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(54) CENTRAL PALLET CONNECTOR OR POST FOR USE WITH GRABBER ARMS OF A FORKLIFT

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Related U.S. Application Data

(60) Provisional application No. 60/382,007, filed on May 17, 2002.

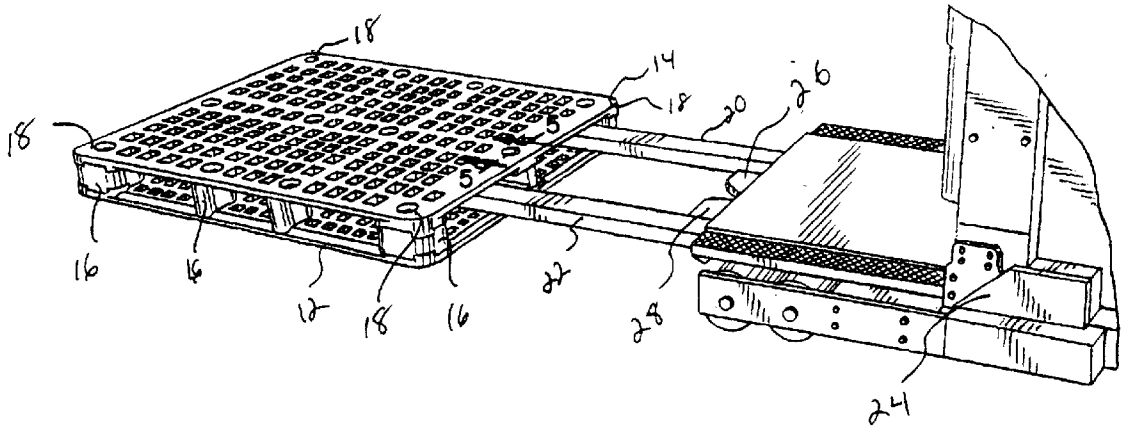
Publication Classification

(51) **Int. Cl.**[7] **B65D 19/00**

(52) **U.S. Cl.** **108/51.11**

(57) **ABSTRACT**

A plastic center connector or post for a plastic pallet assembly configured to facilitate engagement by grabber arms of a forklift and/or projections from the grabber arms. The center connector having an integrally formed first flange extending from a top surface of the connector for snap-fittingly connecting the connector to a top deck of the pallet assembly, and an integrally formed first flange extending from a bottom surface of the connector to snap-fittingly connect the connector to a bottom deck of the pallet assembly.



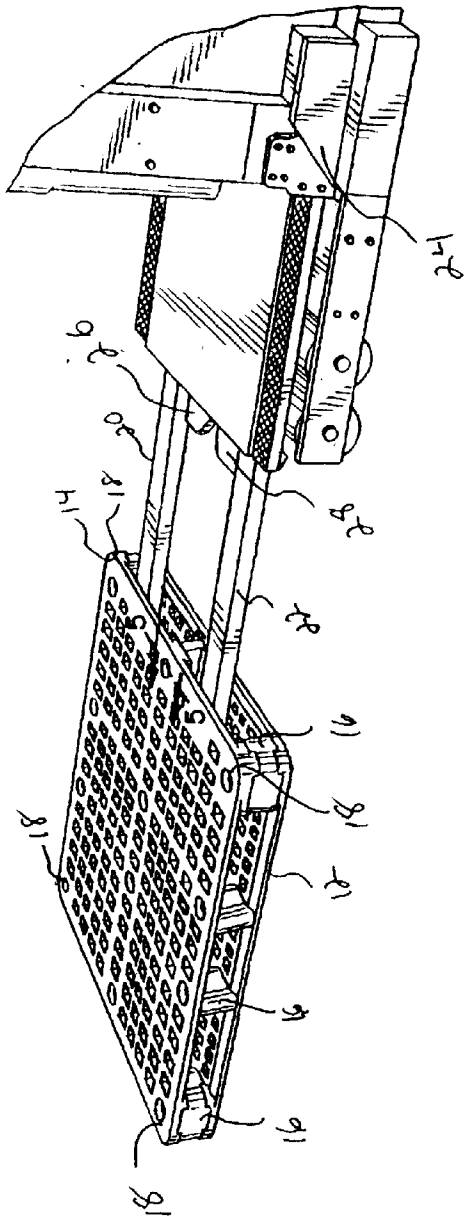


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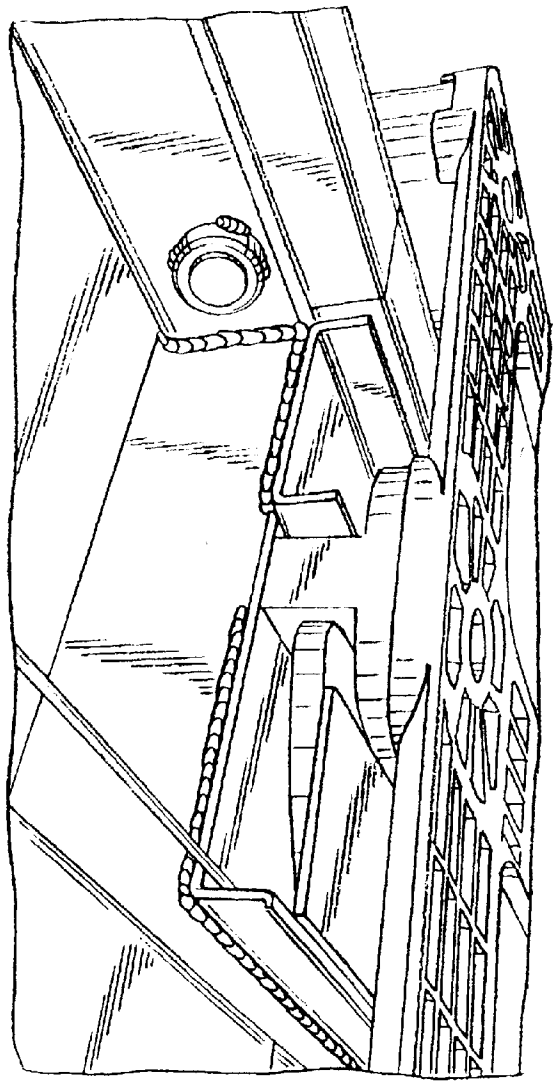


FIG. 2

FIG. 3

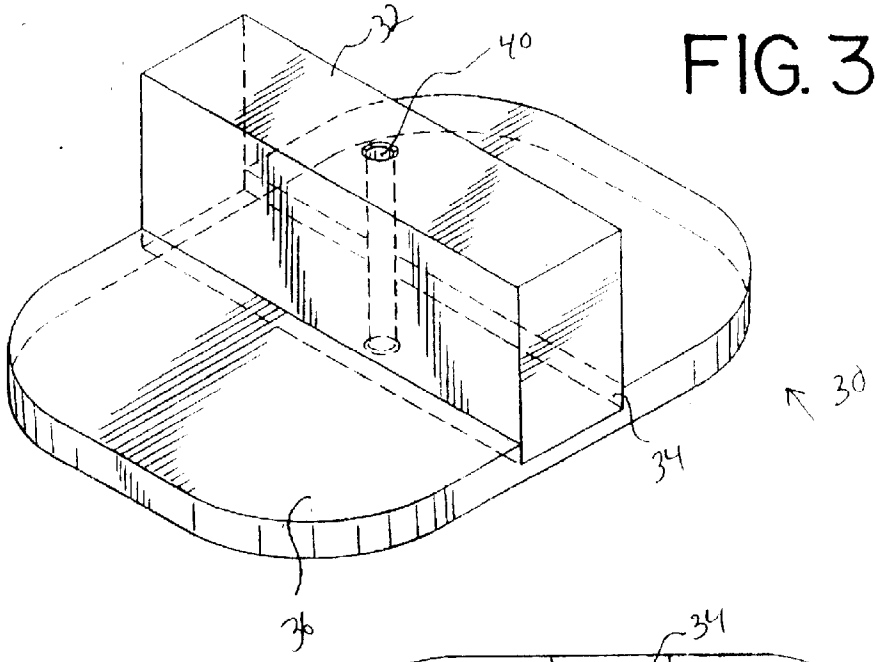


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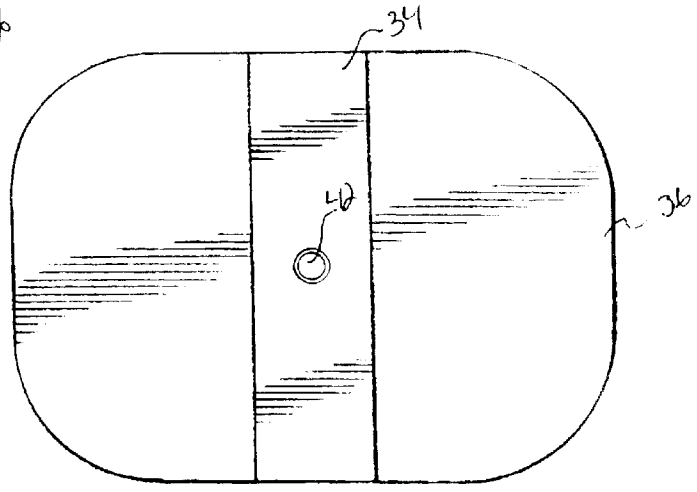
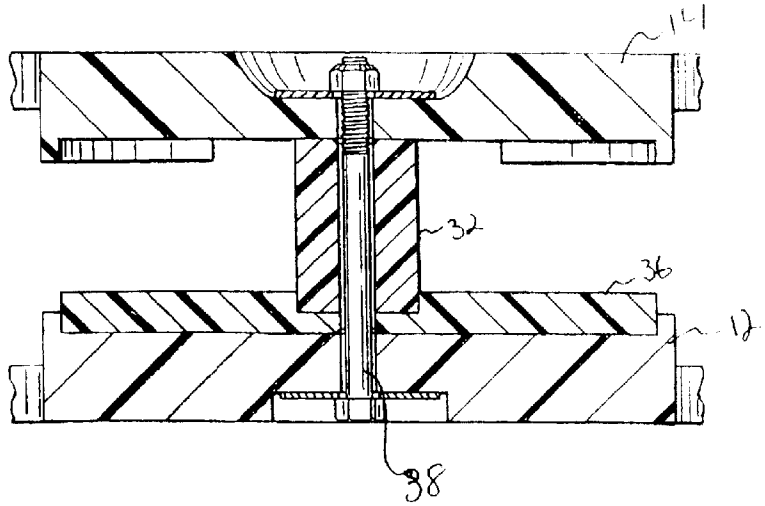


FIG. 5



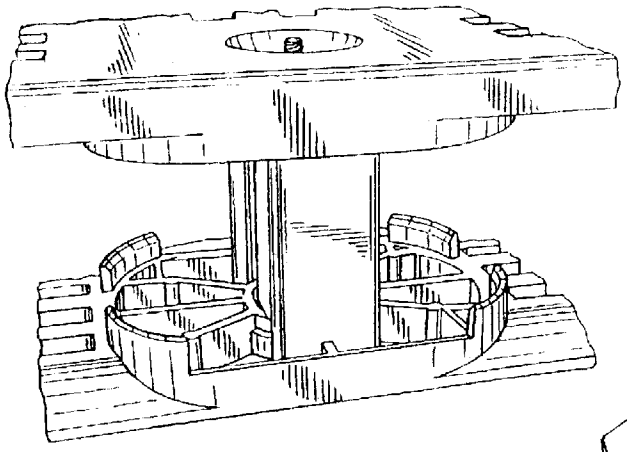


FIG. 6

FIG. 7

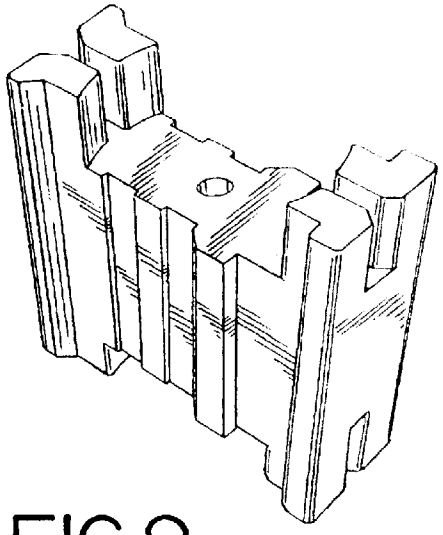


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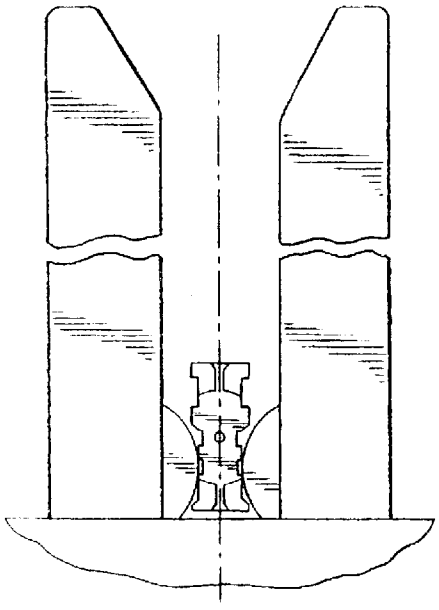


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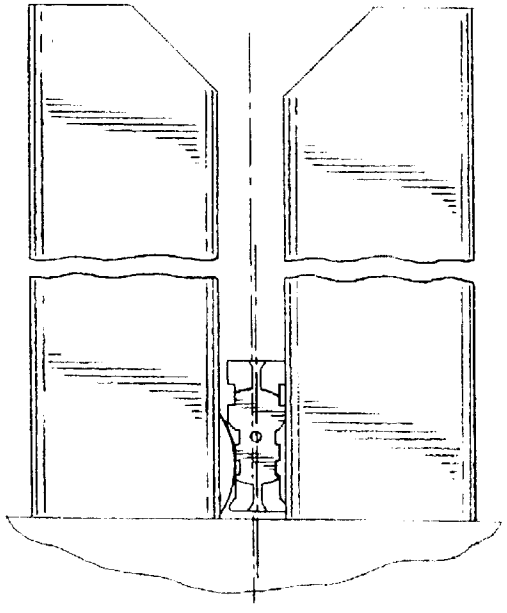


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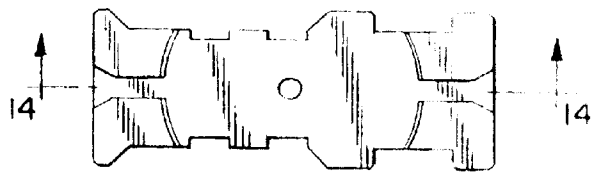


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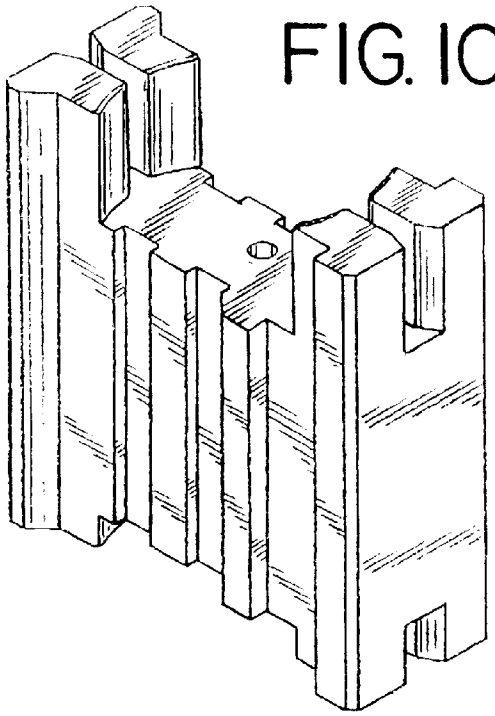


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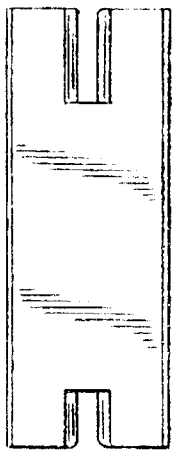


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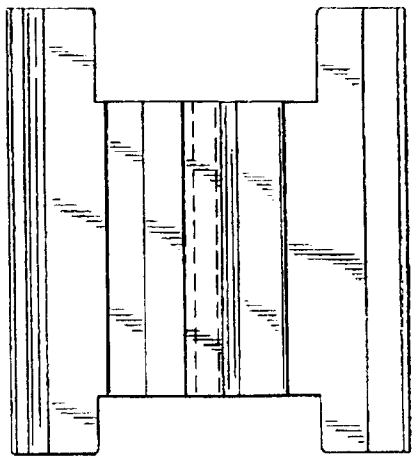


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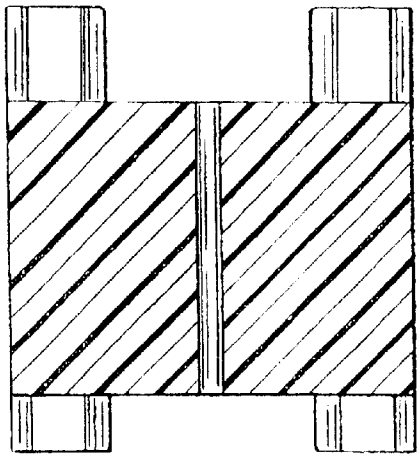


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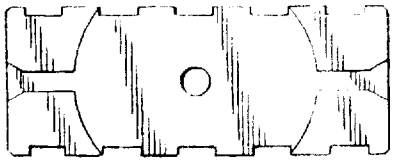


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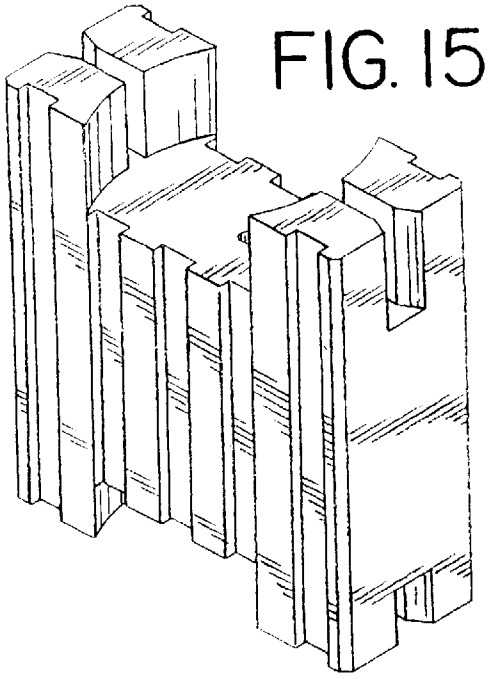


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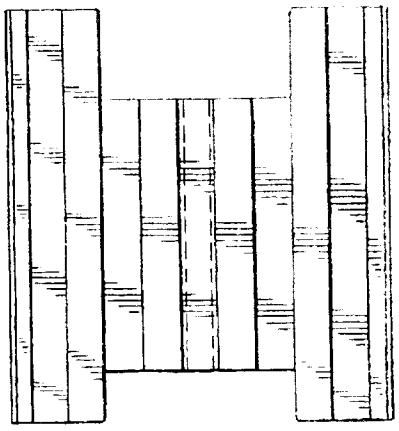


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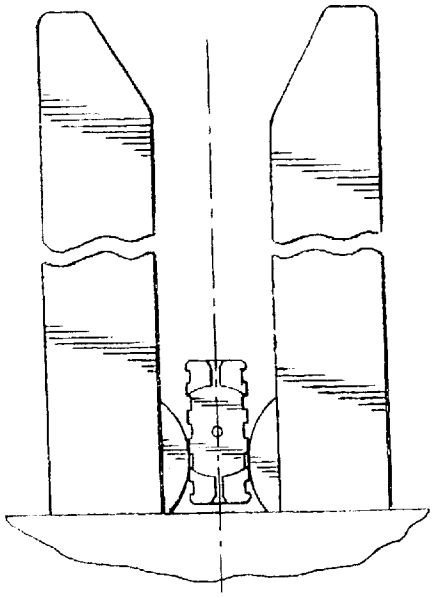


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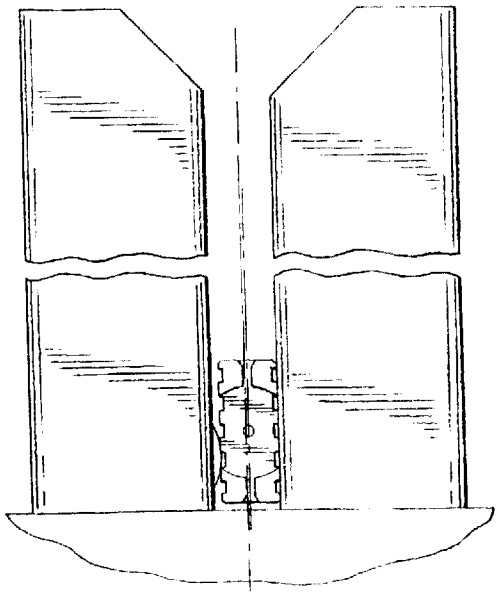


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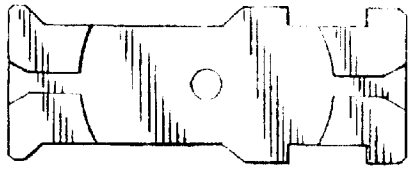


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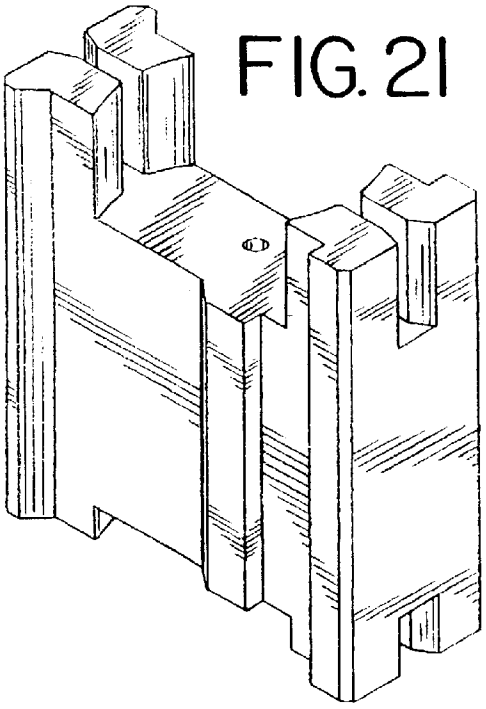


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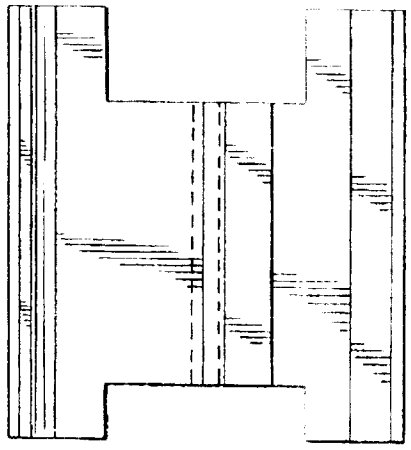


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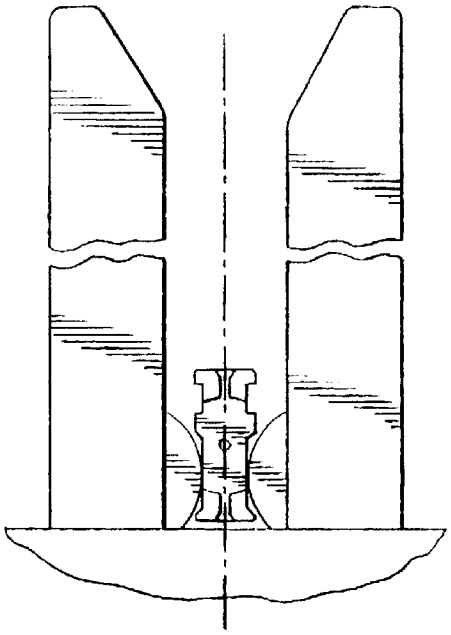


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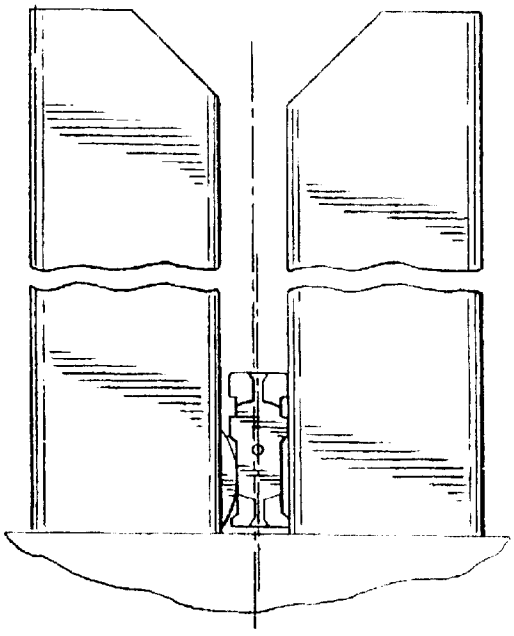


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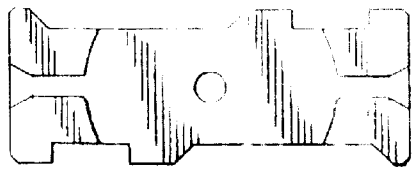


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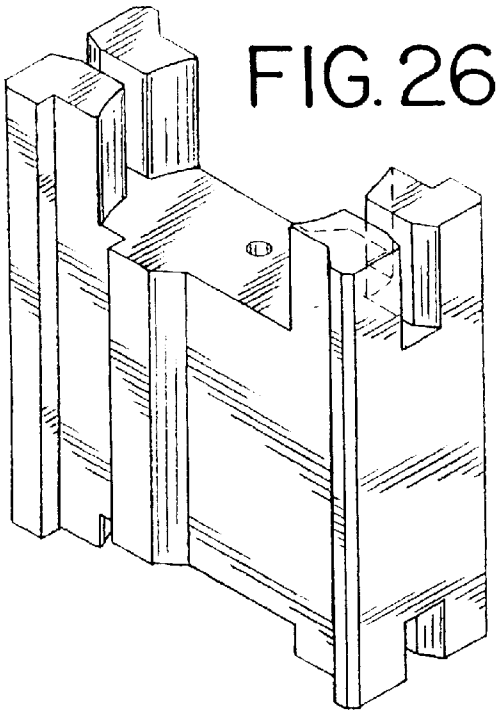


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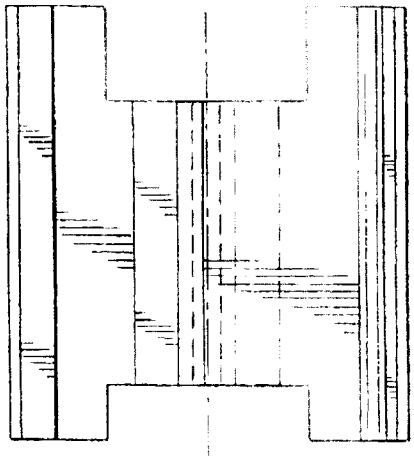


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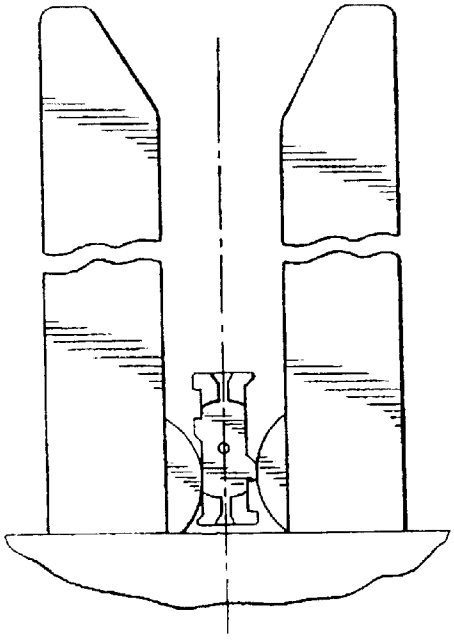
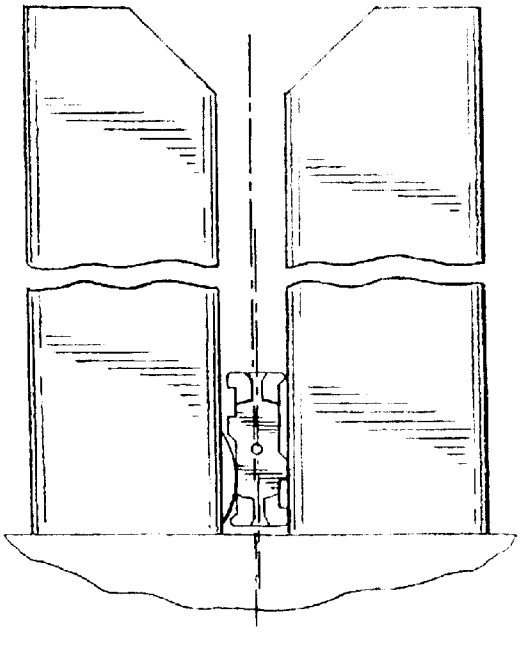
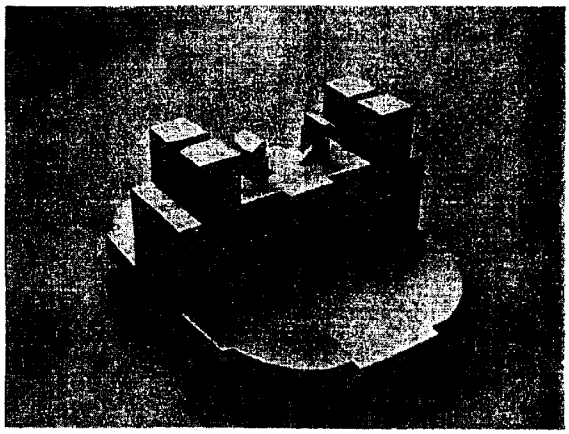


FIG. 29





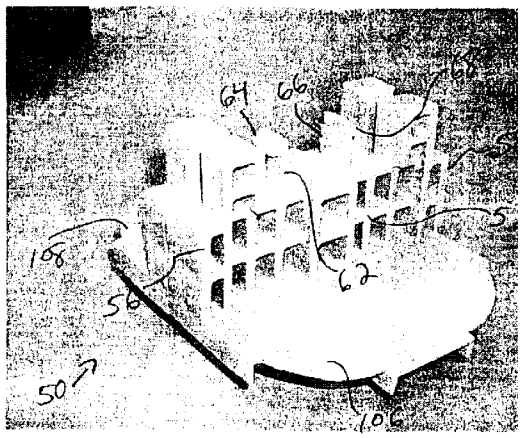


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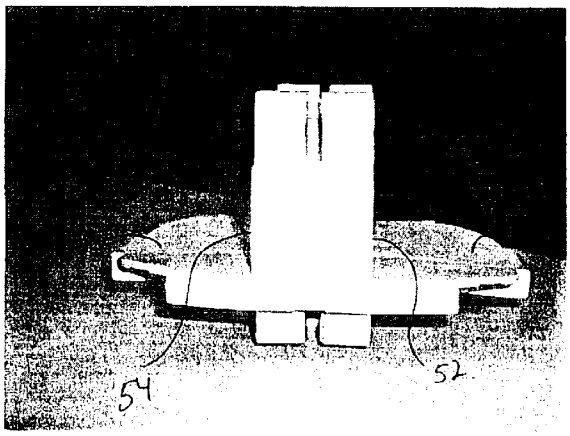


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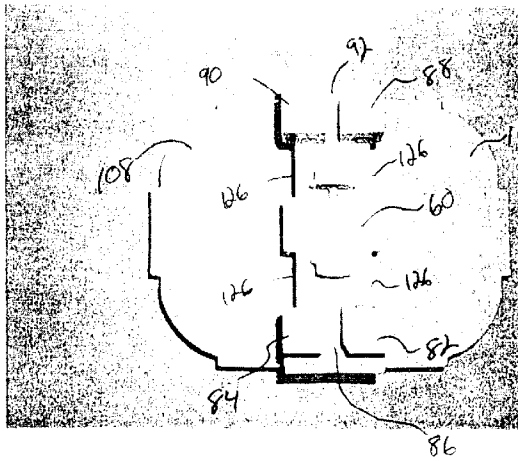


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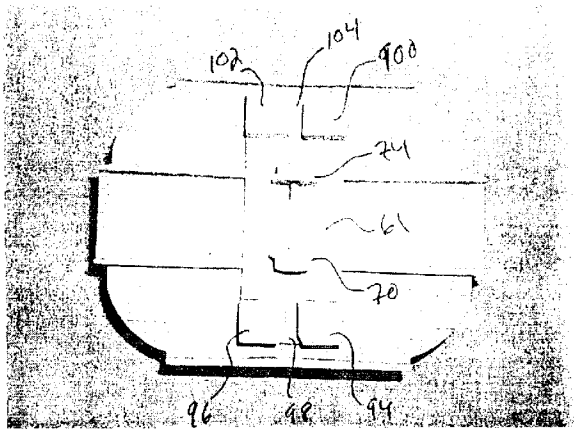


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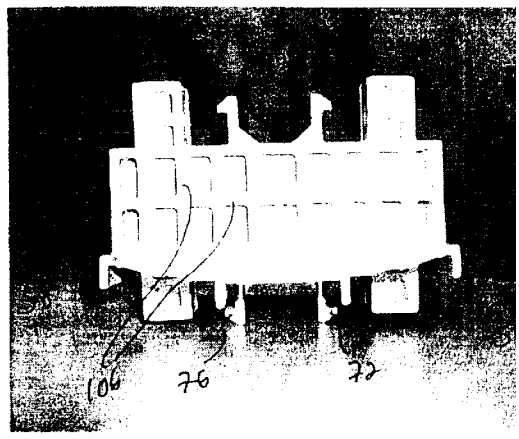
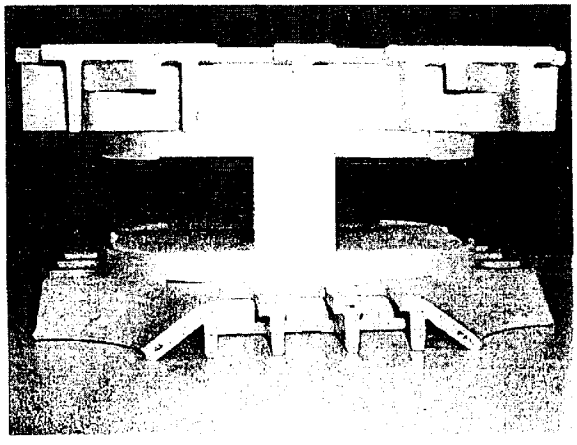
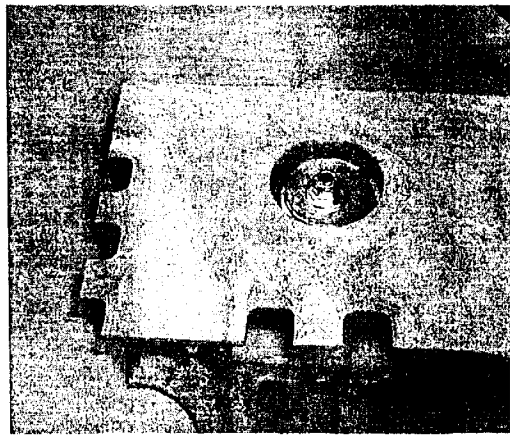
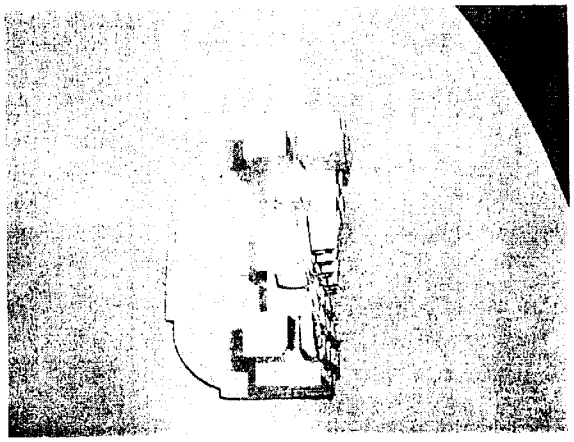


Fig. 34







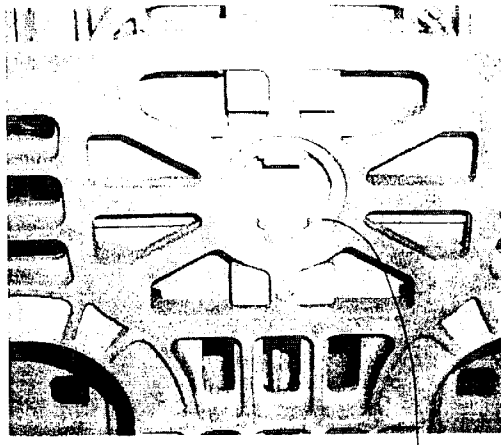


Fig. 35

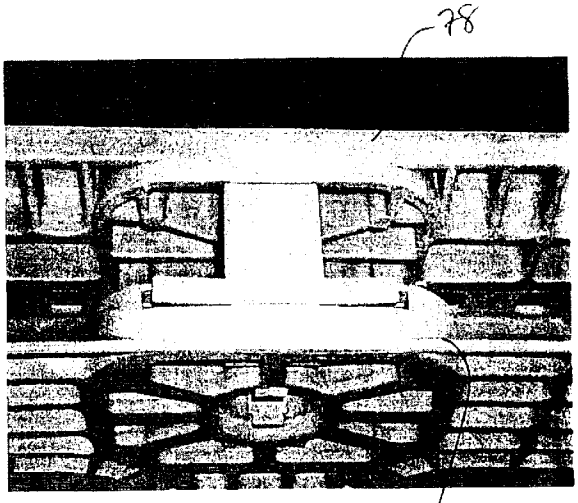
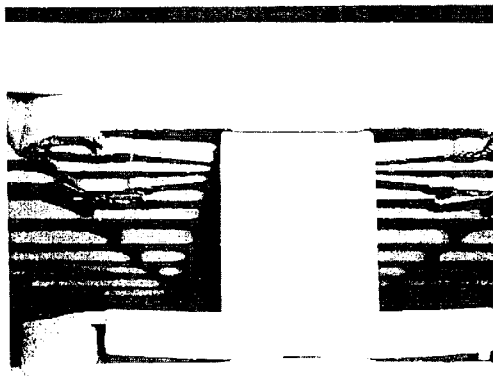


Fig. 36



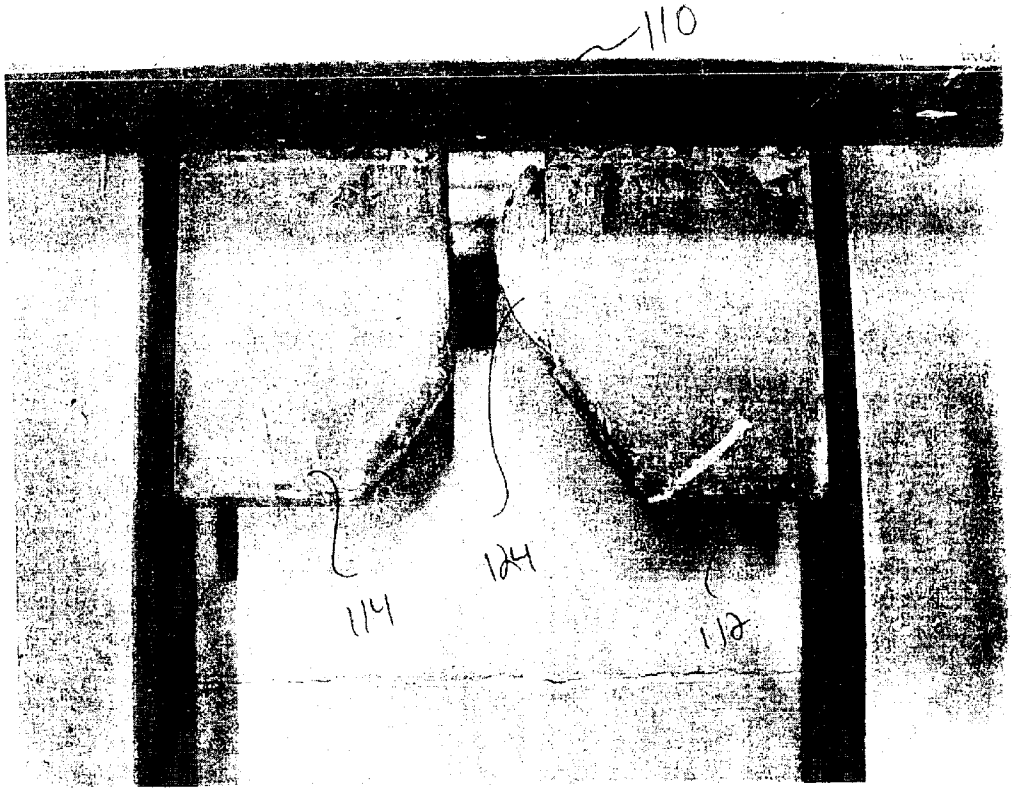


Fig. 37

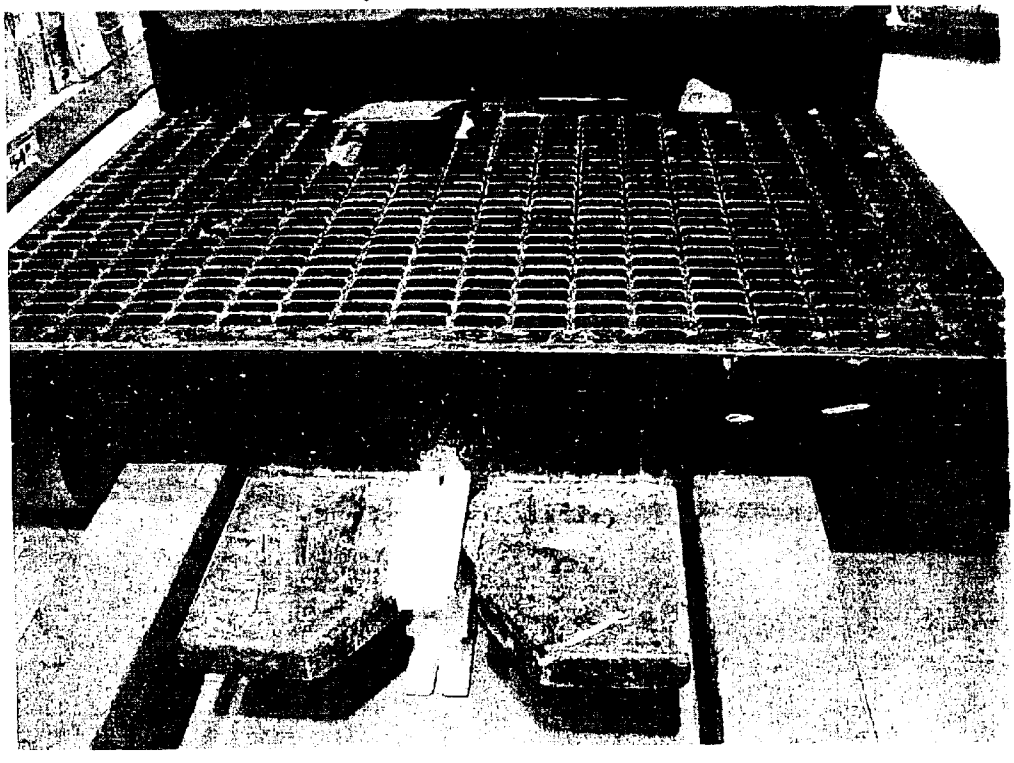
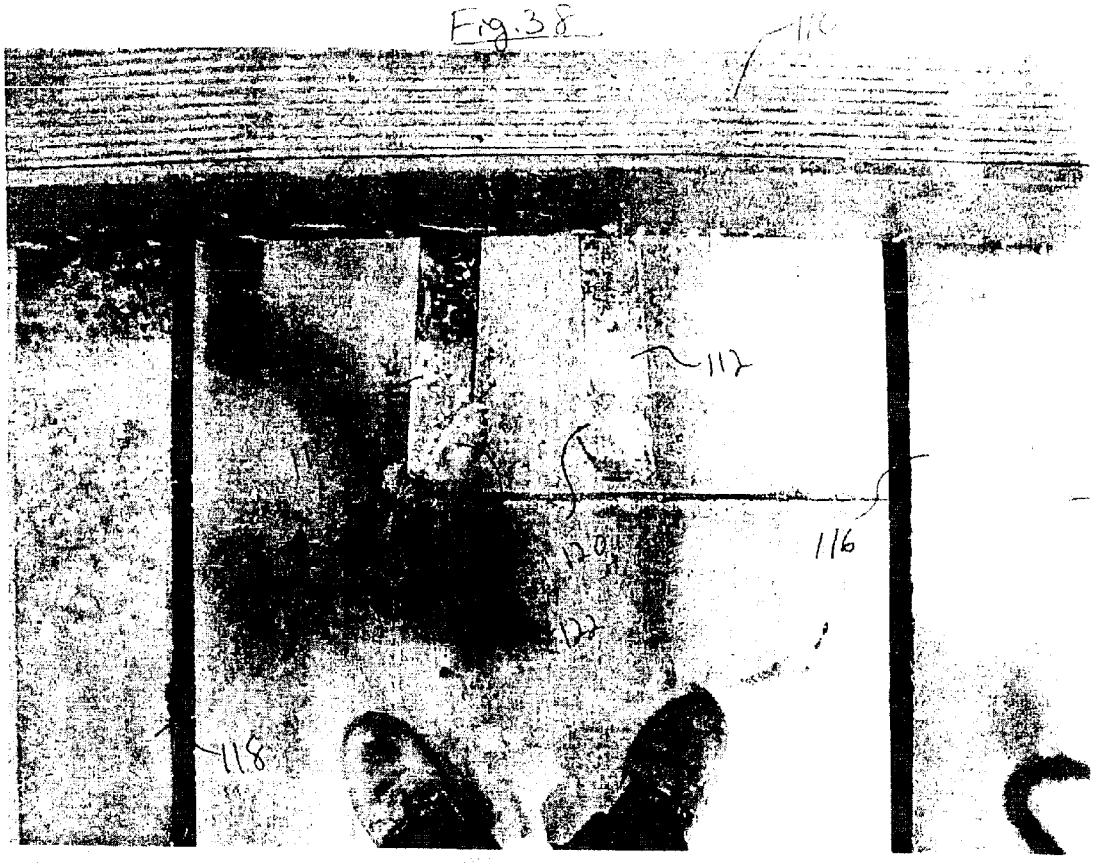


Fig. 38



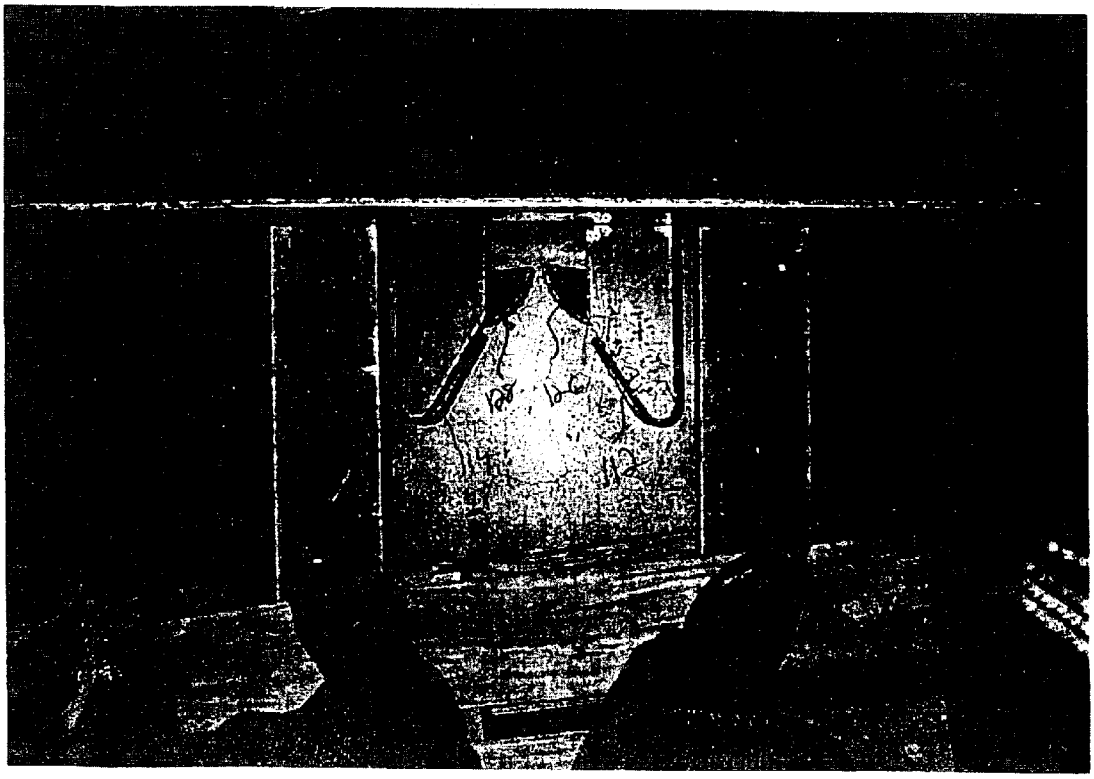


Fig. 39

FIG. 40

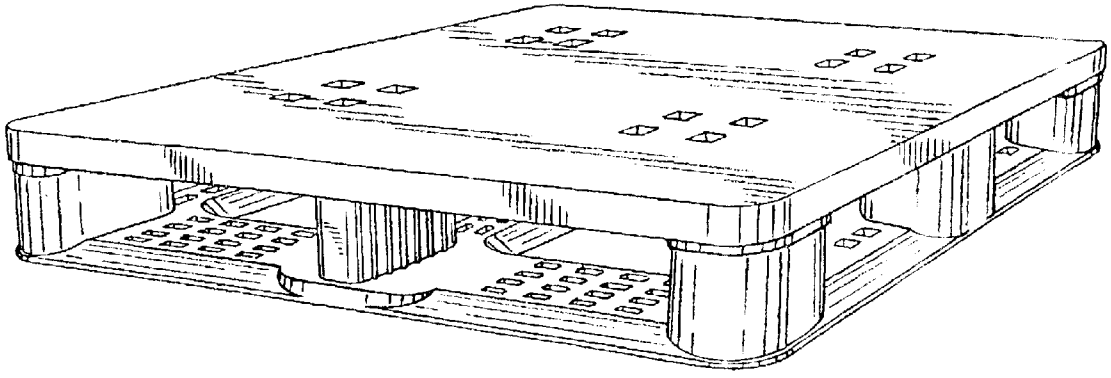


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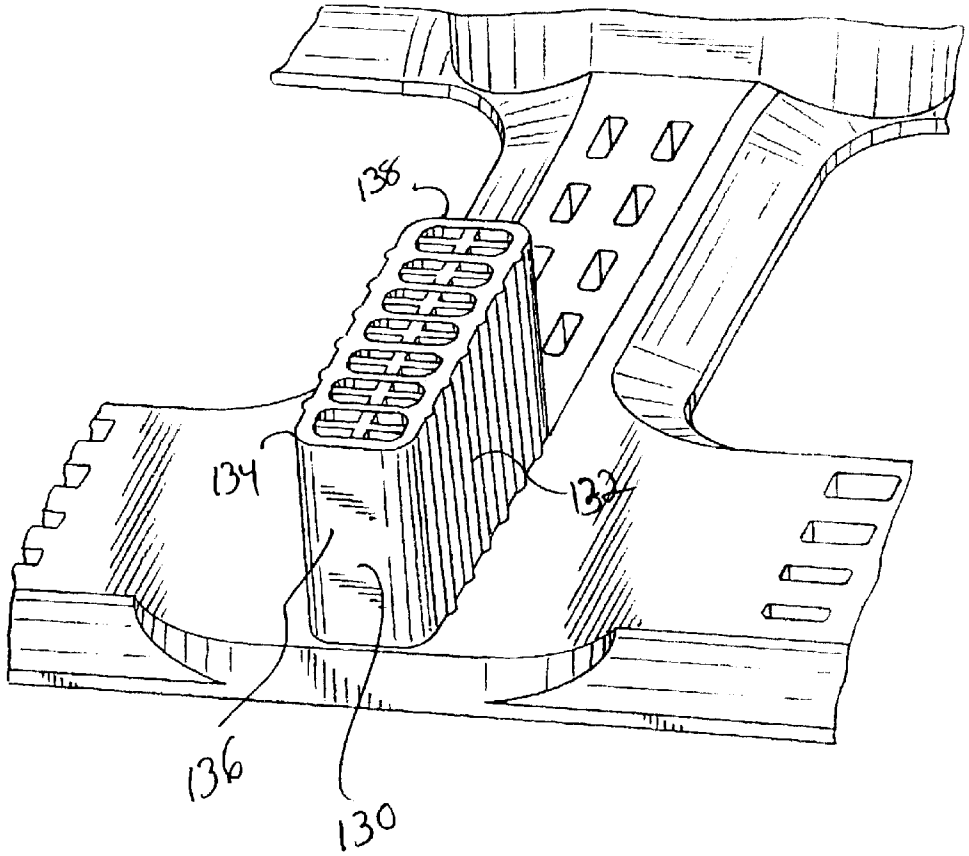


FIG. 42

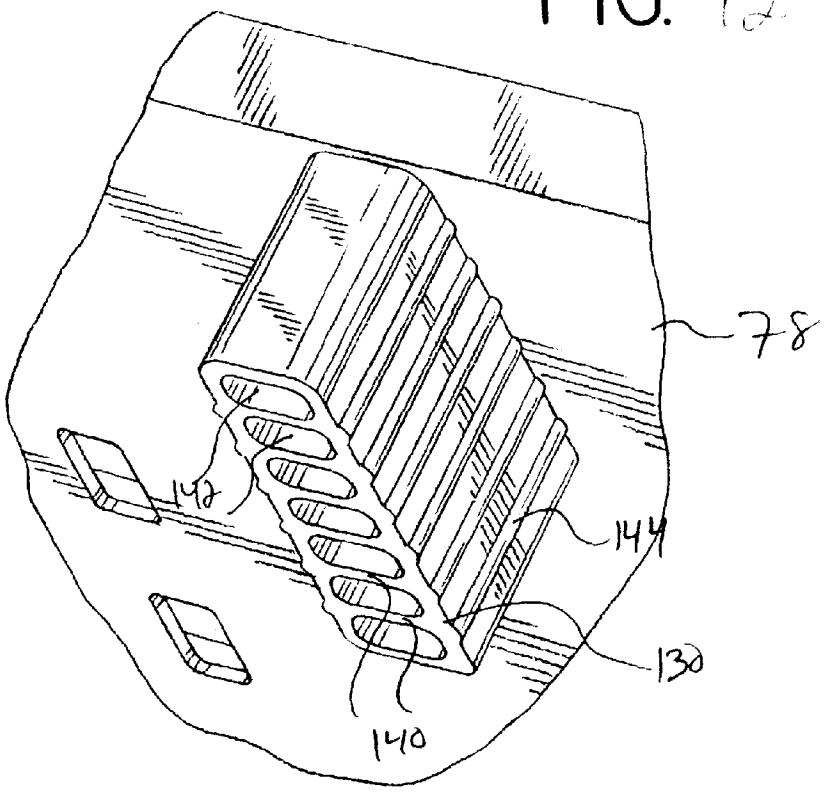
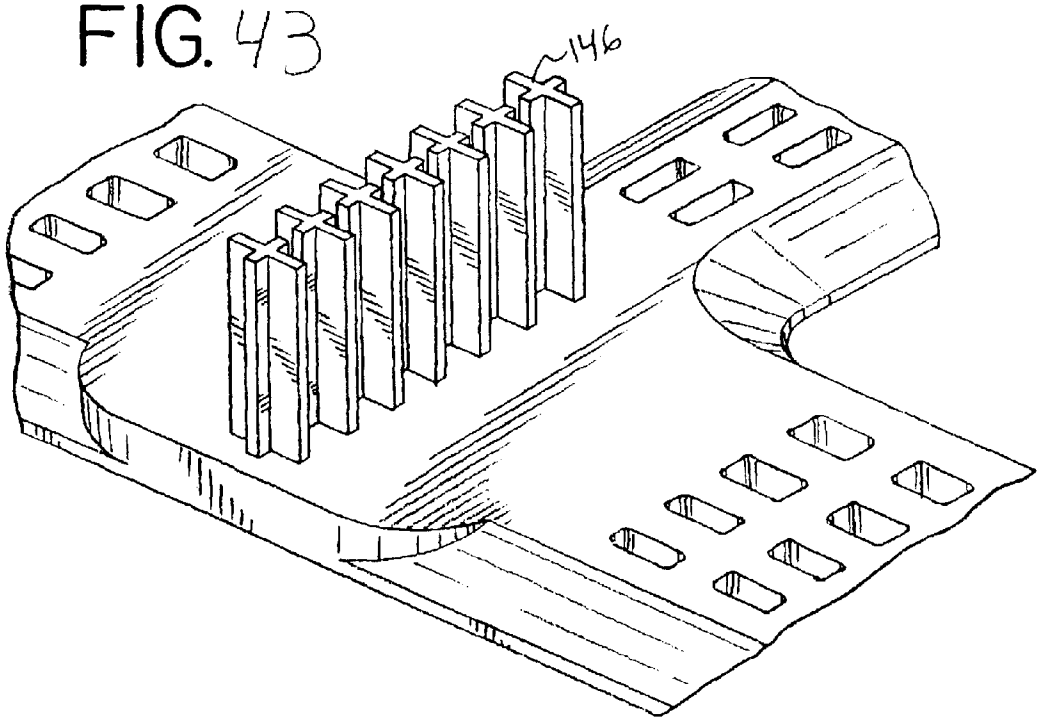


FIG. 43



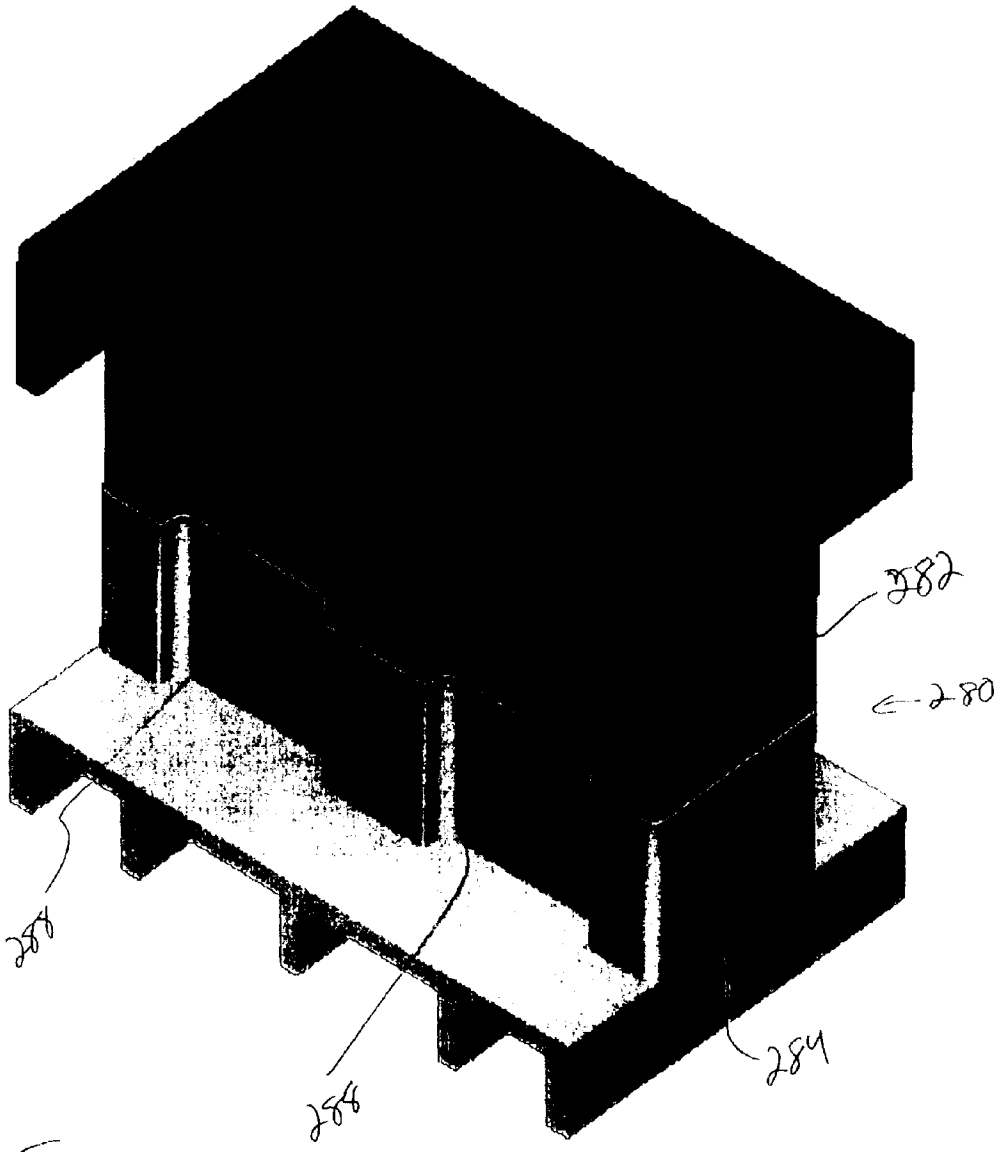


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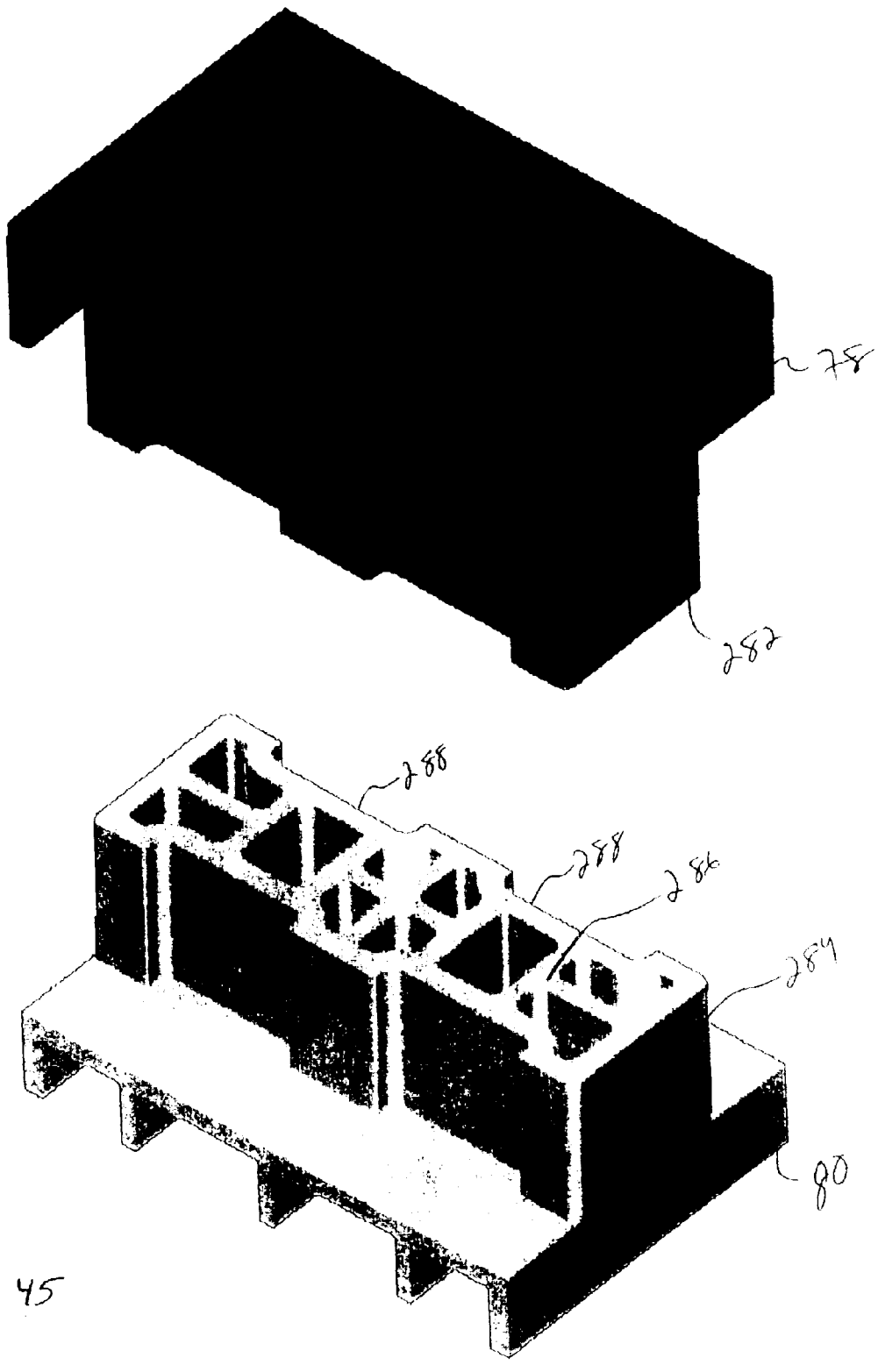


Fig. 45

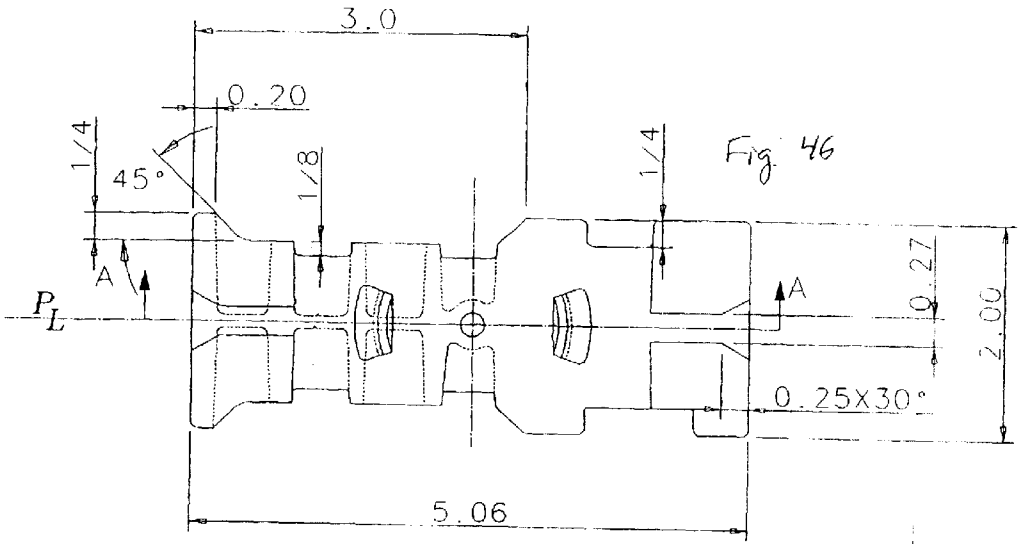


Fig 46

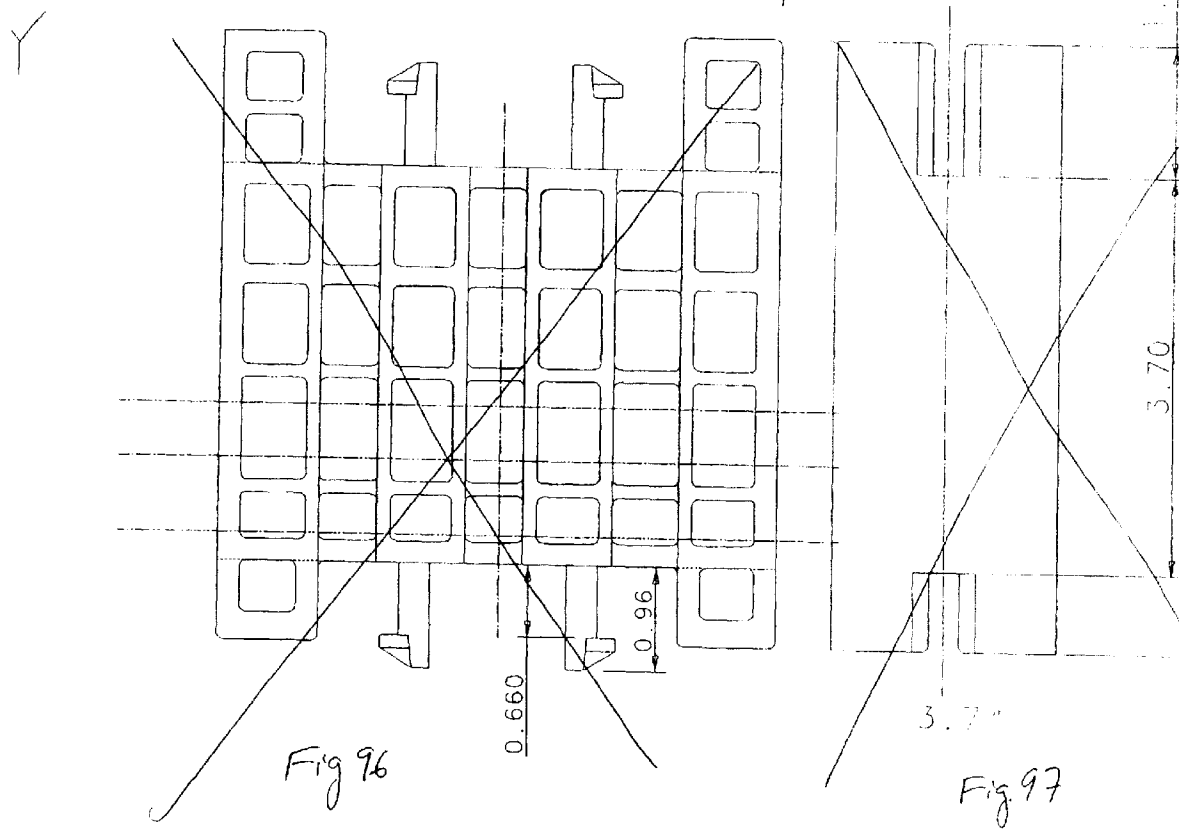


Fig 96

Fig 97

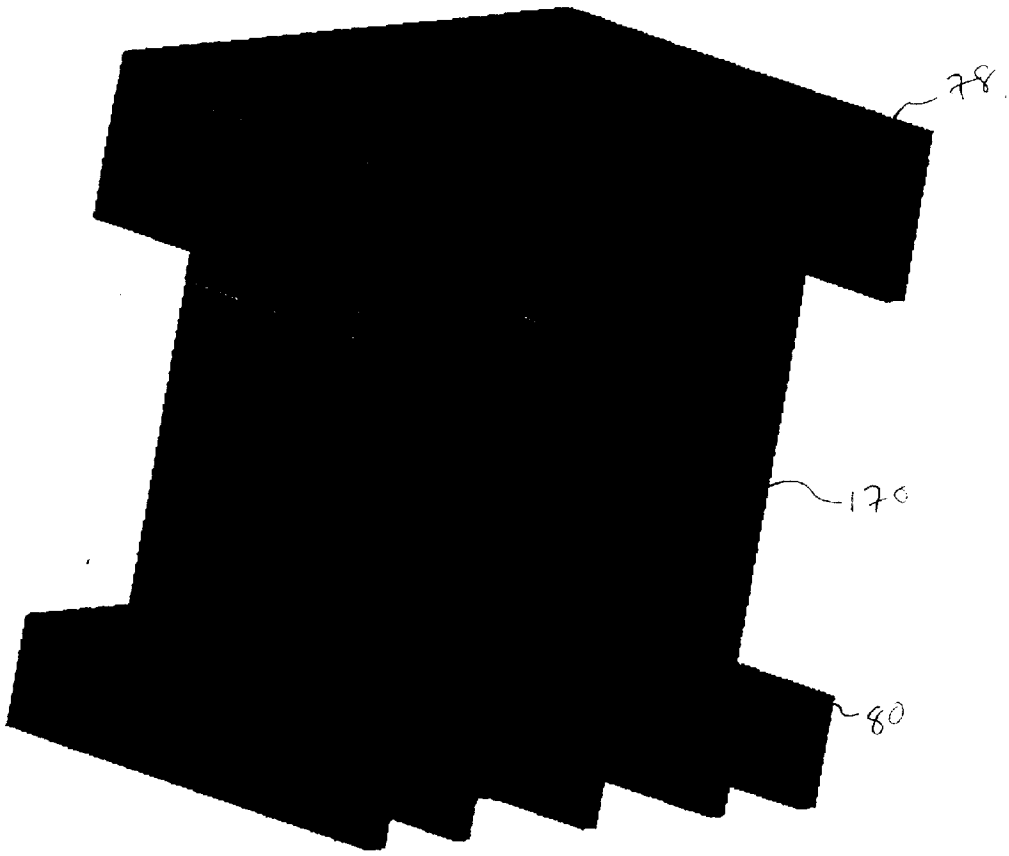


Fig. 47

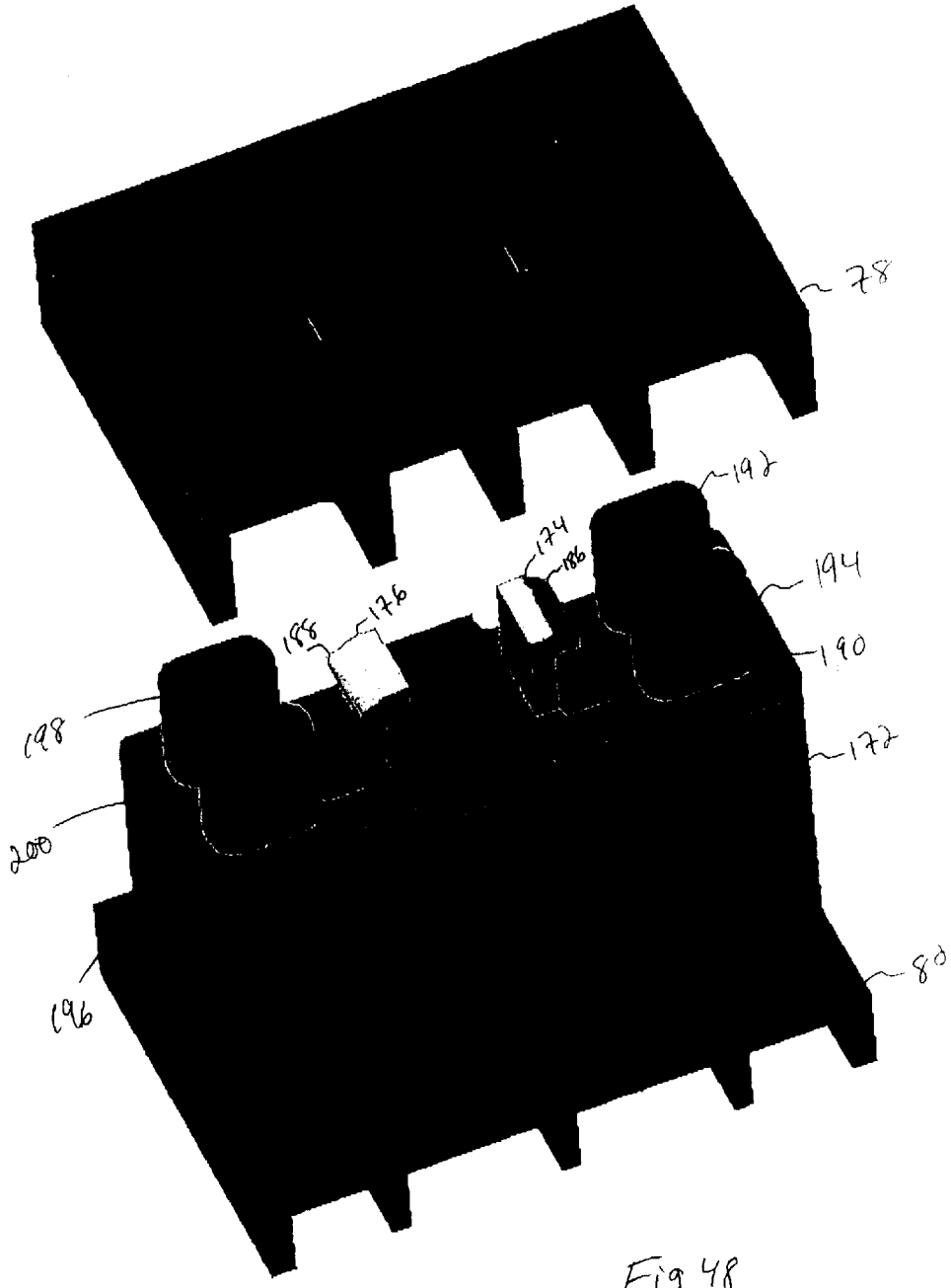


Fig 48

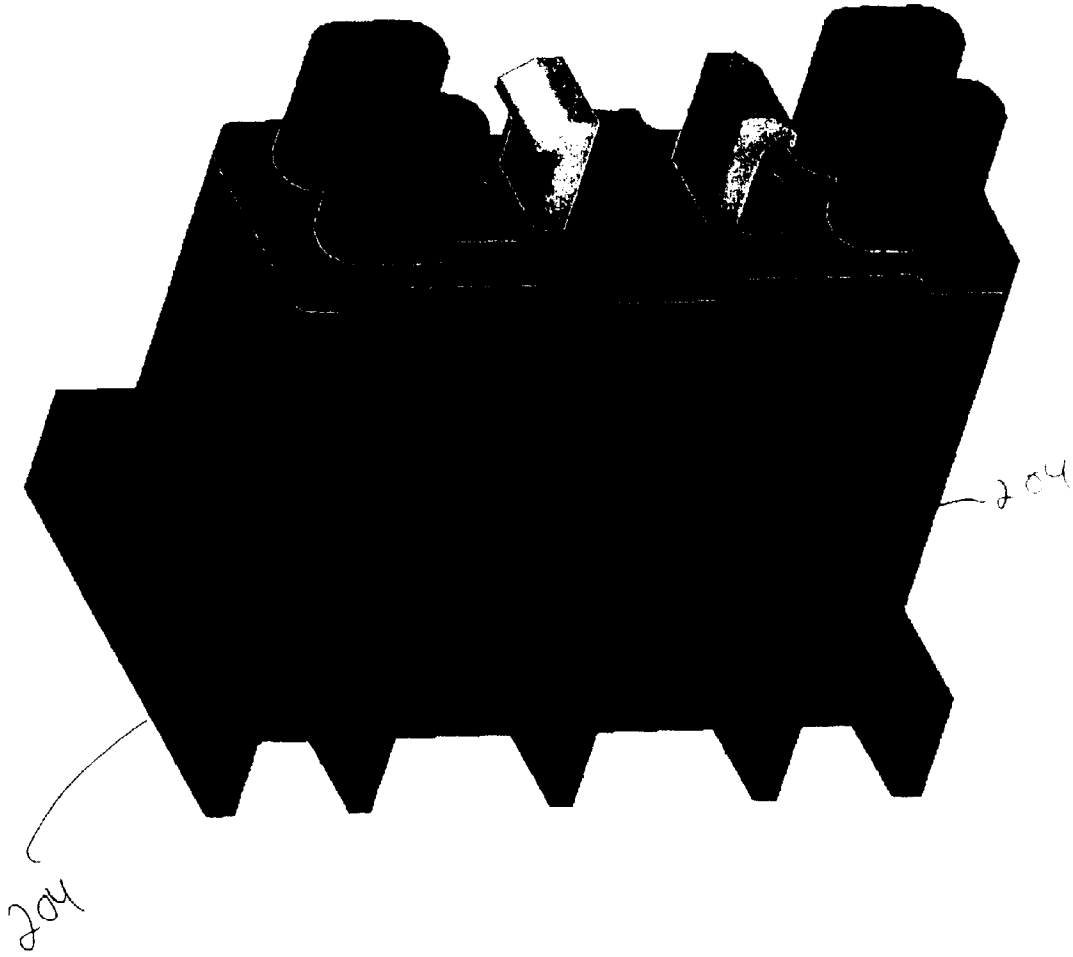


Fig. 49

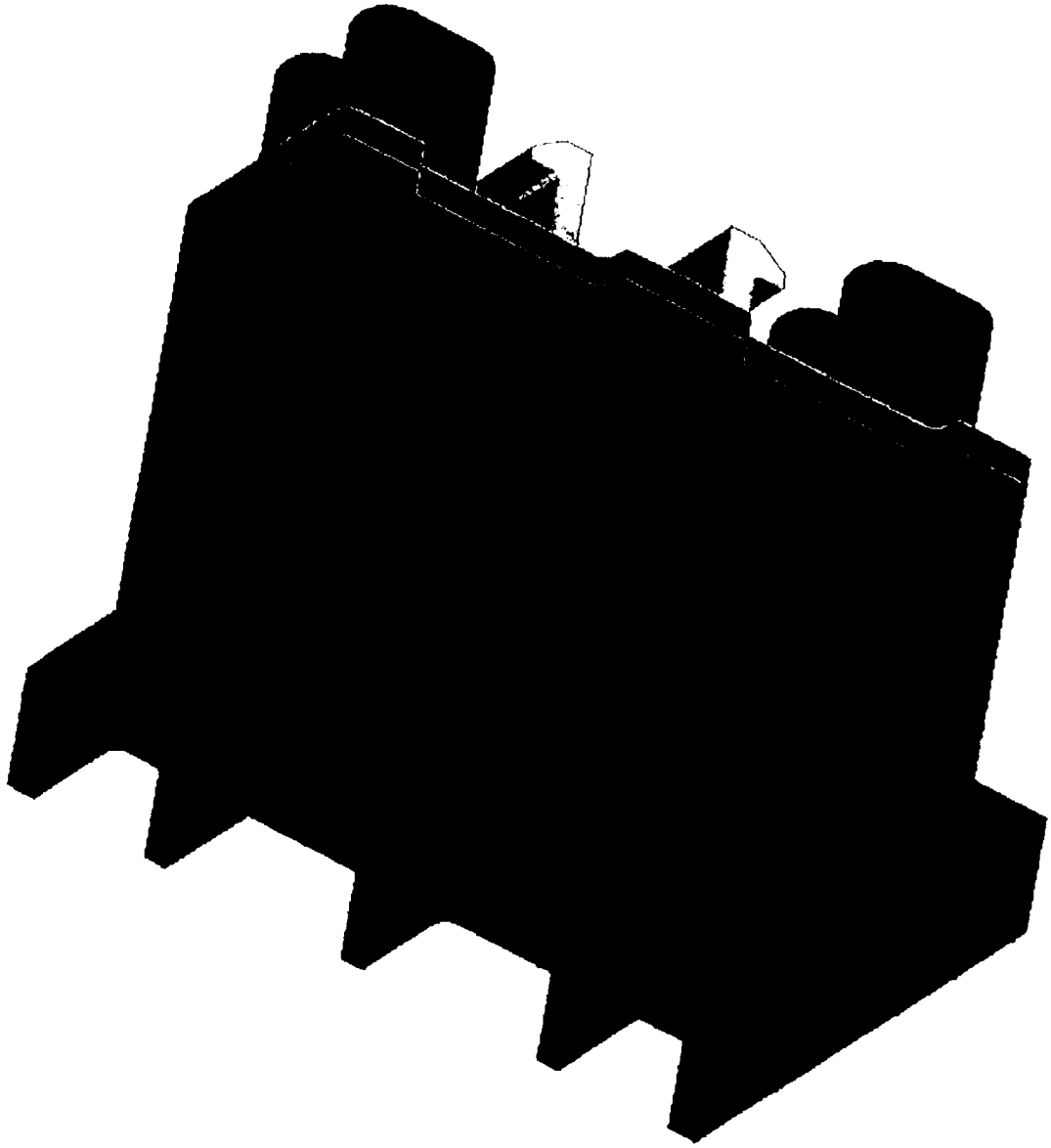


Fig 50

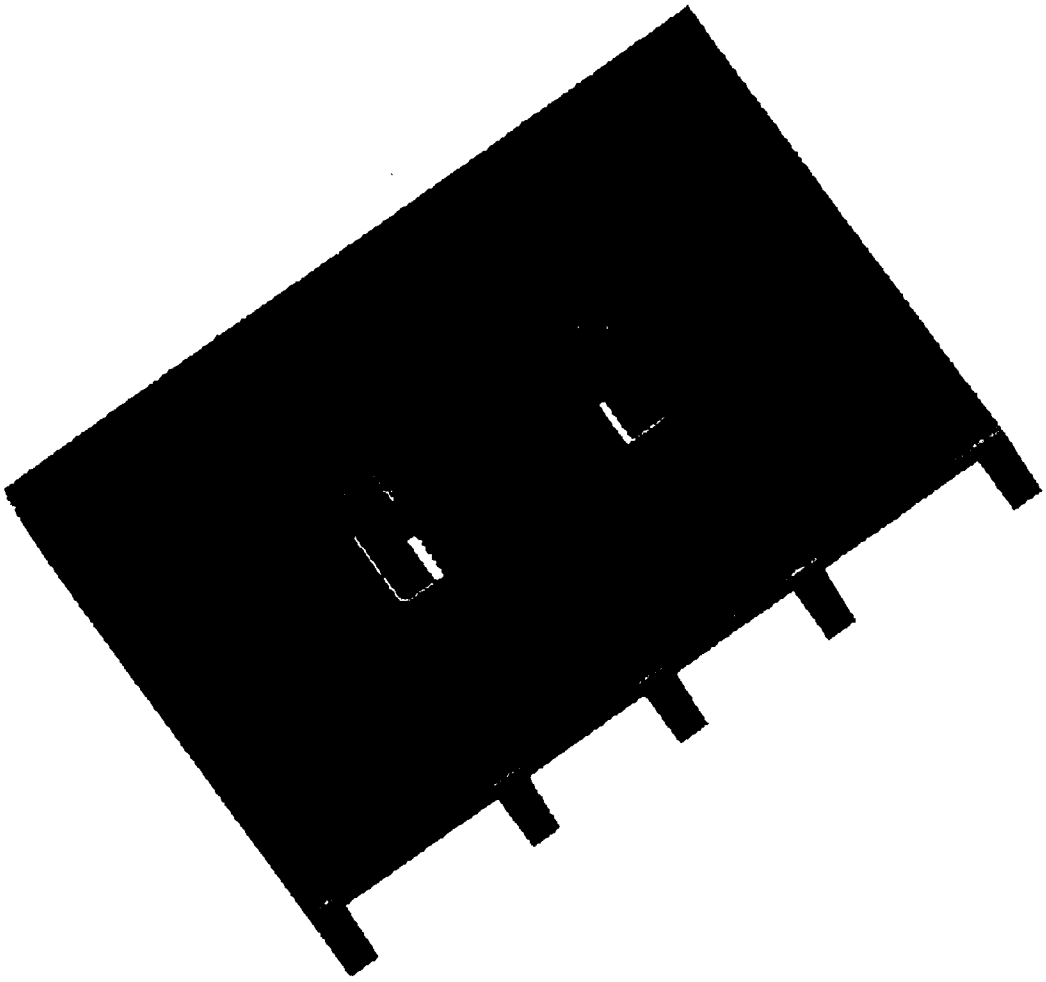


Fig. 51

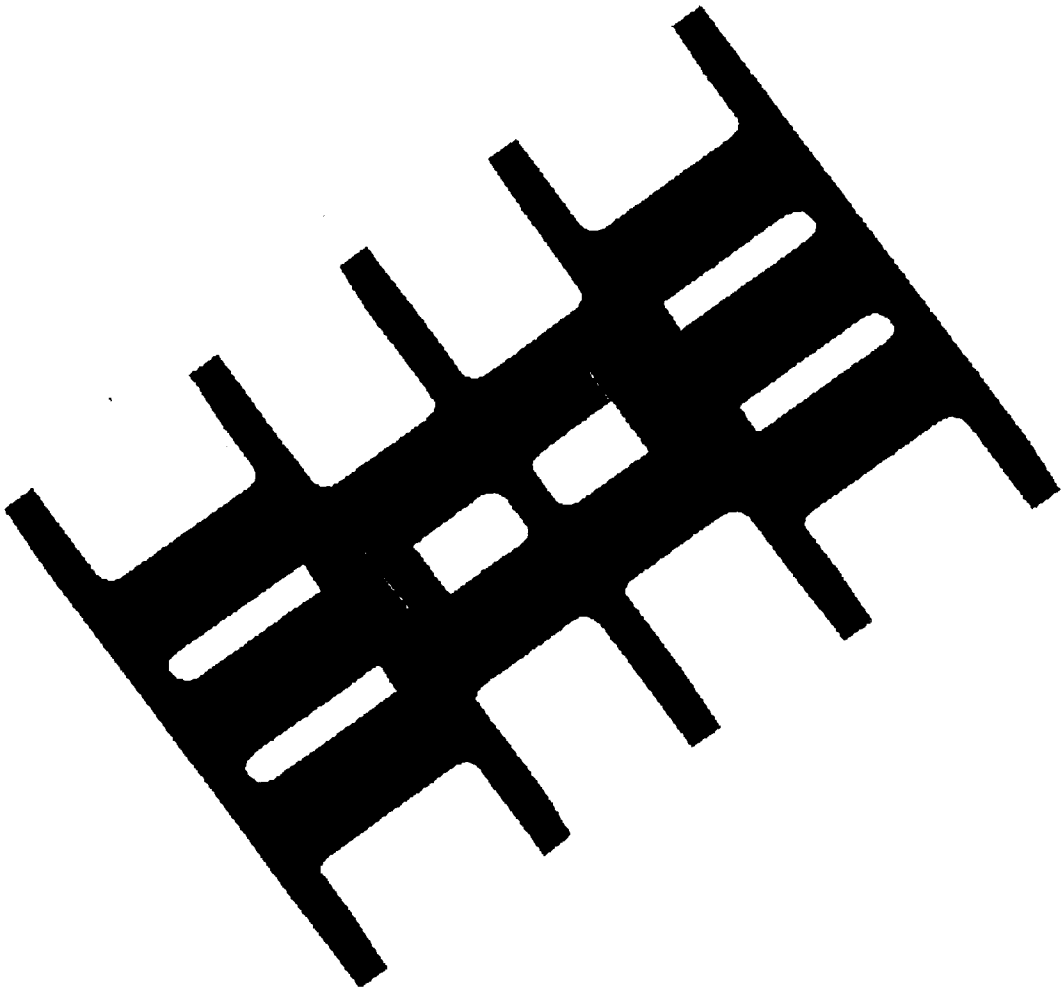


Fig. 52

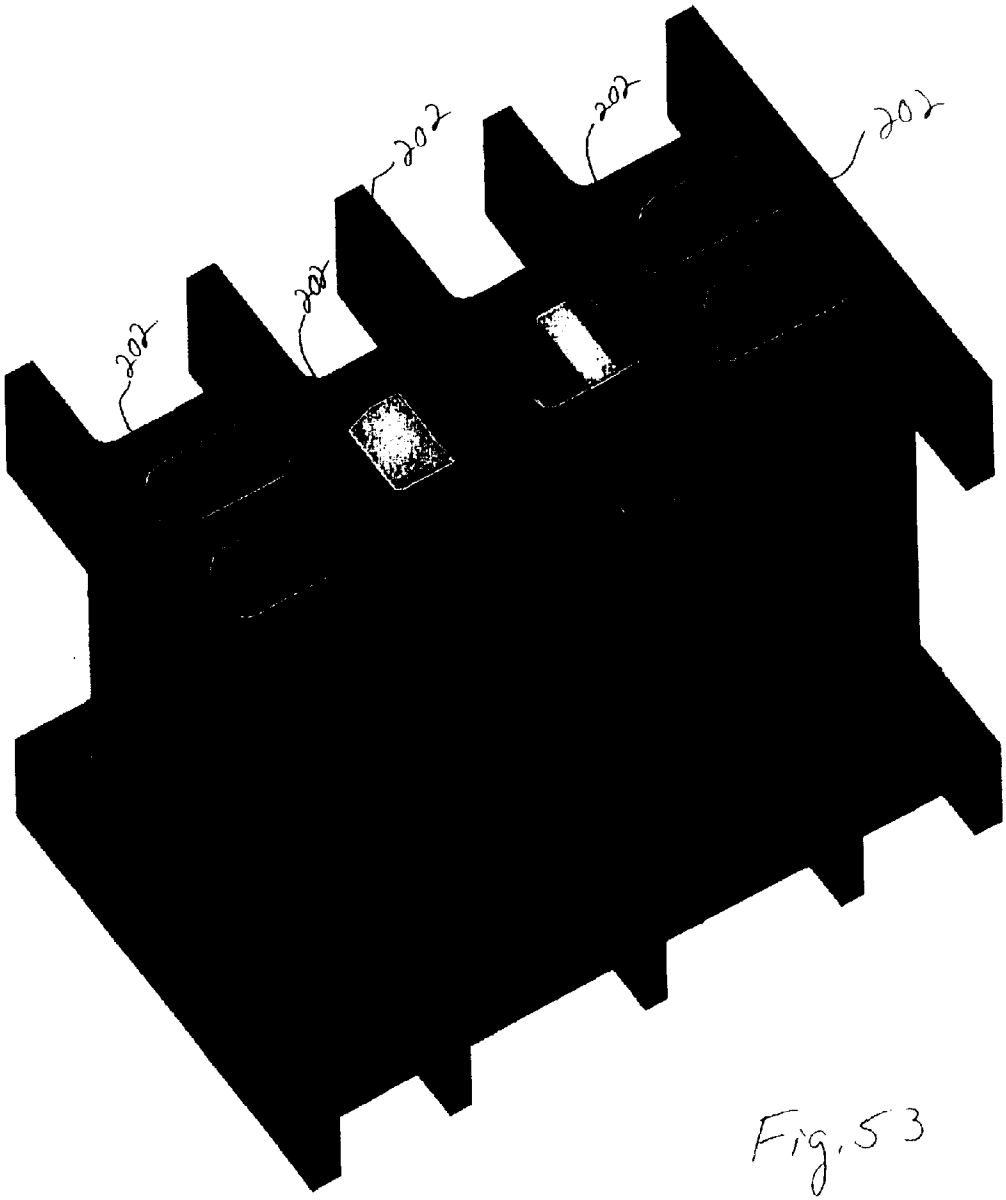


Fig. 53

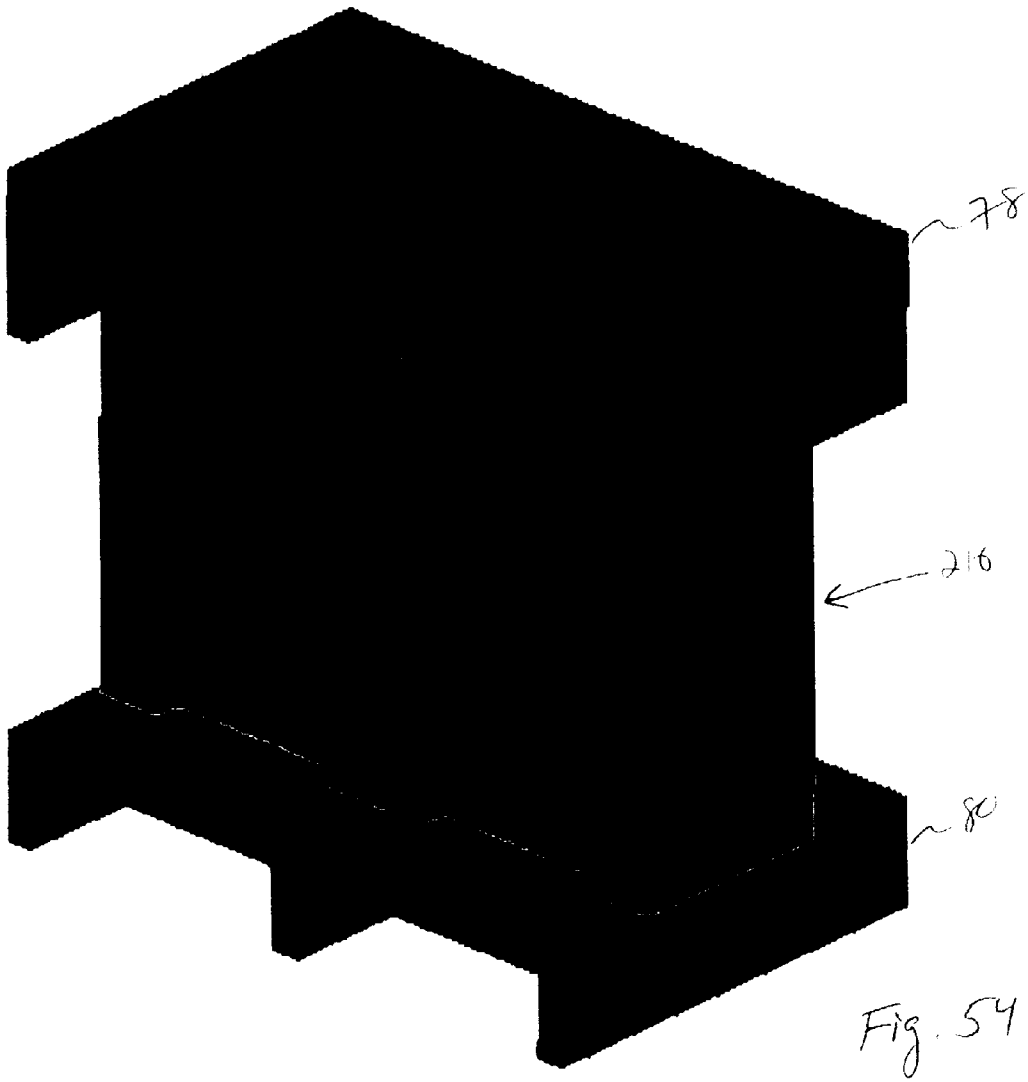


Fig. 54

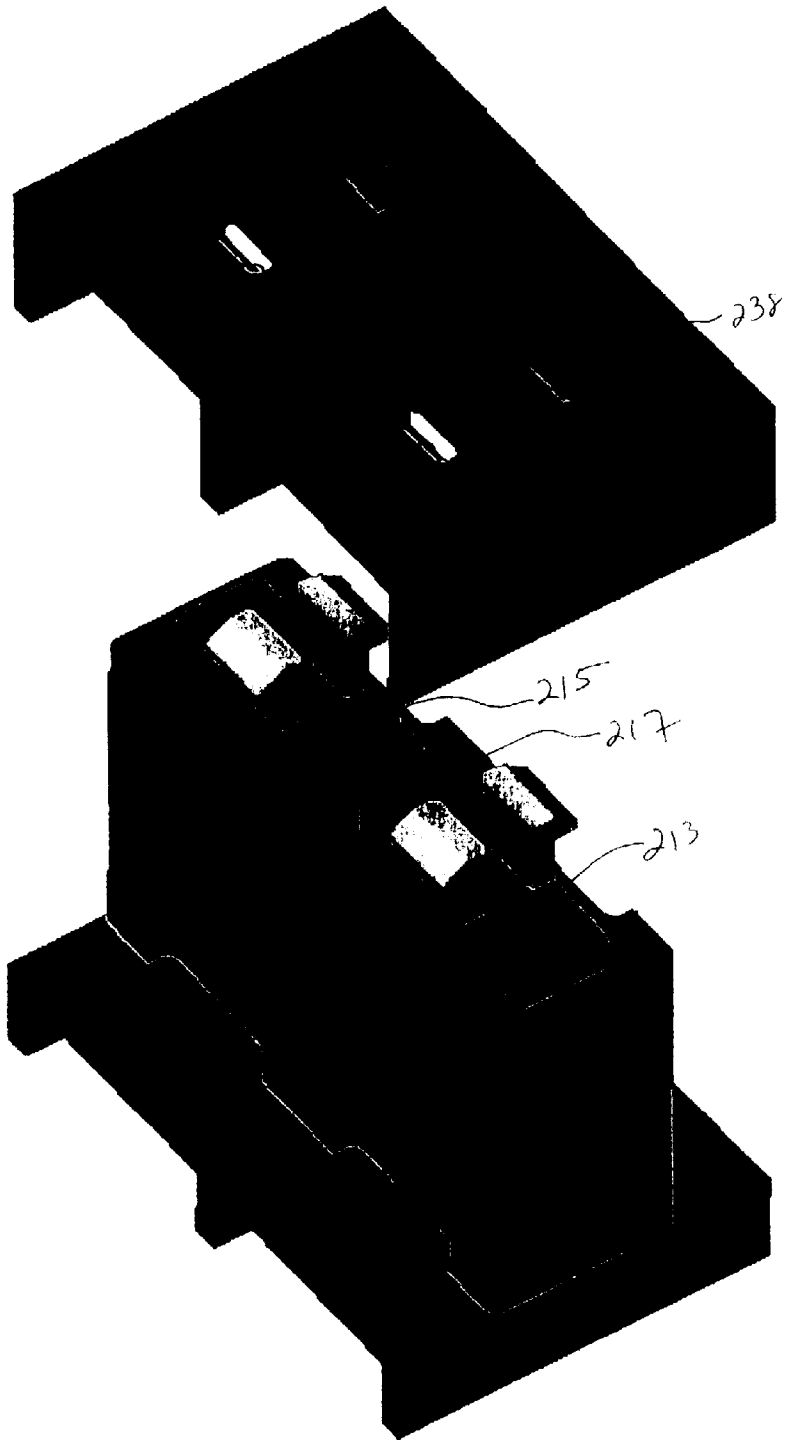


Fig 55

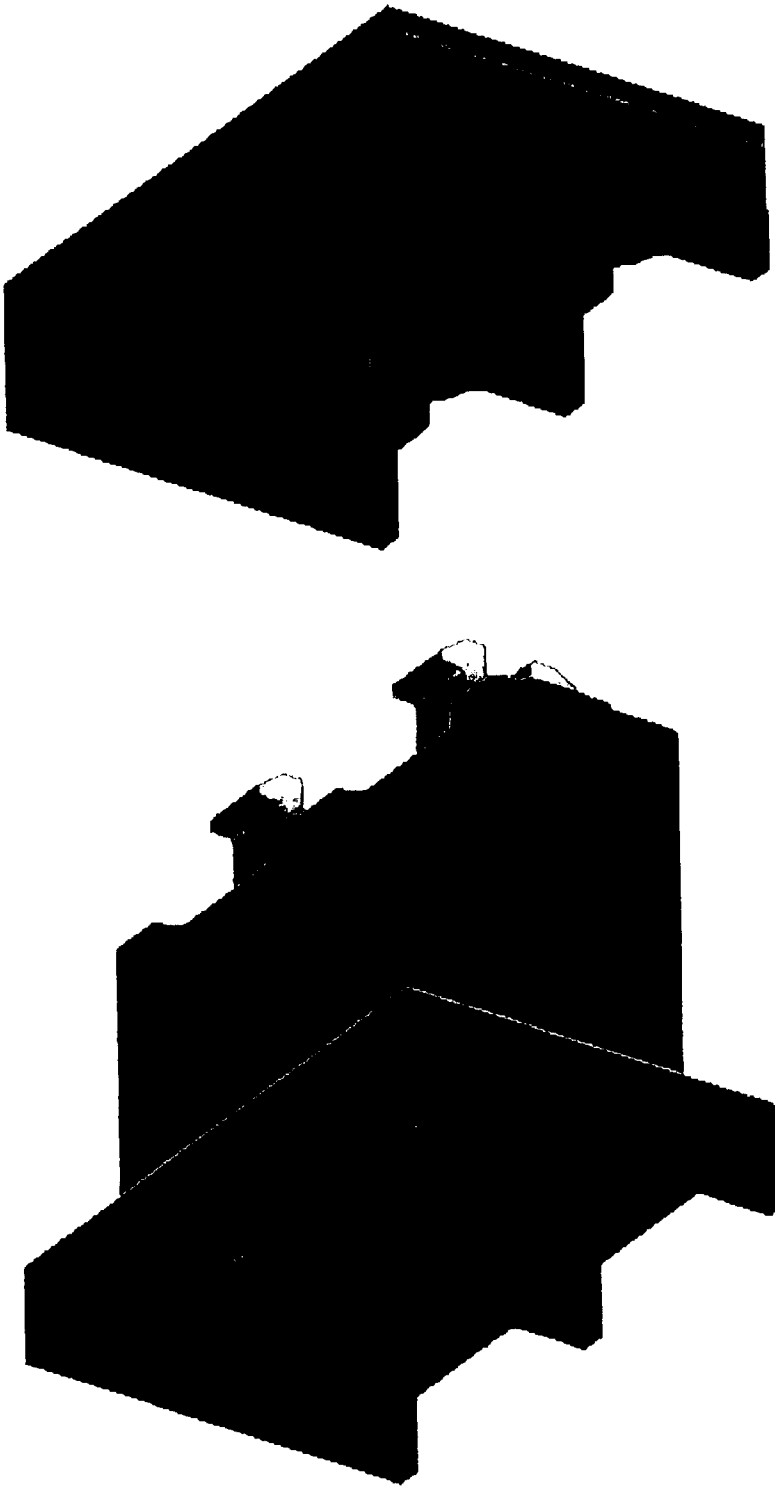


Fig. 56

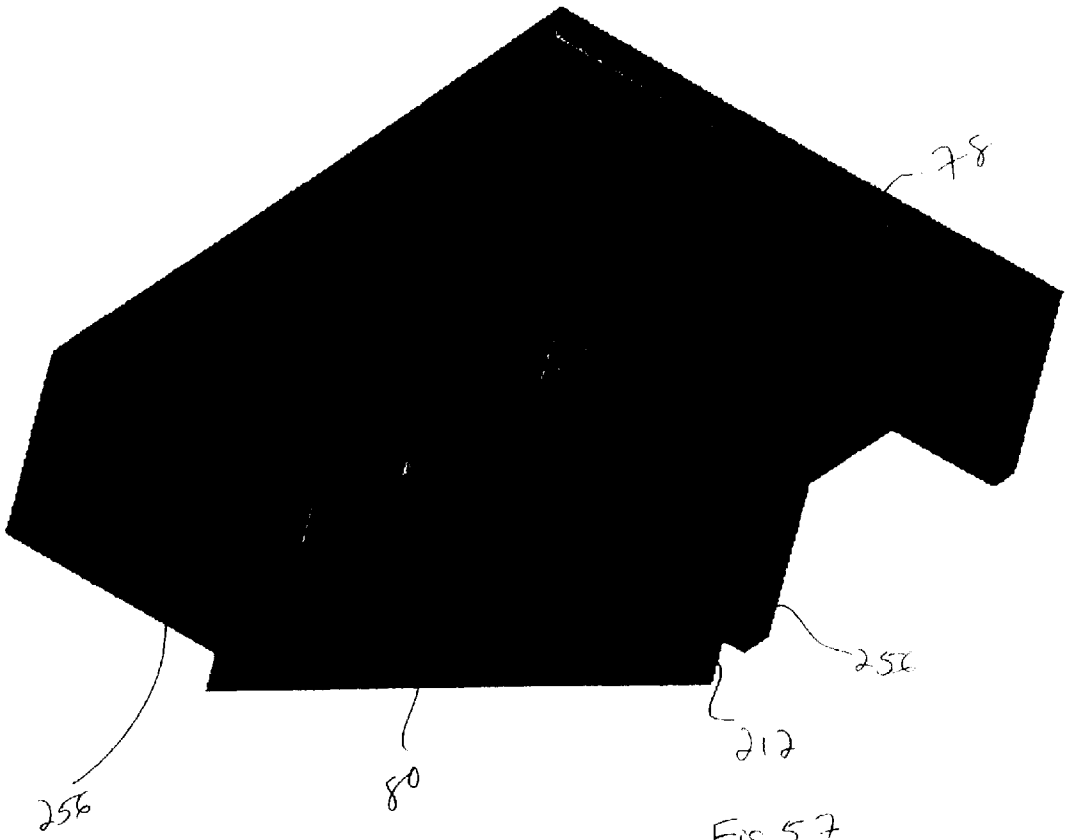


Fig. 57

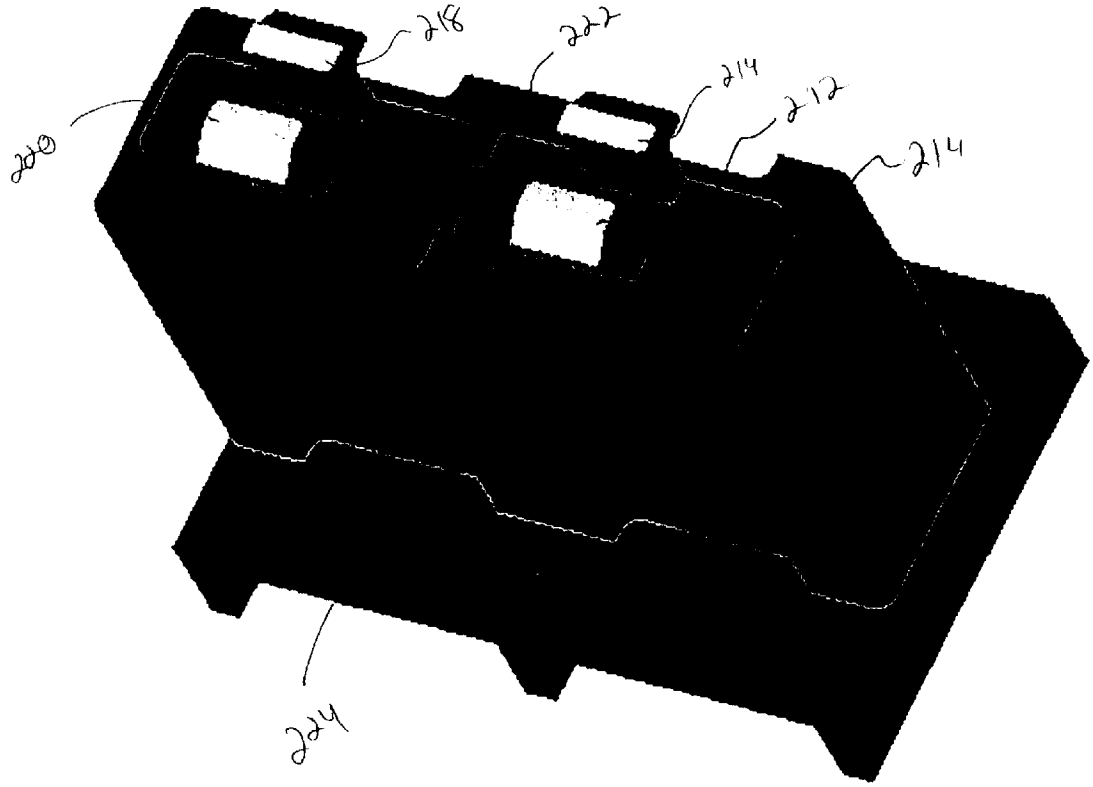


Fig. 58

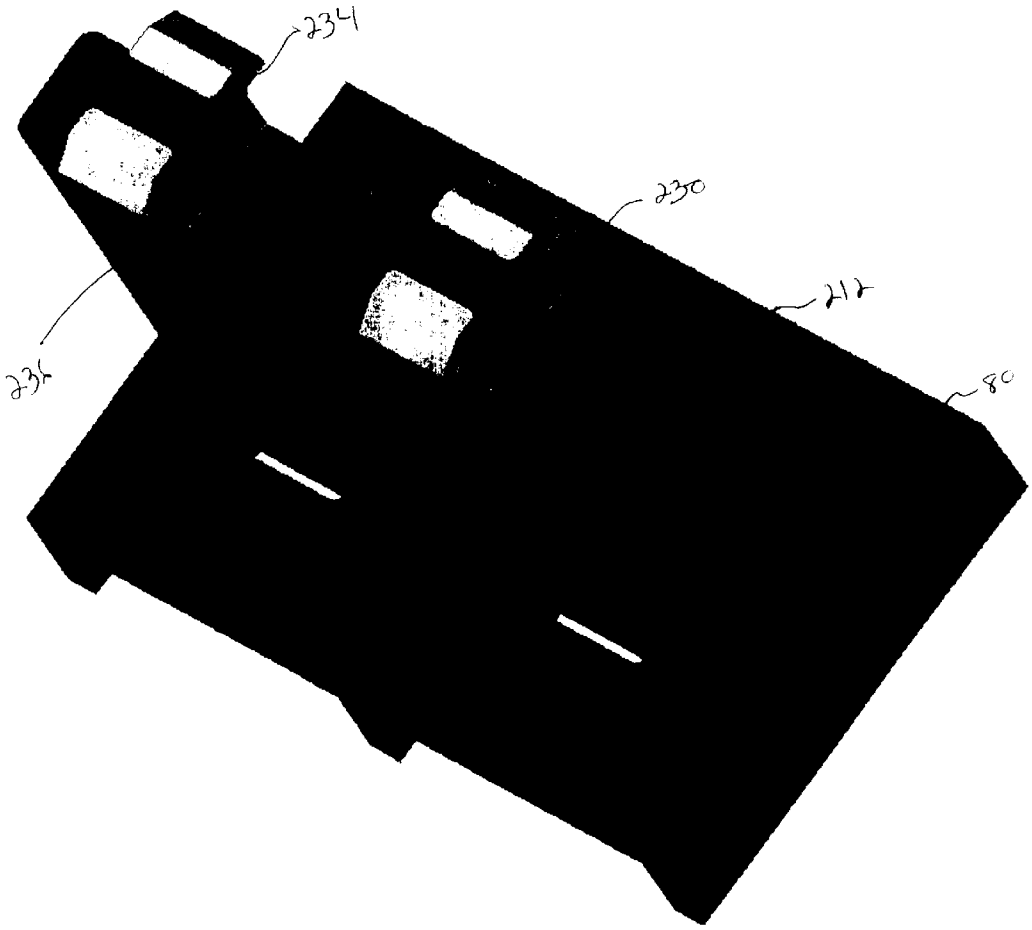


Fig 59

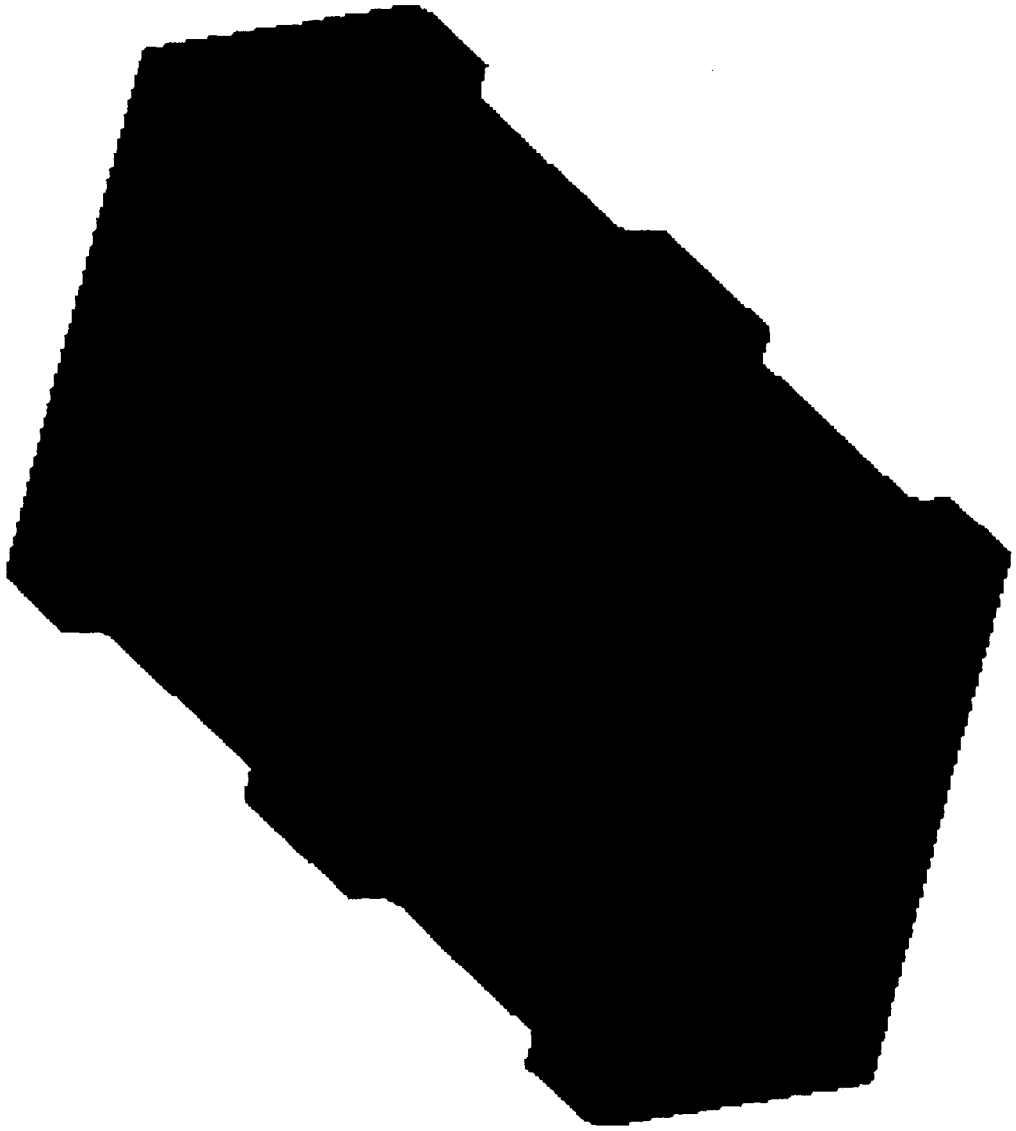


Fig. 66

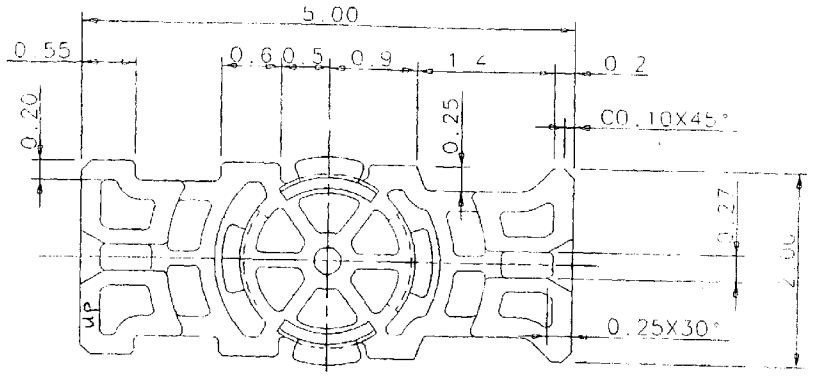


Fig 61

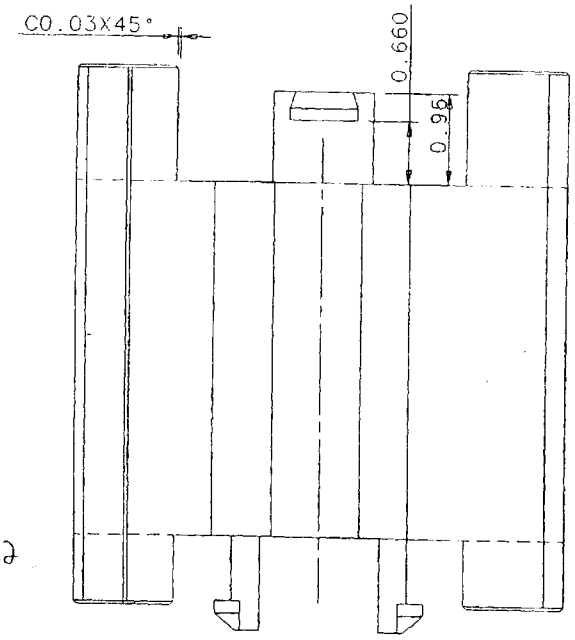


Fig 62

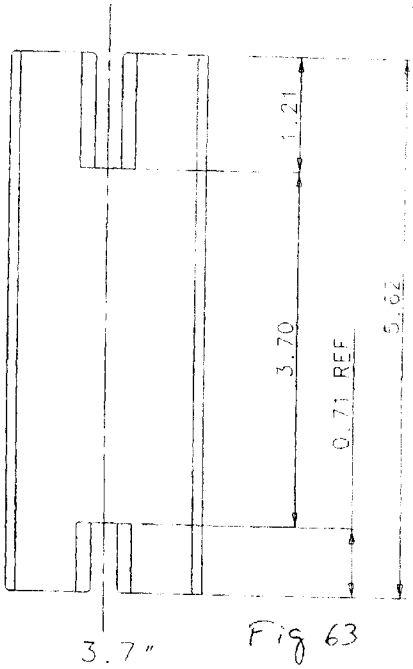


Fig 63

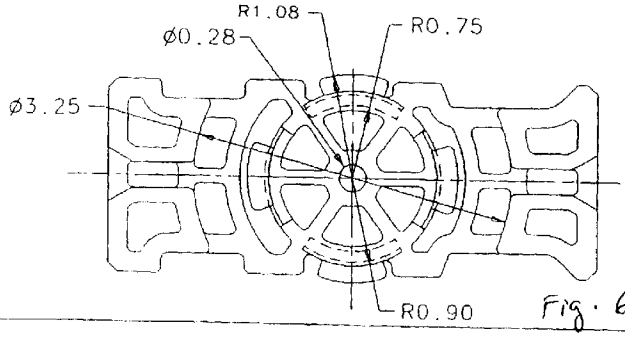


Fig. 64

3B

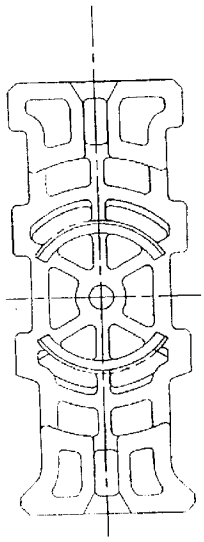


Fig. 65

Fig 66

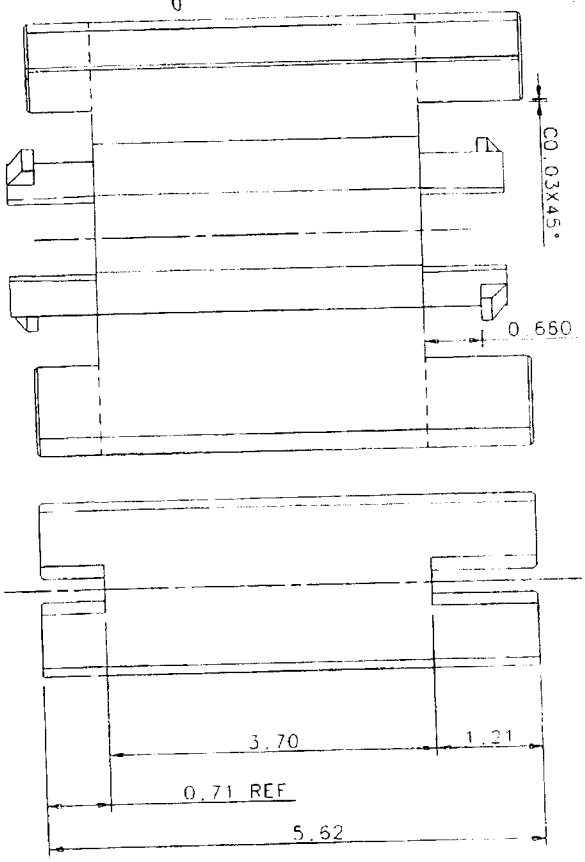


Fig. 67

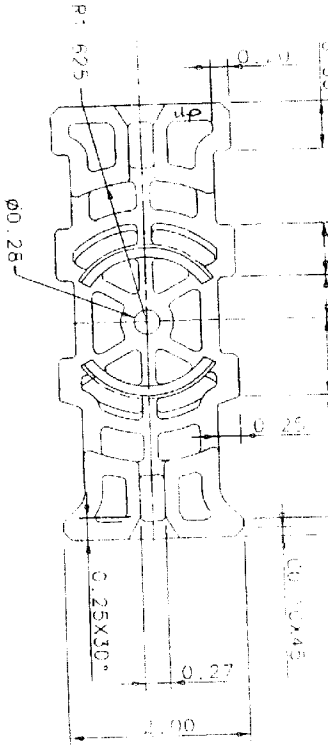


Fig 68

CENTRAL PALLET CONNECTOR OR POST FOR USE WITH GRABBER ARMS OF A FORKLIFT

RELATED APPLICATIONS

[0001] The present Application claims the benefit of U.S. Provisional Patent Application No. 60/382,007, filed on May 17, 2002.

TECHNICAL FIELD

[0002] The present invention is generally directed to a central pallet connector or post, positioned midway between two corner pallet connectors or posts along an edge of a plastic pallet, for connecting a top deck and a bottom deck or base of the pallet; and more particular, to a molded bolt-less central pallet connector or post configured to be gripped by the grabber arms of a forklift and also to an integrally formed central pallet connector or post similarly configured to be gripped by the grabber arms.

BACKGROUND OF THE INVENTION

[0003] A plastic pallet assembly is typically constructed to provide a top deck and a bottom deck, joined together by a plurality of connectors or columns. The connectors are typically located at the corners of the pallet, and for larger pallets, between the corners along the periphery of the pallet assembly (i.e., center connectors), and in the interior of the pallet assembly.

[0004] Plastic pallet assemblies are increasingly used to store and transport items instead of wood pallet assemblies. Such wood pallet assemblies were typical constructed as a top series of boards connected to two to three two-by-four wood beams, and a bottom series of boards connected to the wood beams.

[0005] Forklifts designed to transport items on wood pallet assemblies typically include two grabber arms positioned between the tines of the lift. The grabber arms were designed to grip the two-by-four wood beam centrally located in the pallet assembly between the tines. This would help stabilize the pallet assembly on the forklift, especially when a worker has to step onto the pallet to handle the products while it is high on the storage racks.

[0006] Conventional plastic pallet assemblies did not include connectors that were easily installed that were capable of being gripped by the grabber arms which are designed for wood pallets. Accordingly, such assemblies could not take advantage of the stabilizing influence of the grabber arms.

SUMMARY OF THE INVENTION

[0007] The present invention provides a center connector or post for connecting a top deck and a bottom deck of a pallet assembly, especially a plastic pallet assembly. The connector is sized to allow a first grabber arm and a second grabber arm positioned between a first tine and a second tine of a forklift to engage and hold the pallet connector. The pallet connector has a first side, an opposing second side, a first end, an opposing second end, and a top surface and a bottom surface. A first top flange extends from the top surface of the connector for snap-fittingly connecting the pallet connector to a top deck of a pallet assembly; and, a first bottom flange extending from the bottom surface for snap-fittingly connecting the pallet connector to a bottom deck of a pallet assembly. More than one top or bottom flanges (hooks) can be used to secure the connector to the top deck or base.

[0008] The connector is preferably a one piece molded plastic having a plurality of ribs. The ribs may either extend outward from the sides of the connector, or upward and downward from the top or bottom of the connector.

[0009] The connector may further include a first brace member extending from the top surface and a second opposing brace member extending from the top surface spaced apart from the first brace member a sufficient distance to allow a first rib portion extending downwardly from a bottom surface of the top deck to fit between the first brace member and the second brace member. The first and second brace members are positioned proximate the first end of the pallet connector and the pallet connector further comprises a third brace member extending from the top surface proximate the second end of the pallet connector and an opposing fourth brace member extending from the top surface proximate the second end of the pallet connector spaced apart a sufficient distance from the third brace member to allow a second rib portion extending downwardly from the bottom surface of the top deck to fit between the third brace member and the fourth brace member. The bottom surface of the connector may also be provided with such braces.

[0010] The connector may further comprise a first platform portion extending from the first side proximate the bottom surface of the pallet connector, and a second platform portion extending from the second side proximate the bottom surface of the pallet connector.

[0011] The pallet connector preferably has a width from the first side to the second side of approximately two inches. Alternatively the width may be up to around five inches. The width will depend on the design of the grabber arms.

[0012] In an alternative embodiment, the invention is a pallet assembly comprising a top deck, a bottom deck, a pallet connector positioned at a perimeter of the pallet assembly midway between a first corner and a second corner, the pallet connector sized to allow a first grabber arm and a second grabber arm positioned between a first tine and a second tine of a forklift to engage and hold the pallet connector. The pallet connector has a first side, an opposing second side, a first end, an opposing second end, and having a top surface and a bottom surface, a first top flange extending from the top surface snap-fittingly connecting the pallet connector to the top deck of the pallet assembly and, a first bottom flange extending from the bottom surface snap-fittingly connecting the pallet connector to the bottom deck of the pallet assembly.

[0013] In yet another embodiment, the invention is a structure for connecting a top deck and bottom deck of a pallet assembly comprising a generally rectangular box shaped connector having a first side, an opposing second side, a first end and an opposing second end, a generally hollow interior portion having a plurality of internal ribs extending from an interior surface of the first side to an interior surface of the second side. The connector is sized to enable a first grabber arm and a second grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the connector and stabilize the pallet

assembly. The connector may be removable, or alternatively, integrally formed as a cover post or column of one of the top deck or bottom deck.

[0014] Another aspect of the invention is a pallet assembly comprising a first plastic deck having a generally rectangular planar portion and an integrally formed connector extending outwardly proximate a perimeter of the first deck midway between a first corner and a second corner, the connector having a generally rectangular box shape having a first side, an opposing second side, a first end and an opposing second end, a generally hollow interior portion having a plurality of internal ribs extending from an interior surface of the first side to an interior surface of the second side. The connector is sized to enable a first grabber arm and a second grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the connector and stabilize said pallet assembly. The assembly further includes a second plastic deck connected to the connector.

[0015] A further embodiment is a pallet assembly comprising a first plastic deck having a generally rectangular planar portion and an integrally formed first connector portion extending outwardly from said planar portion proximate a perimeter of said first deck midway between a first corner and a second corner, the first connector portion having a generally rectangular shape and, a second plastic deck connected to the first plastic deck. The second plastic deck having a generally rectangular planar portion and an integrally formed second connector portion extending outwardly from the second deck planar portion. The second connector portion has a generally rectangular shape slightly larger than the rectangular shape of said first connector portion. The second connector portion positioned to surround the first connector portion, and is sized to enable a first grabber arm and a second grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the second connector portion and stabilize the pallet assembly.

[0016] In yet another embodiment, a pallet assembly having a center connector configured to allow gripping by grabber arms of a forklift comprises a first plastic deck having an integrally formed center connector located proximate a periphery of the deck between a first corner and a second corner of the deck. The connector includes a first flange for snap-fittingly connecting the connector to a second deck. The connector has sidewalls forming an outer profile configured for gripping by grabber arms of a forklift.

[0017] Another embodiment of the invention is a plastic pallet assembly comprising a top deck having an integral downwardly projecting center post portion, and a bottom deck having an integral upwardly projecting post portion connected to the downwardly projecting post portion. The downwardly projecting center post portion and the upwardly projecting post portion form a center post of the pallet assembly. The center post is configured to enable grabber arms of a forklift to grip the center post.

[0018] Further aspects of the invention are disclosed in the detailed description of the preferred embodiment, the drawings and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] **FIG. 1** is a perspective view of a forklift being inserted into a pallet assembly;

[0020] **FIG. 2** is a partial perspective view of grabber arms of a forklift engaging a center connector piece;

[0021] **FIG. 3** is a perspective view of center connector for a plastic pallet;

[0022] **FIG. 4** is a top plan view of the connector of **FIG. 3**;

[0023] **FIG. 5** is a cross-sectional view of the connector of **FIG. 2** attached to a top and bottom deck of a pallet assembly;

[0024] **FIG. 6** is a perspective view of another center connector between a partial view of a top deck and a bottom deck of a pallet assembly;

[0025] **FIG. 7** is a perspective view of the connector of **FIG. 6** without the top deck, bottom deck, and securing bolt;

[0026] **FIG. 8** is a top plan view of the connector of **FIG. 7** between the grabber arms of one type of a forklift;

[0027] **FIG. 9** is a top plan view of the connector of **FIG. 7** between the grabber arms of a second type of forklift;

[0028] **FIG. 10** is a perspective view of center connector;

[0029] **FIG. 11** is a top plan view of the connector of **FIG. 10**;

[0030] **FIG. 12** is plan view of an end of the connector of **FIG. 10**;

[0031] **FIG. 13** is plan view of a side of the connector of **FIG. 10**;

[0032] **FIG. 14** is a cross-sectional view of the connector of **FIG. 11** taken along the lines **14-14**;

[0033] **FIG. 15** is a perspective view of another center connector;

[0034] **FIG. 16** is a top plan view of the connector of **FIG. 15**;

[0035] **FIG. 17** is a side plan view of the connector of **FIG. 15**;

[0036] **FIG. 18** is a top plan view of the connector of **FIG. 15** between one type of grabber arms of a forklift;

[0037] **FIG. 19** is a top plan view of the connector of **FIG. 15** between another type of grabber arms of a forklift;

[0038] **FIG. 20** is a top plan view of another center connector;

[0039] **FIG. 21** is a perspective view of the connector of **FIG. 20**;

[0040] **FIG. 22** is a side plan view of the connector of **FIG. 21**;

[0041] **FIG. 23** is a top plan view of the connector of **FIG. 20** between one type of grabber arms of a forklift;

[0042] **FIG. 24** is a top plan view of the connector of **FIG. 20** between another type of grabber arms of a forklift;

[0043] **FIG. 25** is a top plan view of another center connector;

[0044] **FIG. 26** is a perspective view of the connector of **FIG. 25**;

[0045] **FIG. 27** is a side plan view of the connector of **FIG. 26**;

[0046] **FIG. 28** is a top plan view of the connector of **FIG. 25** between one type of grabber arms of a forklift;

[0047] **FIG. 29** is a top plan view of the connector of **FIG. 25** between another type of grabber arms of a forklift;

[0048] **FIG. 30** is a perspective view of a center connector;

[0049] **FIG. 31** is a plan view of an end of the center connector of **FIG. 30**;

[0050] **FIG. 32** is a top plan view of the connector of **FIG. 30**;

[0051] **FIG. 33** is a bottom plan view of the connector of **FIG. 30**;

[0052] **FIG. 34** is a side plan view of the connector of **FIG. 30**;

[0053] **FIG. 35** is a perspective view of the connector of **FIG. 30** connected to a bottom deck of a pallet assembly;

[0054] **FIG. 36** is a perspective side view of the connector of **FIG. 30** connected to the bottom deck and top deck of a pallet assembly;

[0055] **FIG. 37** is a top plan view of the grabber arms of a on type of forklift;

[0056] **FIG. 38** is a top plan view of the grabber arms of another type of forklift;

[0057] **FIG. 39** is a top plan view of the grabber arms of another type of forklift;

[0058] **FIG. 40** is a perspective view of a center connector in a pallet assembly;

[0059] **FIG. 41** is a partial perspective view of the connector of **FIG. 40** without the top deck of the pallet assembly;

[0060] **FIG. 42** is a partial perspective view of a portion of a center connector attached to a top deck of a pallet assembly;

[0061] **FIG. 43** is a partial perspective view of a portion of a center connector attached to a bottom deck of a pallet assembly;

[0062] **FIG. 44** is a perspective view of a center connector having a first portion integral with a top deck and a second portion integral with a bottom deck of a pallet assembly;

[0063] **FIG. 45** is an exploded perspective view of the assembly of **FIG. 44**;

[0064] **FIG. 46** is a top plan view of another connector;

[0065] **FIG. 47** is partial perspective view of a center connector between a top deck and a bottom deck of a pallet assembly;

[0066] **FIG. 48** is a partial perspective partially exploded view of the pallet assembly of **FIG. 47**;

[0067] **FIG. 49** is a perspective view of the connector of **FIG. 48** only connected to a bottom deck;

[0068] **FIG. 50** is another perspective view of the connector and bottom deck of **FIG. 49**;

[0069] **FIG. 51** is a partial perspective view of the top deck of **FIG. 47**;

[0070] **FIG. 52** is a partial perspective view of the top deck of **FIG. 51** with the top surface of the top deck removed to show ribbing in the top deck;

[0071] **FIG. 53** is a partial perspective view of the pallet assembly of **FIG. 47** with the top surface of the top deck removed to show the engagement of the ribbing of the top deck with structure in the connector;

[0072] **FIG. 54** is a partial perspective view of center connector with a top deck and a bottom deck of a pallet assembly;

[0073] **FIG. 55** is a partial perspective partially exploded view of the pallet assembly of **FIG. 54**;

[0074] **FIG. 56** is another partial perspective partially exploded view of the pallet assembly of **FIG. 54**;

[0075] **FIG. 57** is a partial perspective view of the connector and top deck of the pallet assembly of **FIG. 54**;

[0076] **FIG. 58** is a partial perspective view of the connector and the bottom deck of the pallet assembly of **FIG. 54**;

[0077] **FIG. 59** is a partial perspective view of the connector and the bottom deck of the pallet assembly of **FIG. 54** with the sleeve removed;

[0078] **FIG. 60** is a perspective view of the sleeve shown in **FIG. 54**; and,

[0079] FIGS. **61-68** are various views of another center connector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0080] While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

[0081] A plastic pallet assembly **10** typically includes three major components: a generally rectangular or square bottom deck or base **12**; a generally rectangular or square top deck **14**, and a plurality of columns or connectors **16** connecting the bottom deck **12** to the top deck **14**. The connectors **16** are typically placed in the corners **18** of the assembly **10**. Additionally, for larger pallet assemblies, connectors **16** are placed along the perimeter of the assembly midway between the comers **18**, and sometimes in the interior of the assembly (i.e., the center of the pallet assembly). As shown in **FIG. 1**, the connectors **16** are spaced so as to allow the first and second tines **20**, **22** of a forklift **24** to be inserted into channels created between the connectors **16** to allow the forklift **24** to lift the pallet assembly (and the contents placed on the assembly).

[0082] In addition to the first and second tines, certain forklifts also include first and a second grabber arms **26, 28** positioned between the first and second tines **20, 22**. The grabber arms are able to grip a two-by-four wood beam, and are particularly useful for preventing the pallet from slipping away, especially when a worker is standing on the top of the pallet to handle products high on a storage rack. Such pallets typically were constructed of a plurality of boards forming a top deck connected to a plurality of boards forming a bottom deck or base by three or more two-by-four beams. The grabber arms could engage and hold onto a center beam. This would stabilize and secure the pallet.

[0083] For plastic pallets, the central post or connector is conventionally designed with a wide body for strength and general purposes. For example, a typical 40"×48" plastic pallet would have a central post or connector with a width of 6" to 8". Plastic pallets are usually made of commodity plastic material such as High Density Polyethylene and Polypropylene which are not as strong as higher grades of plastics. Plastic pallets also need to be constructed with generally uniform and thin walls. They normally can not have a thick wall like a two by four wood board because: (1) a thick wall will greatly prolong the molding process hence the cost; and (2) a thick wall will have void and sink marks unless otherwise dealt with. The wall thickness on a conventional plastic pallet is usually between ⅛" to ⅜". Challenges therefore exist for a center post, most likely a narrow one such as less than 2", being a part of a plastic pallet, made of plastic with fairly uniform and thin walls, being strong enough to endure the tough grabbing and twisting of the metal grabber arms which often have teeth, withstanding concentrated load, yet economical enough so as not to increase the total cost of the plastic pallet significantly.

[0084] One economical way of making a plastic pallet with such a center post is to make the post being a removable part. Therefore, the post and the rest of the plastic pallet can be made with two different materials and different processes. Such removable posts or connectors on a plastic pallet are covered by patents by Pigott, et al., under U.S. Pat. No. 4,843,976, U.S. Pat. No. 5,197,395, U.S. Pat. No. 5,579,686, U.S. DES. Pat. No. 398,731; CANADA 1,330,958; AUSTRALIA 650,837, EPO 0,583,796, EPO 0,796,203 etc. Improvements are made in designing a center post or connector suitable for the grabber arms on the forklifts.

[0085] One attempt to take advantage of the use of the grabber arms for plastic pallets is shown in FIGS. **3-5**. These Figures disclose a solid plastic connector **30** having a generally rectangular block **32** positioned within a groove **34** of a platform piece **36**. The block **32** and platform piece **36** were secured to the top and bottom decks **14, 12** of a plastic pallet assembly by a metal bolt **38**. A hole **40** was provided in the block **32**, which matched a hole **42** in the platform piece **36** to accommodate the bolt **38**. The block **32** was sized to resemble a two-by-four wood beam and functioned in a similar manner to the wood beam to allow the grabber arms **26** and **28** to engage the connector **30** and assist in lifting and stabilizing the pallet assembly.

[0086] Another attempt of providing a center connector sized to allow the grabber arms to engage the connector is shown in FIGS. **6-29**. The connector **44** is also formed from a solid block of plastic. The connector **44** includes recesses **46** in the side wall to allow the grabber arms, or extensions from the grabber arms, to obtain a secure grip on the connector **44**. The connector also includes braces **48** extending upwardly from the top surface of the connector and downwardly from the bottom surface of the connector. The braces engage and hold onto rib portions in the top deck and bottom deck, respectively, to provide a more secure pallet assembly to inhibit twisting of the center post or connector **44** by the grabber arms with respect to the top deck and the bottom deck.

[0087] Both of these designs were formed from solid blocks of plastic machined to the appropriate dimensions. Additionally, both designs utilize bolts to secure the connectors to the top and bottom decks of a pallet assembly.

[0088] As shown in FIGS. **30-34** a further improved connector is in the form of a molded plastic connector **50**. The connector **50** includes a first side **52**, an opposing second side **54**, a first end **56** and an opposing second end **58**. The connector **50** further includes a top surface **60** and a bottom surface **61** (the bottom surface is shown in the bottom plan view of **FIG. 33**). The top surface **60** further includes an integrally formed, flexible first flange **62** having a hook **64** and an integrally formed, flexible second flange **66** having a hook **68** extending upwardly from the top surface **60**. The first and second flanges **62, 66** engage abutments in a top deck **78** of a plastic pallet assembly and are used to connect the connector **50** to a top deck. Similarly, the bottom surface includes an integrally formed, flexible first flange **70** having a hook **72**, and an integrally formed second flange **74** having a hook **76** extending downwardly from the bottom surface **61**. The first and second flanges **70, 74** extending from the bottom surface **61** engage abutments **79** in a bottom deck of a plastic pallet assembly and connect the connector **50** to the bottom deck **80**. A connector **50** connecting a top and bottom deck of a plastic pallet assembly is shown in **FIG. 36**. **FIG. 35** shows the connection of the connector **50** to the bottom deck **80**. The abutment **79** in the bottom deck is similar to the abutment in the top deck (not shown).

[0089] The top surface **60** of the connector **50** further includes a first brace **82** extending upwardly from the top surface **60**, and an opposing second brace **82** also extending upwardly from the top surface **60**. The first and second braces are separated by a channel **86**, and are preferably positioned proximate the first end **56** of the connector **50**. The top surface also includes a third brace **88**, and an opposing fourth brace **90** separated by a channel **92**, extending proximate the second **58** of the connector **50**. The braces are designed to engage or surround rib portions on the lower surface of the top deck **78** to inhibit twisting of the center post or connector **50** by the grabber arms with respect to the top deck **78** and the bottom deck **80** of the pallet assembly. Similarly, the bottom surface **61** includes a first brace **94**, an opposing second brace **96** separated from the first brace **94** by a channel **98** extending downwardly from the bottom surface proximate the first end **56** of the connector **50**, and a third brace **100**, an opposing fourth brace **102** separated from the third brace **100** by a channel **104** extending downwardly from the bottom surface **61** proximate the second end **58** of the connector **50**. The braces extending from the lower surface **61** engage or surround portions of ribs extending upwardly from the top surface of the bottom deck **80**, and similarly help prevent twisting of the center connector **50**.

[0090] The connector **50** shown in FIGS. **30-36** includes strengthening ribs **106** extending outward from a central portion toward the first side **52** and the second side **54** of the connector **50**. Alternatively, the connector **50** can be molded top to bottom and have ribs extend up and down from a central portion.

[0091] The connector **50** also includes a first platform portion **106** generally extending outward from the first side **52** proximate the lower surface **61**, and a second platform portion **108** generally extending outward from the second side **54** proximate the lower surface **61**. The first and second platform portions are preferably in the shape of the outline of prior connectors (such as that shown in **FIG. 11** of U.S. Pat. No. 5,579,686). The platform portions **106, 108** thus fit into abutments or other structure in the bottom deck designed to hold such prior connectors, and provide further support for the connector. The connector **50** of the present invention does not necessarily have to include the platform portions.

[0092] The connector **50** has a generally rectangular shape and is sized to enable the grabber arms of a forklift to engage and hold the connector **50**. Preferably the connector **50** has a width of approximately two inches (to resemble a two-by-four wood beam). However, the width can be modified to accommodate the space between the grabber arms of different designs.

[0093] Additionally, the connector can be provided with recesses in one or both of the first side **52** and the second side **54** to accommodate features on or extending from the grabber arms to facilitate a secure grip by such arms.

[0094] Specifically, FIGS. **37-39** disclose various grabber arm configurations and extensions. Referring to **FIG. 38, a** forklift **110** includes a first grabber arm **112** and an opposing second grabber arm **114** disposed between a first tine **116** and a second tine **118**. The first grabber arm includes a contacting member in the form of a projection or teeth **120** at a distal end of the arm **112**. Similarly, the second grabber arm **114** also includes a projection or teeth **122** at a distal end of the arm **114**. To accommodate this configuration, the connector **50** can be provided with recesses **126** on the first and second sides **52, 54** sized to accept and hold the projections **120, 122**. Preferably, each side **52, 54** of the connector **50** includes two such recesses so that it does not matter which end **52, 54** is placed proximate the perimeter of the assembly to allow for ease in installation.

[0095] Referring to **FIG. 37**, the forklift **110** includes a first grabber arm **120** having a half moon flange **124** extending from the side of the arm **112**. The half moon flange can be spring loaded and biased outwardly to place pressure on objects between the first and second grabber arms **112, 114**. The connector **60** can be provided with a recess sized to accept and hold the flange **24** to provide a more secure grip on the connector **50**.

[0096] Referring to **FIG. 39**, the forklift includes a first grabber arm **112** with a flange or cam **126**, and a second grabber arm **114** with a flange or cam **128**. Again, the connector **50** can be provided with appropriately sized recesses to provide for a more secure grip from the grabber arms.

[0097] The embodiment described in FIGS. **30-36** provides several advantages over the solid block plastic pallet center pallet connectors. By providing integral flange connection pieces, the connector **50** can be snap-fitted to the bottom and top decks. This allows for greater speed and flexibility in installation. Additionally, such connectors are less costly because no bolt is required (which also reduces the number of parts that must be kept tracked of) and less plastic is used in the molded pieces. It also facilitates recycling of the plastic pallets without metal parts involved. Moreover, molding is less costly than machining the plastic block connectors.

[0098] In another embodiment, another central connector **130** is shown in FIGS. **40-42**. The connector is a generally block shaped piece having a first side **132**, an opposing second side **134**, a first end **136**, and an opposing second end **132**. Again, the connector is sized to allow the grabber arms (and any extensions thereof) to grip and hold the connector **130** when utilized with a forklift lifting a pallet assembly including such connectors **130**.

[0099] Referring to **FIG. 42**, the connector **130** is shown as part of a top deck **78** of a pallet assembly. The connector is generally hollow and includes a plurality of supporting and strengthening ribs **140** extending from one side of the interior of the connector **130** to the other. Rectangular shaped compartments **142** are formed between the ribs **140**. The connector includes a scalloped outer surface **144** for obtaining a better grip on the connector **130** by the grabber arms.

[0100] A plurality of cross-ribbed supports **146** are shown as part of the bottom deck of a pallet assembly in **FIG. 43**. These supports **146** are positioned within the compartments **142** of the connector **130** as shown in **FIG. 41**, and provide additional support against the compressive forces of the grabber arms. By separating the center connector into two portions, an outside shell and an inside support, they can be molded with fairly uniform and thin walls, also with relatively larger spaces between the ribs which are better for molding purposes. Yet, after assembly, they form a very strong structure by inserting one into another so as to provide support to the side wall with reduced spaces. Bonding means such as adhesives, snap-fitting, bonding, fastening or welding can be used to join the two parts together.

[0101] The connector **130** and supports (if utilized) **146** can also be separately molded plastic pieces that are subsequently connected to the bottom and top decks of a pallet assembly by bonding means such as adhesives or welding. Additionally, the connector **130** can also include flanges extending from the top and bottom of the connector **130** for snap-fittingly connecting the connector to the decks. In another embodiment, a separate sleeve **148** can be placed around the outside of the connector **130** to provide additional wear resistance and support. The sleeve can be the same material as the base plastic pallet. However, the sleeve is preferably made from a different material that is tougher and more durable than the typical plastic pallet material, such as some of the engineering thermoplastic resins, rubber, or metal. The sleeve can be made with an extrusion process that is more economical than the molding processes used to create the top and bottom decks of the pallet assembly. A separate sleeve over an inner post is the second way of making the grab-on post with a different material and a

different process than the pallet main body itself. Alternatively, the sleeve can be made in multiple pieces and served as side covers that join the center post. For instance, two separate covers can be snapped from the sides onto the center post which can be provided with recesses for the snap-on hooks. The benefit for this embodiment is that the covers can be replaced after wearing and tearing without dismantling the pallet or the center post. Other methods of bonding such as welding, fastening, adhesion and inserting can be used.

[0102] In another embodiment, the center grab-on post is designed for a welded plastic pallet in which the pallet has a deck made of two parts, an upper deck and a lower deck, and a base. All three parts are welded together at a common welding line. The central connector is in the form of an integrally formed post extending from one of the top deck or the bottom deck of the pallet assembly, and an integrally formed sleeve extending from the other deck. An integrally formed post can extend upward from a bottom deck of a pallet assembly. The post is welded to a portion of an upper deck. A plurality of ribs or cross-ribs can extend across the interior of the post to provide additional strength and support. The top deck can further include an integrally formed sleeve extending downward. The sleeve can be aligned with and positioned to cover the post. The sleeve can be sized to allow the grabber arms of a forklift to engage and hold the connector. The distal end (i.e., from the top deck) of the sleeve can be configured to fit into a well formed in the bottom deck.

[0103] Another embodiment of a center connector configured to be held by the grabber arms of a forklift is shown in FIGS. **47-53**. **FIG. 47** shows the connector **170** between partial cut-outs of a top deck **78** and a bottom deck **80**. In this embodiment, the connector **170** is integrally formed (i.e., molded) with the bottom deck **80** and is preferably snap-fittingly secured to the top deck **78**. However, this arrangement may be reversed and the connector can be integrally formed with the top deck **78** and then snap-fittingly secured to the bottom deck.

[0104] The connector **170** includes a main body **172** configured in a generally rectangular block shape adapted to be held by the grabber arms of a forklift. As shown in **FIG. 48**, the top of the connector **170** includes a first and a second flange or hook **174** and **176** for snap-fittingly connecting the connector **170** to the top deck **78**. The flanges **174, 176** fit into slots **178, 180** in the top deck **78**. Each slot **178, 180** includes a seat **182, 184** (also shown in **FIGS. 51 and 52**) for engaging a projection **186, 188** on the flanges **174, 176**. A well **189, 191** is provided for each flange **174, 176** to allow for a mold piece to form the undercut portion of the projections **186, 188**.

[0105] The top of the connector **170** also includes a first and second brace **190, 192** positioned proximate a first end **194** of the connector **170**, and a third and fourth brace **196, 198** positioned proximate a second end **200** of the connector **170**. As shown in **FIG. 53**, the braces **190, 192, 196** and **198** fit between ribs **202** in the top deck **78** (the top surface of the top deck **78** is not shown in **FIG. 53** for clarity). The ribs **202** hold the braces in place and inhibit twisting of the connector **170** especially the hooks **174, 176** which are the weakest links about the decks **78, 80**.

[0106] Similar to some of the other embodiments, the sides of the body **172** of the connector **170** may include recesses **204** to facilitate gripping of the connector **170** by the grabber arms or extensions from the grabber arms.

[0107] FIGS. **54-60** show another embodiment of a center connector **210** integrally formed with a bottom deck **80** of a pallet assembly (again, the structure can be reversed, and the connector be integrally formed on the top deck). The connector **210** includes an integrally formed body **212** (i.e., with the bottom deck **80**—best shown in **FIG. 59**) surrounded by a protective sleeve **214**. The protective sleeve **214** can be made of a tougher plastic than the typical plastic used to form the bottom deck **80** and connector body **212**, and is replaceable when damaged or worn from use. The sleeve **214** is preferably made by an extrusion process; however, it may also be made by injection molding.

[0108] The body **212** of the connector includes a first well **213** and a second well **215**, connected by a bridge segment **217**. The top of the body **212** includes a first, second, third and fourth flange or hook **214, 216, 218** and **220** integrally formed with the body **212**. The flanges include projections **230, 232, 234** and **236** which fit into slots **238, 240, 242** and **244** of the top deck **78**, and abut seats **248, 250, 252** and **254**. Unlike the prior embodiments, the projections of the flanges are directed toward the sides **222** and **224** of the connector rather than the ends **226** and **228**. This is because the shape of the body **212** and the placement wells **213** and **215** inhibit positioning the flanges in other positions.

[0109] As shown in **FIG. 57**, the top deck **78** includes ribbing **256** configured to enclose and hold onto the outer edge of the top portion of the body **212** of the connector **210**. The sleeve **214** is not shown in the view of **FIG. 57** for clarity purposes only. The sleeve **214** should be formed to have a height which is slightly less than the height of the body **212** so the body **212** can be held and supported by the ribbing **256**. Alternatively, the sleeve **214** can be formed with the same height as the body **212**, and the ribbing **256** can be configured to enclose and hold onto the outer edge of the top portion of the sleeve **214**. In either case, the ribbing **256** inhibits twisting of the connector, especially the hooks, about the deck and the base of the pallet. The base of the pallet can also have a well for the sleeve to sit in. This provides additional support to the sleeve and the post against the twisting.

[0110] In an alternative design, the connectors **170** and **210** can be welded to the top deck rather than secured by the flanges.

[0111] In yet another embodiment shown in FIGS. **44-45**, the center post **280** is designed for a welded plastic pallet where the welding line is around the middle of the post. In this embodiment, a first half or portion **282** of the center post is formed as an integral part of the top deck **78**, and a second half or portion **282** of the center post is formed as an integral part of the base **80**. **FIG. 44** shows a portion of the pallet with a center post **280** designed for engagement by the grabber arms. **FIG. 45** shows an exploded view of the first and second halves **282, 284** of the center posts before welding. The end surfaces of the partial post are preferably mirror image to each other. They are preferably at the same planes as of the other posts so the welding plane is flat one. A hot plate welding can be used to weld the center and the other posts together. The pallet then becomes an integral

part. Other bonding processes can be utilized to join the pallet parts together as well. The interior of each portion **282, 284** may include support ribbing **286** or other support structure. Additionally, as described above with other embodiments, the sides of the center post may include recesses **288** to facilitate gripping by the grabber arms. An optional sleeve can also be used as described above.

[**0112**] The grab-on center connector or post of the present invention can be a separately-made part or parts. These separate parts can be joined to the main body of the pallet assembly through reversible processes such as snapping, fastening or non-reversible processes such as adhesion or welding. Additionally, the grab-on center post can have a separate sleeve or one or multiple side covers which can be joined to the center post by reversible processes such as snapping, inserting, fastening or non-reversible processes such as adhesion or welding. Alternatively, the grab-on center post can have an outer portion and an inner portion that are inserted into each other. Further, the grab-on center post can be an integral part of the deck and/or the base.

[**0113**] While specific embodiments have been illustrated and described, numerous modifications are possible without departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying claims.

I claim:

1. A center connector for a connecting a top deck and a bottom deck of a pallet assembly comprising:

a pallet connector sized to allow a first grabber arm positioned between a first tine and a second tine of a forklift to engage and hold the pallet connector, the pallet connector having a first side, an opposing second side, a first end, an opposing second end, and having a top surface and a bottom surface;

a first top flange extending from the top surface for snap-fittingly connecting the pallet connector to a top deck of a pallet assembly; and,

a first bottom flange extending from the bottom surface for snap-fittingly connecting the pallet connector to a bottom deck of a pallet assembly.

2. The connector of claim 1 wherein the connector is a one piece molded plastic having a plurality of ribs.

3. The connector of claim 2 wherein the plurality of ribs extend outward from a central portion of the pallet connector toward the first side and the second side of the pallet connector.

4. The connector of claim 2 wherein the plurality of ribs extend outward from a central portion of the pallet connector toward the top surface and the bottom surface of the pallet connector.

5. The connector of claim 1 wherein the pallet connector is sized to allow the first grabber arm and a second grabber arm positioned between a first tine and as second tine of the forklift to engage and hold the pallet connector.

6. The connector of claim 5 further comprising a first recess in the first side of the pallet connector and a second recess in the second side of the pallet connector, the first recess adapted to receive a contacting member of the first grabber arm, and the second recess adapted to receive a contacting member of the second grabber arm.

7. The connector of claim 1 further comprising a first recess in the first side of the pallet connector and a second recess in the second side of the pallet connector, the first recess adapted to receive a cam extending from the first grabber arm, and the second recess adapted to receive a cam extending from the second grabber arm.

8. The connector of claim 1 further comprising a prong at a distal end of the top flange.

9. The connector of claim 1 further comprising a second top flange extending from the top surface for snap-fittingly connecting the pallet connector to a top deck of a pallet assembly.

10. The connector of claim 1 further comprising a prong at a distal end of the bottom flange.

11. The connector of claim 1 further comprising a second bottom flange extending from the bottom surface for snap-fittingly connecting the pallet connector to a bottom deck of a pallet assembly.

12. The connector of claim 1 further comprising a first brace member extending from the top surface and a second opposing brace member extending from the top surface spaced apart from the first brace member a sufficient distance to allow a first rib portion extending downwardly from a bottom surface of the top deck to fit between the first brace member and the second brace member.

13. The connector of claim 12 wherein the first and second brace members are positioned proximate the first end of the pallet connector and the pallet connector further comprising a third brace member extending from the top surface proximate the second end of the pallet connector and an opposing fourth brace member extending from the top surface proximate the second end of the pallet connector spaced apart a sufficient distance from the third brace member to allow a second rib portion extending downwardly from the bottom surface of the top deck to fit between the third brace member and the fourth brace member.

14. The connector of claim 13 wherein the top flange is positioned between the first and second brace members and the third and fourth brace members.

15. The connector of claim 1 further comprising a first brace member extending from the bottom surface and a second opposing brace member extending from the bottom surface spaced apart from the first brace member a sufficient distance to allow a first rib portion extending upwardly from a top surface of the bottom deck to fit between the first brace member and the second brace member.

16. The connector of claim 15 wherein the first and second brace members are positioned proximate the first end of the pallet connector and the pallet connector further comprising a third brace member extending from the bottom surface proximate the second end of the pallet connector and an opposing fourth brace member extending from the bottom surface proximate the second end of the pallet connector spaced apart a sufficient distance from the third brace member to allow a second rib portion extending upwardly from the top surface of the bottom deck to fit between the third brace member and the fourth brace member.

17. The connector of claim 16 wherein the bottom flange is positioned between the first and second brace members and the third and fourth brace members.

18. The connector of claim 1 further comprising a recess in the first side of the pallet connector adapted to receive a flange extending from the first grabber arm.

19. The connector of claim 1 wherein the pallet connector has a width from the first side to the second side of approximately one to two inches.

20. The connector of claim 1 wherein the pallet connector has a width from the first side to the second side of approximately five inches.

21. A pallet assembly comprising:

a top deck;

a bottom deck:

a pallet connector positioned at a perimeter of the pallet assembly midway between a first corner and a second corner, the pallet connector sized to allow a first grabber arm positioned between a first tine and a second tine of a forklift to engage and hold the pallet connector, the pallet connector having a first side, an opposing second side, a first end, an opposing second end, and having a top surface and a bottom surface;

a first top flange extending from the top surface snap-fittingly connecting the pallet connector to the top deck of the pallet assembly; and,

a first bottom flange extending from the bottom surface snap-fittingly connecting the pallet connector to the bottom deck of the pallet assembly.

22. A structure for connecting a top deck and bottom deck of a pallet comprising:

a generally rectangular box shaped connector having a first side, an opposing second side, a first end and an opposing second end, a generally hollow interior portion having a plurality of internal ribs extending from an interior surface of the first side to an interior surface of the second side, the connector sized to enable a first grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the connector and stabilize the pallet assembly.

23. The structure of claim 22 wherein the connector is connected to a top deck of a pallet by one of snap fitting, bonding and fastening.

24. The structure of claim 22 wherein the internal ribs form open generally rectangular compartments.

25. The structure of claim 22 wherein the connector is a molded plastic.

26. The structure of claim 22 wherein the first side and the second side include a scalloped outer surface.

27. The structure of claim 22 further comprising an outer sleeve surrounding the first side, the second side, the first end and the second end.

28. The structure of claim 27 wherein the outer sleeve is formed from a material different from a material of the pallet.

29. The structure of claim 24 further comprising a plurality of cross-ribbed strengthening posts positioned in the plurality of generally rectangular compartments.

30. The structure of claim 22 wherein the connector is connected to a bottom deck of a pallet by one of snap fitting, bonding and fastening.

31. A pallet comprising:

a first plastic deck having a generally rectangular planar portion and an integrally formed connector extending outwardly proximate a perimeter of the first deck midway between a first corner and a second corner, the connector having a generally rectangular box shape having a first side, an opposing second side, a first end and an opposing second end, a generally hollow interior portion having a plurality of internal ribs extending from an interior surface of the first side to an interior surface of the second side, the connector sized to enable a first grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the connector and stabilize the pallet assembly, and,

a second plastic deck connected to the connector.

32. The pallet of claim 31 wherein the internal ribs form generally rectangular compartments in the connector, and further comprising a plurality of cross-ribbed posts integrally formed with and extending outwardly from the second deck, the posts positioned to be placed in the rectangular compartments.

33. A pallet assembly comprising:

a first plastic deck having a generally rectangular planar portion and an integrally formed first connector portion extending outwardly from the planar portion proximate a perimeter of the first deck midway between a first corner and a second corner; the first connector portion having a generally rectangular shape; and,

a second plastic deck connected to the first plastic deck, the second plastic deck having a generally rectangular planar portion and an integrally formed second connector portion extending outwardly from the second deck planar portion, the second connector portion having a generally rectangular shape slightly larger than the rectangular shape of the first connector portion, the second connector portion positioned to surround the first connector portion, the second connector portion sized to enable a first grabber arm positioned between a first tine and a second tine of a forklift mechanism to engage the second connector portion and stabilize the pallet assembly.

34. The pallet assembly of claim 33 further comprising a plurality of interior strengthening ribs in an interior portion of the first connector portion.

35. The pallet assembly of claim 33 wherein the second connector portion has a width of approximately one to two inches.

36. The pallet assembly of claim 33 wherein the first connector portion is one of welded, bonded and joined to the second deck.

37. The pallet assembly of claim 33 wherein a distal portion of the second connector portion fits within a well in the first deck.

38. The pallet assembly of claim 33 wherein the first connector portion has a recess in a first side wall, and the second connector portion having a corresponding recess in a first side wall, wherein the recess in the side wall of the second connector portion is adapted to accommodate a projection from the first grabber arm.

39. The pallet assembly of claim 33 wherein the first deck is a bottom deck of the pallet assembly.

40. A pallet assembly having a center connector configured to allow gripping by a grabber arm of a forklift comprising:

a first plastic deck having an integrally formed center connector located proximate a periphery of the deck between a first corner and a second corner of the deck, the connector is snap-fittingly connected to a second

deck, the connector having sidewalls forming an outer profile configured for gripping by a first grabber arm of a forklift.

41. The pallet assembly of claim 40 further comprising a sleeve surrounding the sidewalls.

42. The pallet assembly of claim 41 wherein the sleeve is a removable piece.

43. The pallet assembly of claim 41 wherein the sleeve is integrally formed as part of a second deck.

44. The pallet assembly of claim 40 further comprising a second deck connected to the connector by a first flange, the second deck including ribbing to engage a distal portion of the connector proximate the first flange to inhibit twisting of the second deck with respect to the first deck about the connector.

45. The pallet assembly of claim 40 further comprising a second flange for snap-fittingly connecting the connector to a second deck.

46. The pallet assembly of claim 40 wherein the connector includes a first brace and a second brace extending from a distal end of the connector.

47. The pallet assembly of claim 46 further comprising a third brace and a fourth brace extending from the top of the connector.

48. A plastic pallet assembly comprising:

a top deck having an integral downwardly projecting center post portion, and a bottom deck having an integral upwardly projecting post portion connected to the downwardly projecting post portion, the downwardly projecting center post portion and the upwardly projecting post portion forming a center post of the pallet assembly, the center post configured to enable grabber arms of a forklift to grip the center post.

49. The plastic pallet assembly of claim 48 wherein the center post includes recesses in side walls of the center post.

50. The plastic pallet assembly of claim 48 wherein the downwardly projecting portion and the upwardly projecting portion include matching ribs.

51. The connector of claim 5 further comprising a first recess in the first side of the pallet connector, the first recess adapted to receive a contacting member of the first grabber arm.

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