildings. A typical refrigerant circuit includes a compressor, a condenser, an expansion valve, and an evaporator. Household refrigerators and air conditioning systems typically include a single compressor. Industrial refrigerant systems may require multiple compressors. Many such systems include a frame structure for supporting the compressors and other portions of the refrigerant circuit.

[0002] One challenge presented by larger refrigerant systems that include multiple compressors is that it tends to be difficult to manipulate a compressor into or out of position on the frame. For example, when a compressor needs repair or replacement, it may be necessary to remove the compressor from the frame. Compressors are typically very heavy weighing on the order of 100 kilograms to 600 kilograms in many systems. With the recent changes in refrigerant fluid toward more environmentally friendly refrigerants, compressors have to withstand higher pressures and, therefore, are becoming increasingly heavier.

[0003] While it may be possible to use a forklift or similar mechanism to lift a compressor in some situations, many installations do not provide sufficient clearance around the supporting frame for maneuvering a forklift. Additionally, there is increasing pressure to decrease the footprint of the supporting frame, which results in the compressors being packaged more close to each other, which increases the difficulty of using forklifts or other external devices to move a compressor into or out of position on the frame.

SUMMARY

[0004] An illustrative example embodiment of a refrigerant system includes at least one refrigerant circuit including at least one compressor and a frame that supports the compressor. The frame includes a plurality of structural support members, at least one base supported by the structural support members, and at least one lifting support member situated above or below the compressor. The compressor is supported on the at least one base. The at least one lifting support member is configured to support a load of the compressor and configured to facilitate movement of the compressor relative to the base when the compressor is off the base. At least some of the plurality of structural support members bear at least a portion of the load of the compressor when the load of the compressor is supported by the at least one lifting support member.

[0005] In an example embodiment having one or more features of the refrigerant system of the previous paragraph, the at least one lifting support member comprises a beam or a rail, the beam or rail has a length, and the beam or rail is configured to facilitate movement of the compressor relative to the frame in a direction that is parallel to the length.

[0006] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, at least two of the structural support members are situated perpendicular to the at least one lifting support member and the at least one lifting support member is supported by the at least two of the structural support members near opposite ends of the at least one lifting support member.

[0007] An example embodiment having one or more features of the refrigerant system of any of the previous paragraphs includes a lifting mechanism configured to lift the compressor off the base.

[0008] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member includes a surface that the lifting mechanism engages while lifting the compressor off the base and while supporting the load of the compressor.

[0009] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member includes a channel and the surface is within the channel.

[0010] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the surface is oriented along a direction of intended movement of the compressor relative to the frame and the lifting mechanism is moveable along the surface in the direction of intended movement.

[0011] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member comprises a plurality of lifting support members and a second one of the lifting support members is situated above or below a second compressor of the compressors.

[0012] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, each of the compressors is situated below or above at least one of the lifting support members.

[0013] An example embodiment having one or more features of the refrigerant system of any of the previous paragraphs includes a lifting mechanism configured to lift the compressors, respectively, off the base and wherein the lifting mechanism is selectively engaged with different ones of the lifting support members for lifting different ones of the compressors off the base.

[0014] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member comprises a portion of the base.

[0015] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member comprises a channel configured to guide movement of a lifting mechanism into a position beneath the compressor.

[0016] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one compressor comprises a plurality of compressors and the at least one lifting support member comprises a plurality of lifting support members respectively above or below associated ones of the compressors.

[0017] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member is situated in a single, fixed position relative to the frame.

[0018] In an example embodiment having one or more features of the refrigerant system of any of the previous paragraphs, the at least one lifting support member is selectively removable from the position above or below the compressor and at least one of the structural support members includes a feature that cooperates with a corresponding feature on the at least one lifting support member to locate the lifting support member on the frame.

[0019] The various features and advantages of at least one disclosed example embodiment will become apparent to those skilled in the art from the following detailed description. The drawings that accompany the detailed description can be briefly described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Figure 1 diagrammatically illustrates a refrigerant system including a frame designed according to an embodiment of this invention.

Figure 2 diagrammatically illustrates selected portions of the embodiment of Figure 1 and a lifting mechanism.

Figure 3 illustrates components shown in Figure 2 with the lifting mechanism in position above a compressor for lifting the compressor from the base.

Figure 4 illustrates the compressor of Figures 2 and 3 removed from the base and supported in a manner so that it is moveable relative to the frame into or out of an installation position.

Figure 5 illustrates the compressor of Figures 2-4 supported at least partially outside of the footprint of the frame.

Figure 6 illustrates another feature of the example embodiment of Figure 1.

DETAILED DESCRIPTION

[0021] Figure 1 illustrates a refrigerant system 20. A refrigerant circuit 22 includes a plurality of compressors 24 and 26. A support frame 30 supports the components of the refrigerant circuit 22 including the compressors 24 and 26. The support frame 30 includes horizontally oriented beams or support members 32, 34, 35, and 36 and vertically oriented beams or support members 37 and 38.

[0022] The compressors 24 are supported on a base 40 and the compressors 26 are supported on a base 42. The base 40 and the base 42 are part of the support frame 30.

[0023] Lifting support members 44, which are part of the frame 30, are situated above the compressors 26. Additional lifting support members 46 are provided beneath the compressors 24, respectively. The lifting support members 44 and 46 are configured to bear the load of a respective one of the compressors 26, 24 for suspending that compressor above the base 42, 40. The lifting support members 44, in this example, comprise beams or rails that facilitate movement of the corresponding compressors 26 into or out of an installed position on the base 42. The lifting support members 46, in this example, are part of the base 40 that facilitate movement of the corresponding compressors 24 into or out of an installed position on the base 40.

[0024] The lifting support members 44, 46 are part of the frame 30. In some embodiments, the lifting support members 44, 46 are always present with the other frame members and remain in a single, fixed position relative to the frame. In other embodiments, one or more of the lifting support members 44, 46 is removable from the frame 30 but the frame 30 has corresponding structural features to receive such a removable lifting support member. For example, one or more of the beam or support members 32, 34, 35, 36 includes feature such as a slot or boss that cooperates with a correspondingly shaped feature of the lifting support member 44, 46 to locate the lifting support member 44, 46 on the frame 30 where it can be secured to the frame 30.

[0025] Having lifting support members 44 and 46 above or beneath respective compressors provides a structural feature of the frame 30 that facilitates movement of the respective compressors into or out of installed positions on a corresponding base 40 or 42. The lifting support members 44 and 46 provide an ergonomic and convenient solution for moving compressors relative to the frame 30 at the installation site where the refrigerant system 20 is used to provide cooling or refrigeration. The lifting support members 44 and 46 integrated into the frame 30 facilitate such movement of the compressors 24, 26 without requiring a large, external device such as a forklift.

[0026] Figure 2 shows selected portions of the frame 30 and an example compressor 26 situated on the base 42. A corresponding lifting support member 44 comprises a generally C-shaped beam or rail in a horizontal position above the compressor 26. As shown in Figure 2, two of the structural support members 35, 35' are situated perpendicular to the lifting support member 44. The lifting support member 44 is supported by the structural support members 35 and 35' near opposite ends of the lifting support member 44. The manner in which the different structural components of the frame 30 are secured together may vary depending on the particular embodiment. Those skilled in the art who have the benefit of this

description will realize what arrangement of frame components will best suit their particular needs.

[0027] The lifting support member 44 includes a channel 50 having a surface 52 that a plurality of rollers 54 on a lifting mechanism 56 engage for moving the lifting mechanism 56 within the channel 50. The surfaces 52 of the lifting support member 44 provide a bearing surface against which the rollers 54 are received as the lifting mechanism 56 supports the load of the compressor 26 and the compressor 26 is off the base 42. In this example, the lifting support member 44 has a length and is configured to facilitate movement of the respective compressor 26 relative to the frame 30 in a direction parallel to the length of the beam 44 .The channel 50 is aligned with the length and guides movement of the lifting mechanism 56 along the direction of movement represented by the arrow 58.

[0028] Assuming the compressor 26 is in the installed position shown in Figure 2, the rollers 54 of the lifting mechanism 56 may be inserted into the channel 50 and the lifting mechanism 56 can then be moved into a position above the compressor 26 as shown in Figure 3. The lifting mechanism 56 may then be adjusted into a position where it can be coupled with the compressor 26 as schematically shown by the arrows 60. Many known compressors have features that facilitate lifting the compressor and such features are useful in the illustrated example embodiment. Once an appropriate connection is made, an individual manipulates or operates the lifting mechanism 56 to lift the compressor 26 from the base 42 into a position shown in Figure 4.

[0029] Under the circumstance shown in Figure 4, the lifting support member 44 supports the load of the compressor 26 (and the lifting mechanism 56). The support members of the frame 30 that provide support to the lifting support member 44 bear some of the load.

[0030] The rollers 54 of the lifting mechanism 56 follow the surfaces 52 in the channel 50 to facilitate moving the compressor 26 relative to the frame 30 as schematically shown by the arrows 62 in Figure 4. Assuming the compressor 26 requires repair or replacement, moving the compressor to the left (according to Figure 4) brings the compressor 26 at least partially outside of the envelope or footprint of the frame 30 as shown in Figure 5 where it can be more easily handled by a mechanic or technician. The lifting mechanism 56 and the lifting support member 44 also facilitate moving the compressor 26 (or its replacement) back into the installed position shown in Figure 2.

[0031] The base 40 includes lifting support members 46 integrally formed as part of the base 40. As shown in Figure 6, the illustrated example embodiment includes channel members or portions 46 that establish a pathway for rollers 54' of a lifting mechanism 56' to follow as schematically represented by the arrows 64. The channel 46 facilitates directing the lifting mechanism 56' into position beneath one of the compressors 24 for lifting that compressor off the base 40 and maneuvering it into a position at least partially outside the envelope or footprint of the frame 30 where the compressor 24 can be more conveniently serviced or removed from the site of the refrigerant system 20.

[0032] The lifting mechanisms 56 and 56' are illustrated as scissor lift mechanisms. Those skilled in the art who have the benefit of this description will understand that other types of lifting mechanisms or jacks can be used for lifting and supporting a compressor off of a base from above or beneath the compressor.

[0033] Including lifting support members as part of the frame 30 that supports the compressors 24 and 26 in an installed position where the refrigerant circuit 22 is utilized on an ongoing basis provides improved ergonomics and convenience for procedures that require maneuvering a compressor relative to the support frame 30. No external machines, such as forklifts, are necessary and maintenance or replacement of compressors can be accomplished more quickly and economically.

[0034] The preceding description is exemplary rather than limiting in nature. Variations and modifications to the disclosed examples may become apparent to those skilled in the art that do not necessarily depart from the essence of this invention. The scope of legal protection given to this invention can only be determined by studying the following claims.

Claims

1. A refrigerant system, comprising:

at least one refrigerant circuit including at least one compressor; and

a frame that supports the compressor, the frame including

a plurality of structural support members,

at least one base supported by the structural support members, the compressor being supported on the at least one base, and

at least one lifting support member situated above or below the compressor, the at least one lifting support member being configured to support a load of the compressor and configured to facilitate movement of the compressor relative to the base when the compressor is off the base, at least some of the plurality of structural support members bearing at least a portion of the load of the compressor when the load of the compressor is supported by the at least one lifting support member.

2. The refrigerant system of claim 1, wherein

the at least one lifting support member comprises a beam or a rail;

the beam or rail has a length; and

the beam or rail is configured to facilitate movement of the compressor relative to the frame in a direction that is parallel to the length.

3. The refrigerant system of claim 1 or 2, wherein
at least two of the structural support members are situated perpendicular to the at least one lifting support member; and
the at least one lifting support member is supported by the at least two of the structural support members near opposite ends of the at least one lifting support member.

4. The refrigerant system of any of the preceding claims, comprising a lifting mechanism configured to lift the compressor off the base.

5. The refrigerant system of claim 4, wherein the at least one lifting support member includes a surface that the lifting mechanism engages while lifting the compressor off the base and while supporting the load of the compressor.

6. The refrigerant system of claim 5, wherein
the at least one lifting support member includes a channel; and
the surface is within the channel.

7. The refrigerant system of claim 5 or 6, wherein
the surface is oriented along a direction of intended movement of the compressor relative to the frame; and
the lifting mechanism is moveable along the surface in the direction of intended movement.

8. The refrigerant system of any of the preceding claims, wherein
the at least one lifting support member comprises a plurality of lifting support members; and
a second one of the lifting support members is situated above or below a second compressor of the compressors.

9. The refrigerant system of claim 8, wherein each of the compressors is situated below or above at least one of the lifting support members.

10. The refrigerant system of claim 8 or 9, comprising a lifting mechanism configured to lift the compressors, respectively, off the base and wherein the lifting mechanism is selectively engaged with different ones of the lifting support members for lifting different ones of the compressors off the base.

11. The refrigerant system of any of the preceding claims, wherein the at least one lifting support member comprises a portion of the base.

12. The refrigerant system of claim 11, wherein the at least one lifting support member comprises a channel configured to guide movement of a lifting mechanism into a position beneath the compressor.

13. The refrigerant system of any of the preceding claims, wherein
the at least one compressor comprises a plurality of compressors; and
the at least one lifting support member comprises a plurality of lifting support members respectively above or below associated ones of the compressors.

14. The refrigerant system of any of the preceding claims, wherein the at least one lifting support member is situated in a single, fixed position relative to the frame.

15. The refrigerant system of any of the preceding claims, wherein
the at least one lifting support member is selectively removable from the position above or below the compressor; and
at least one of the structural support members includes a feature that cooperates with a corresponding feature on the at least one lifting support member to locate the lifting support member on the frame.

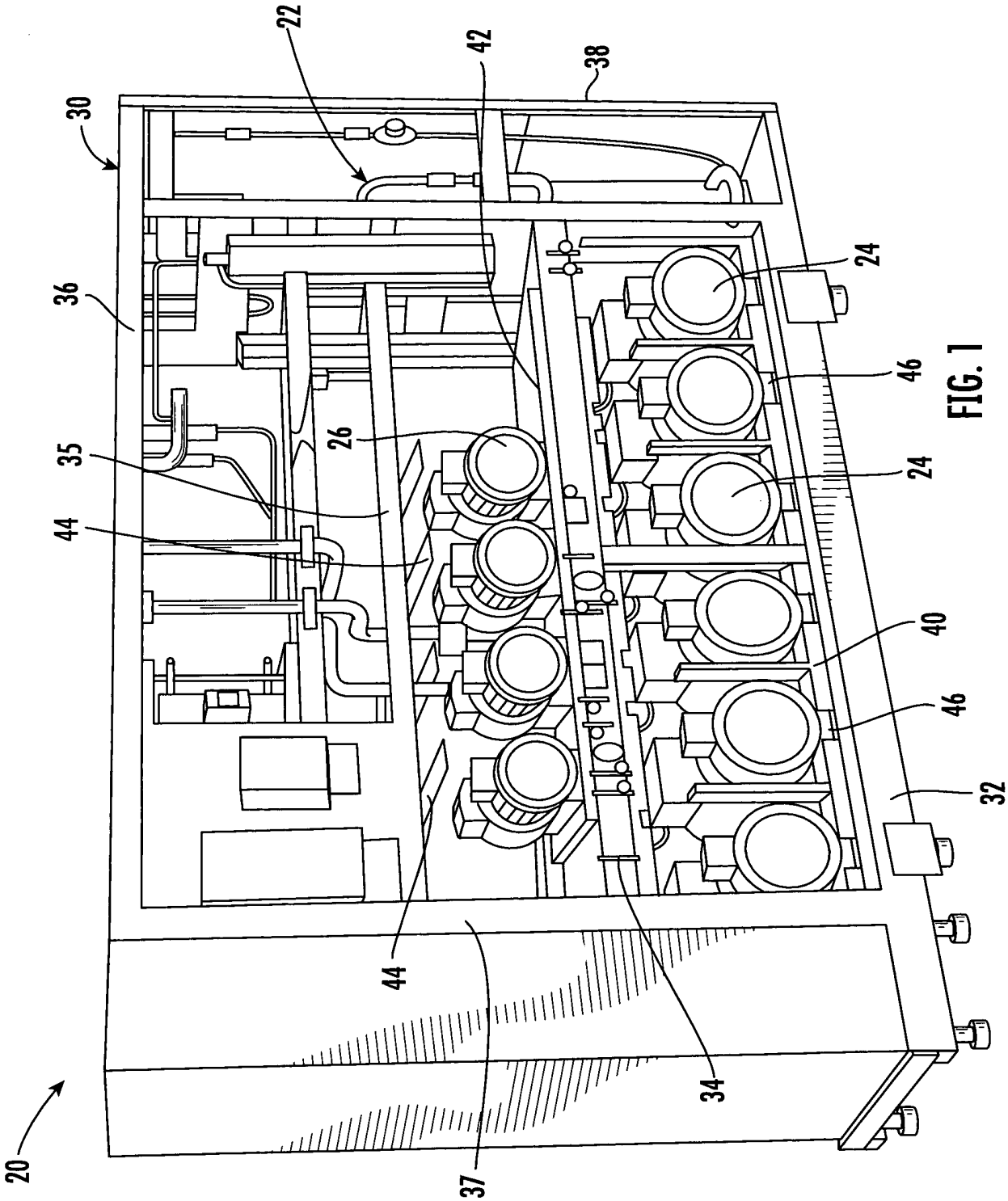


FIG. 1

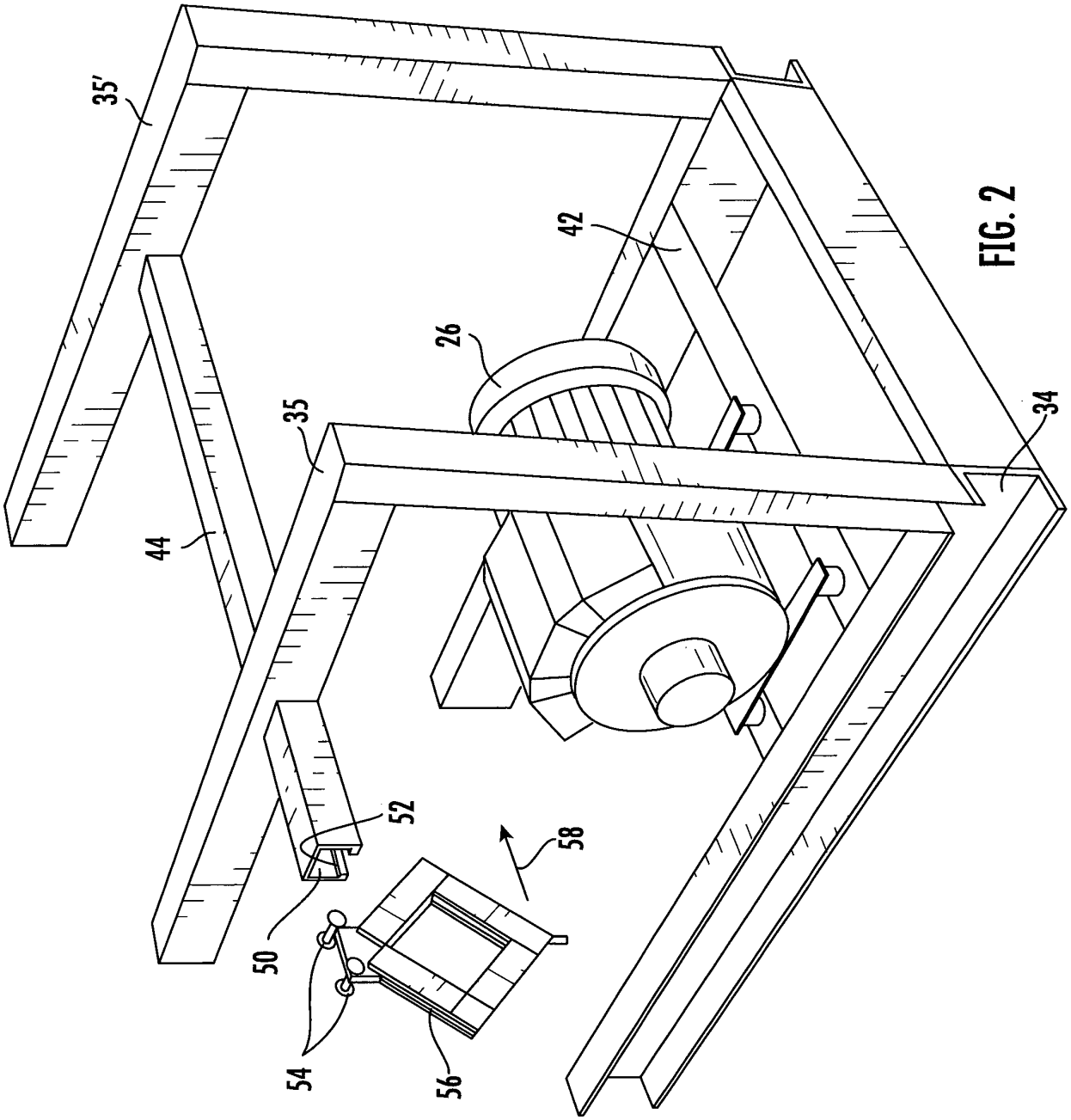


FIG. 2

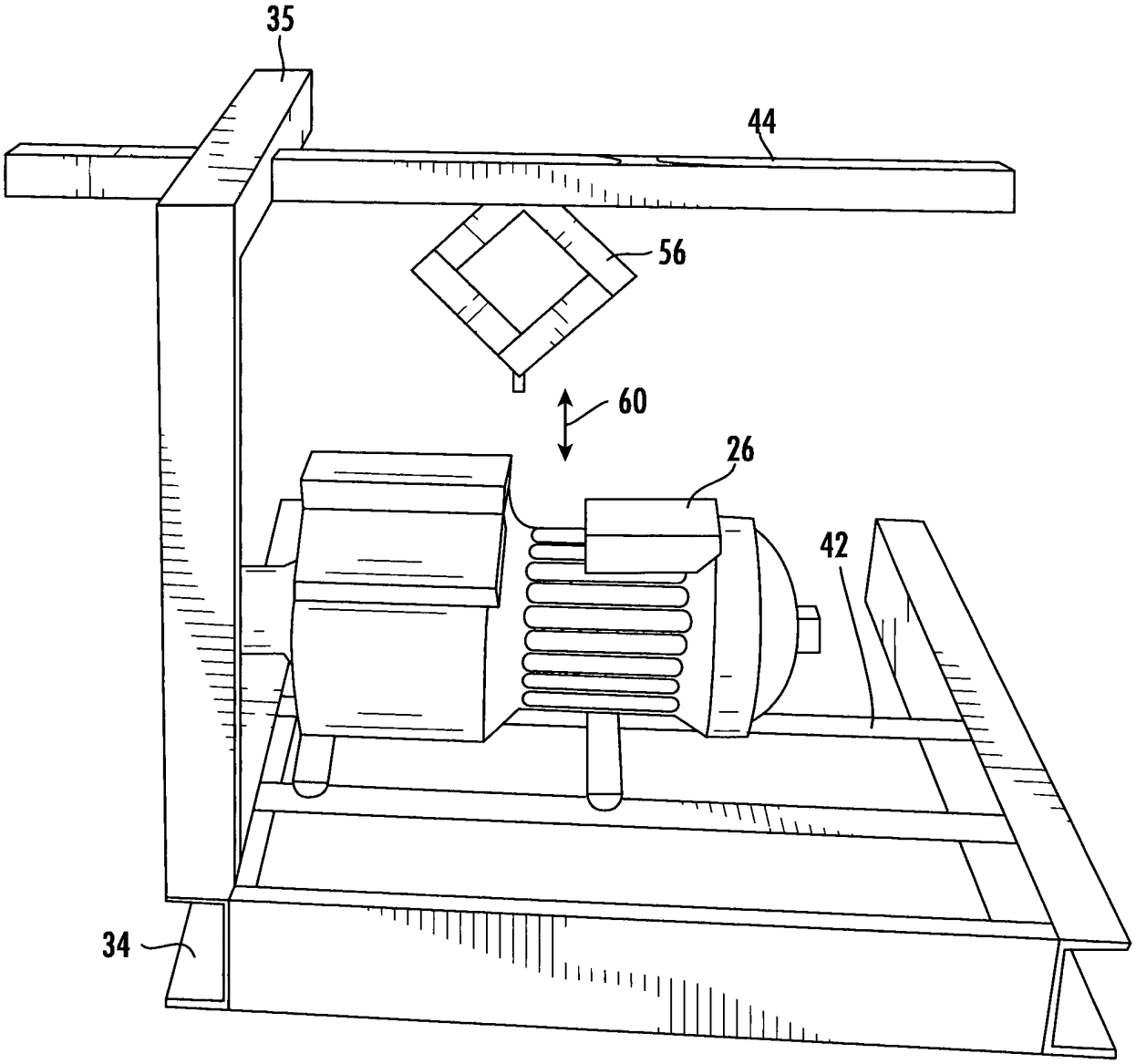
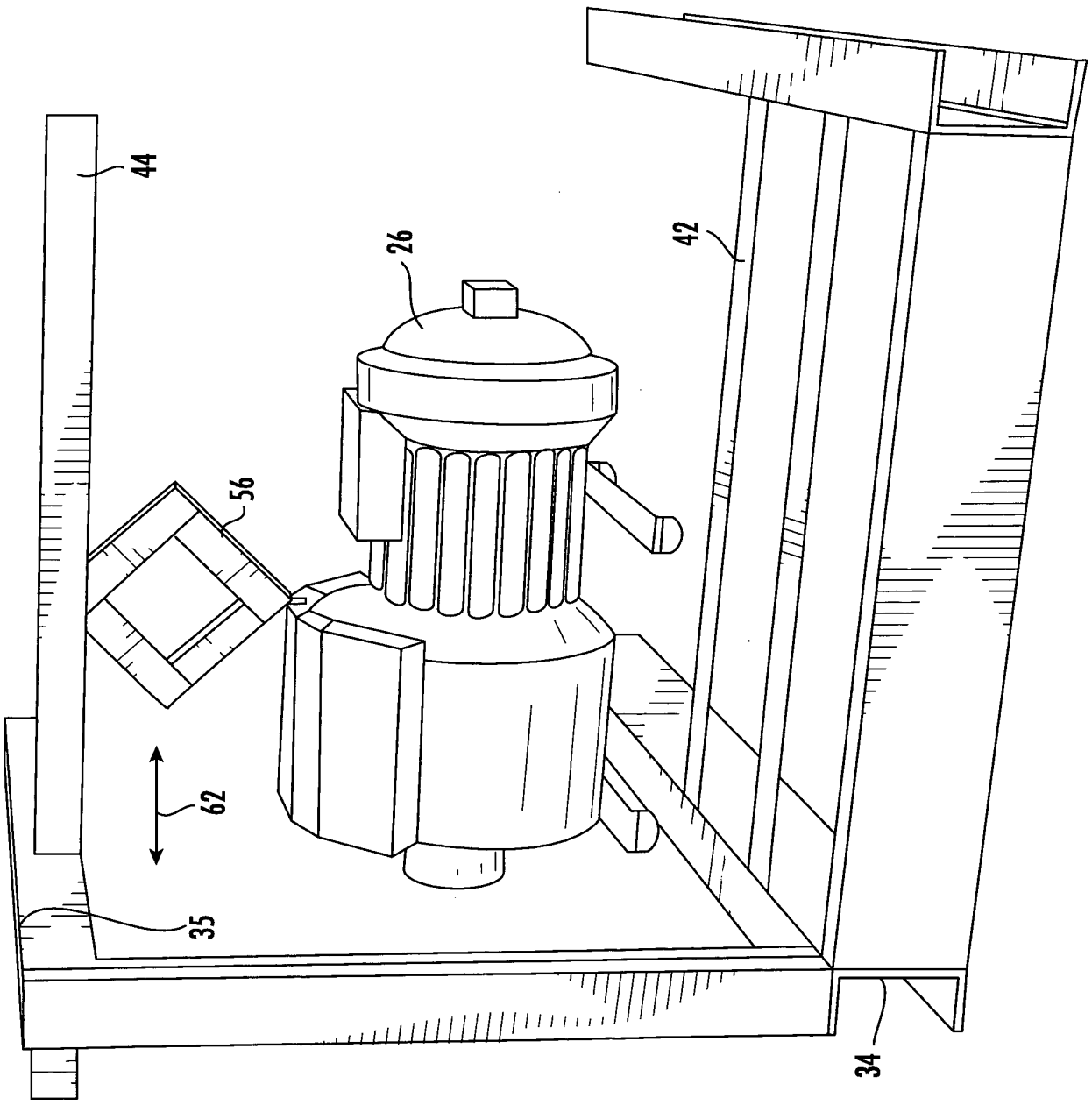


FIG. 3

FIG. 4



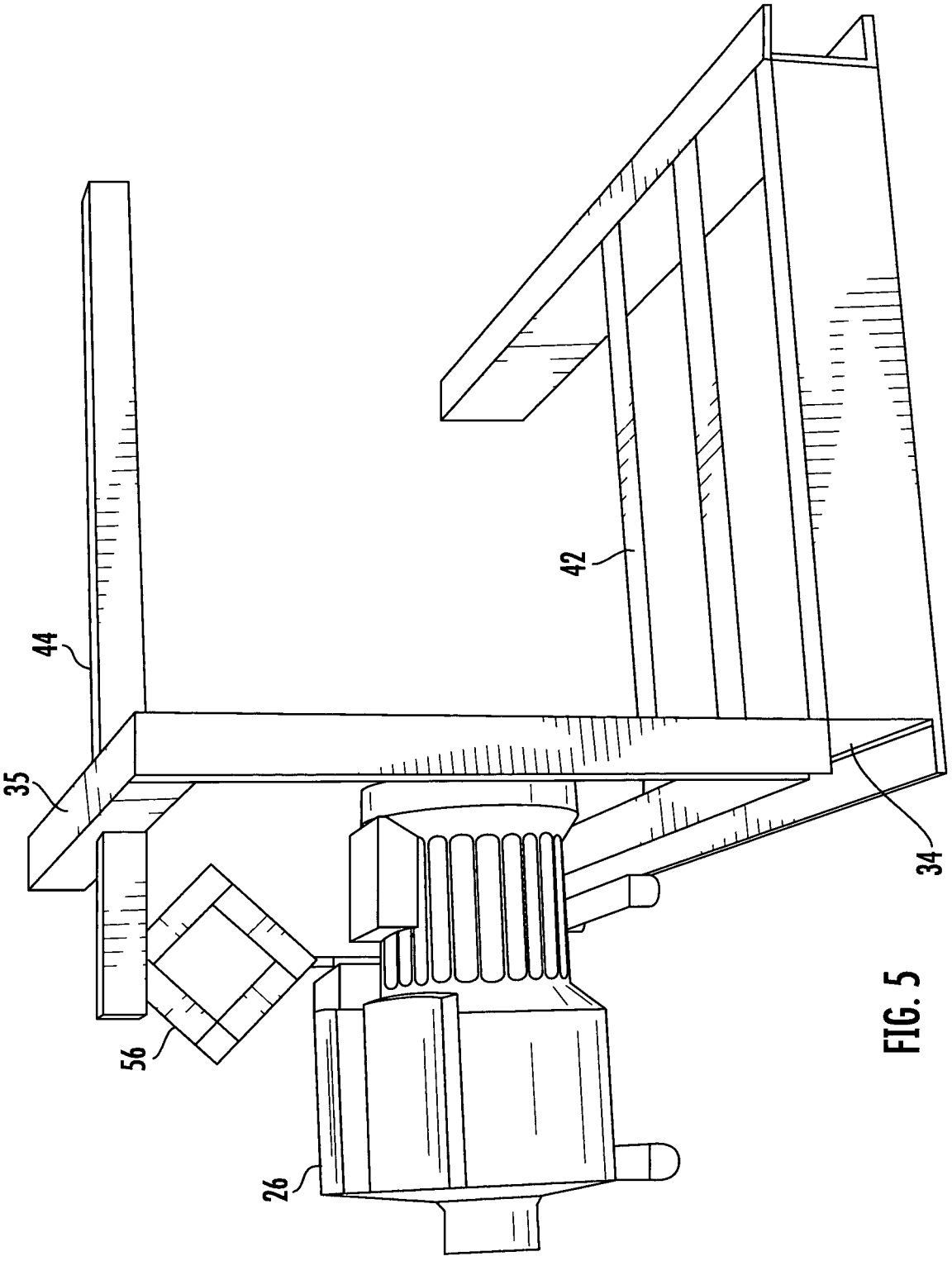


FIG. 5

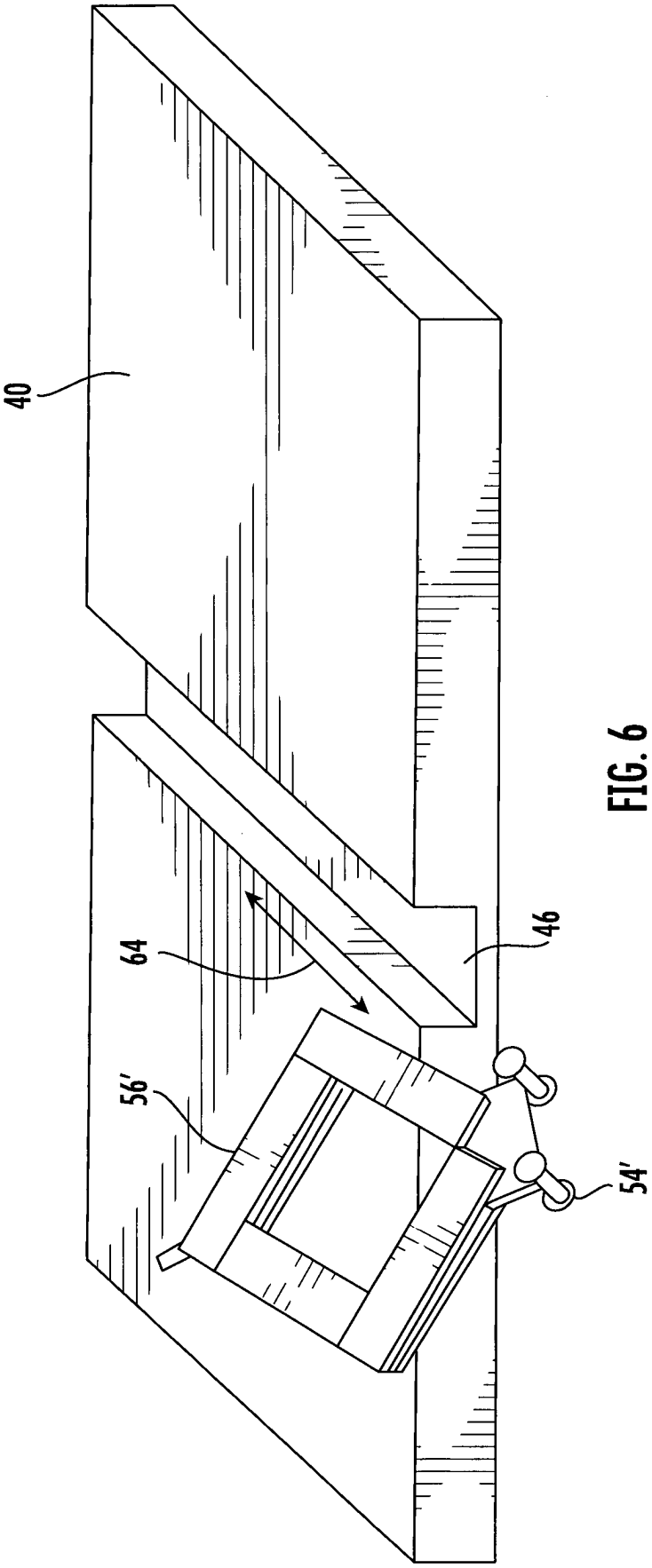


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 0209

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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F04B
F16P
F25B
F16M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 December 2018	Tietje, Kai

CATEGORY OF CITED DOCUMENTS

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