



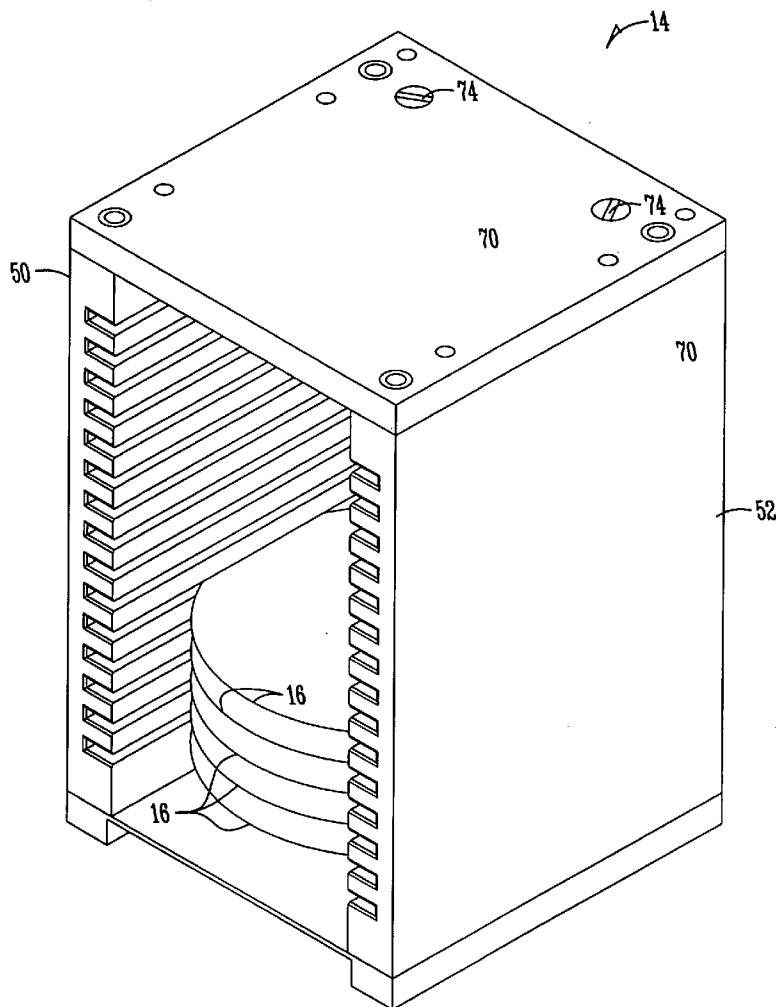
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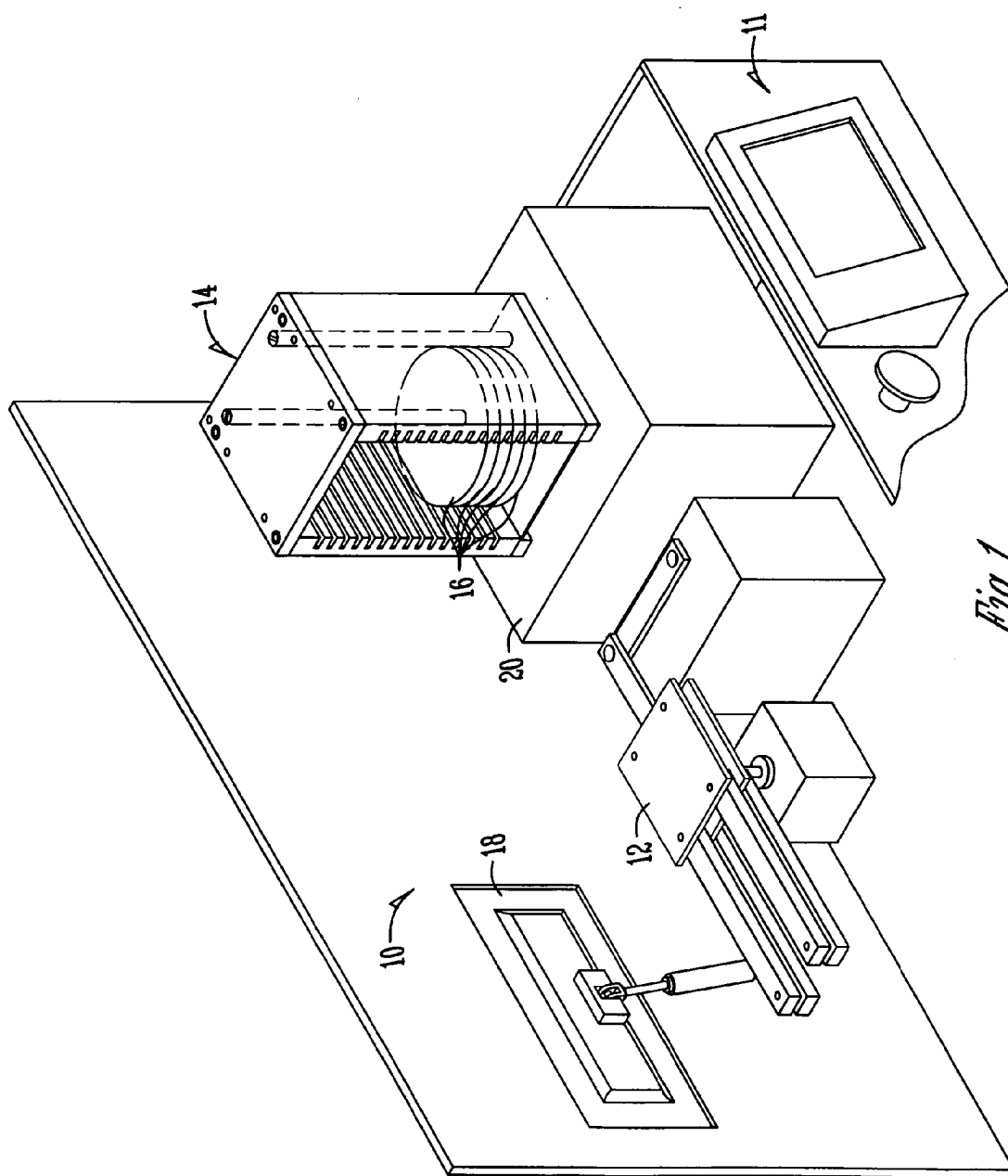
(19) **United States**(12) **Patent Application Publication**
Salzmann(10) **Pub. No.: US 2007/0062889 A1**(43) **Pub. Date: Mar. 22, 2007**(54) **UNIVERSAL CASSETTE**(52) **U.S. Cl. 211/41.18**(75) Inventor: **Jeffrey K. Salzmann**, Lancaster, NY
(US)(57) **ABSTRACT**

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MCKEE, VOORHEES & SEASE, P.L.C.**801 GRAND AVENUE****SUITE 3200****DES MOINES, IA 50309-2721 (US)**(73) Assignee: **VISHAY THIN FILM, INC.**, Niagra
Falls, NY (US)(21) Appl. No.: **11/229,875**(22) Filed: **Sep. 19, 2005****Publication Classification**(51) **Int. Cl.**
A47G 19/08 (2006.01)

A cassette assembly for holding circular and non-circular disks is provided. A cassette body has a top wall, a bottom wall, opposite side walls, and an open front, creating an inside and outside of the cassette body. The side walls have grooves adapted to receive and hold the disk. One or more first stops are provided inside the cassette body adjacent the grooves for stopping non-circular disks at a location in the grooves as the non-circular disks are placed in the grooves from the front. Additionally, one or more removable second stops inside the cassette body are spaced inwardly from the first stops for stopping the circular disks at the location in the groove as the circular disks are placed in the grooves from the front, so that the geometric center of the circular disk approximately aligns with the geometric center of the non-circular disk.





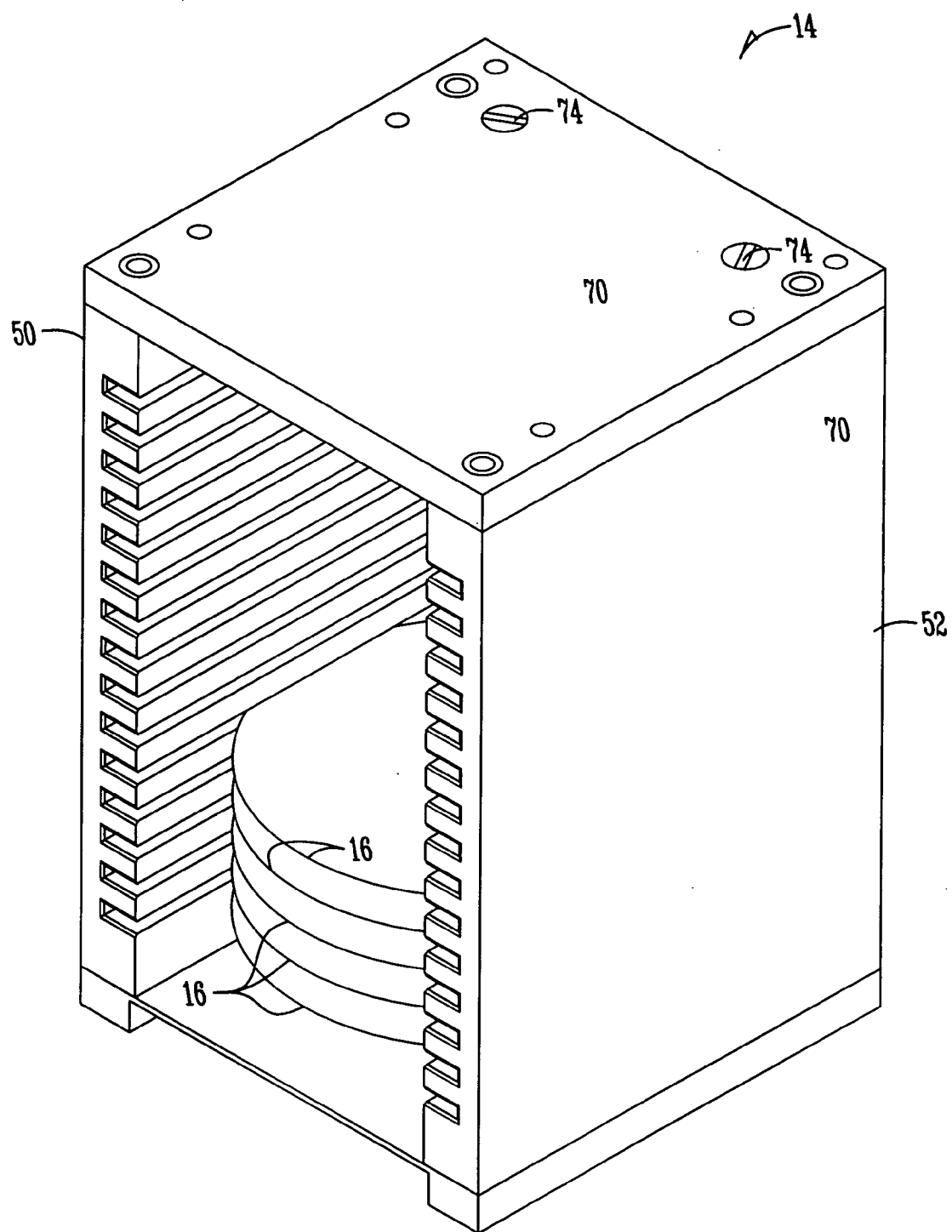


Fig. 2

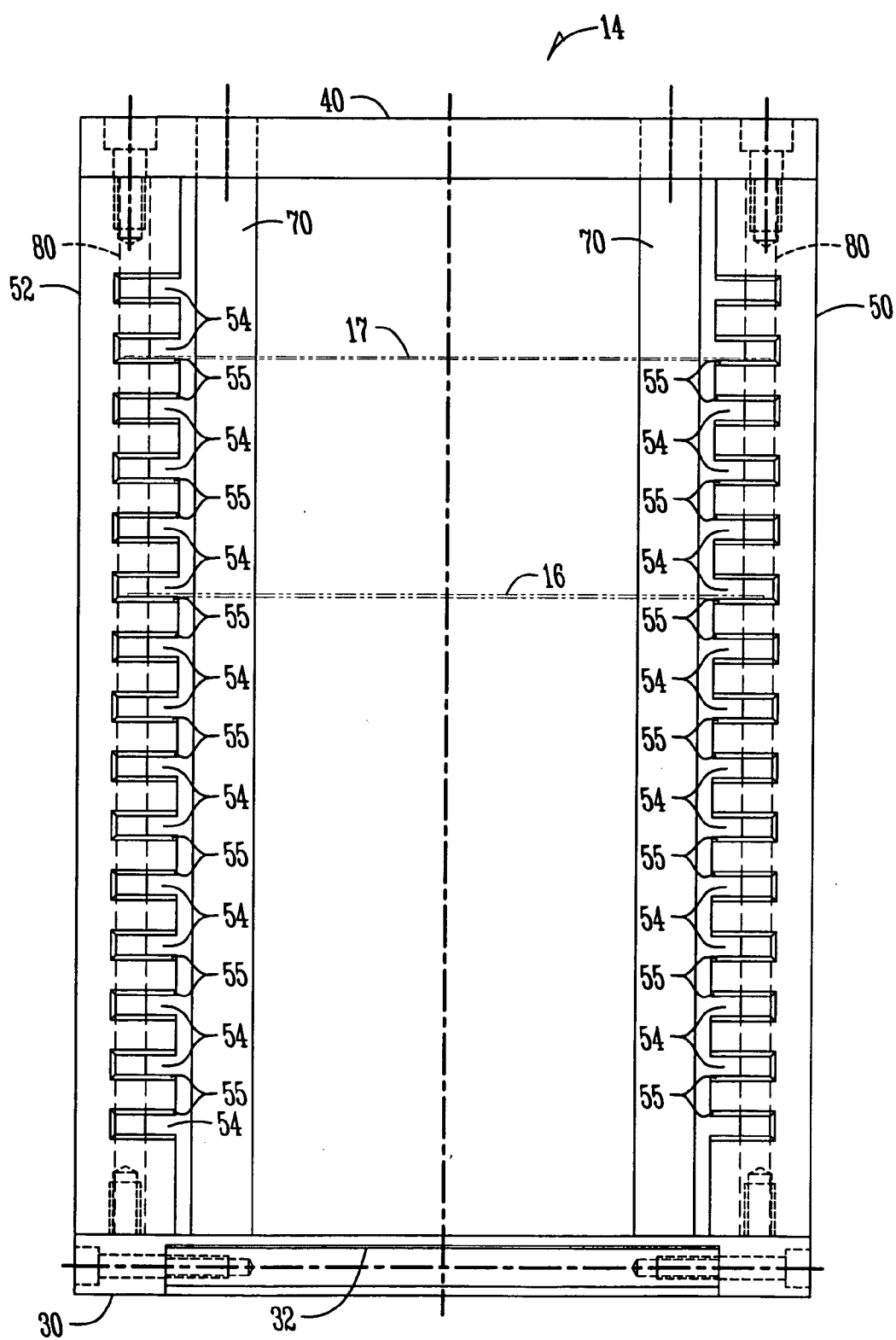


Fig. 3A

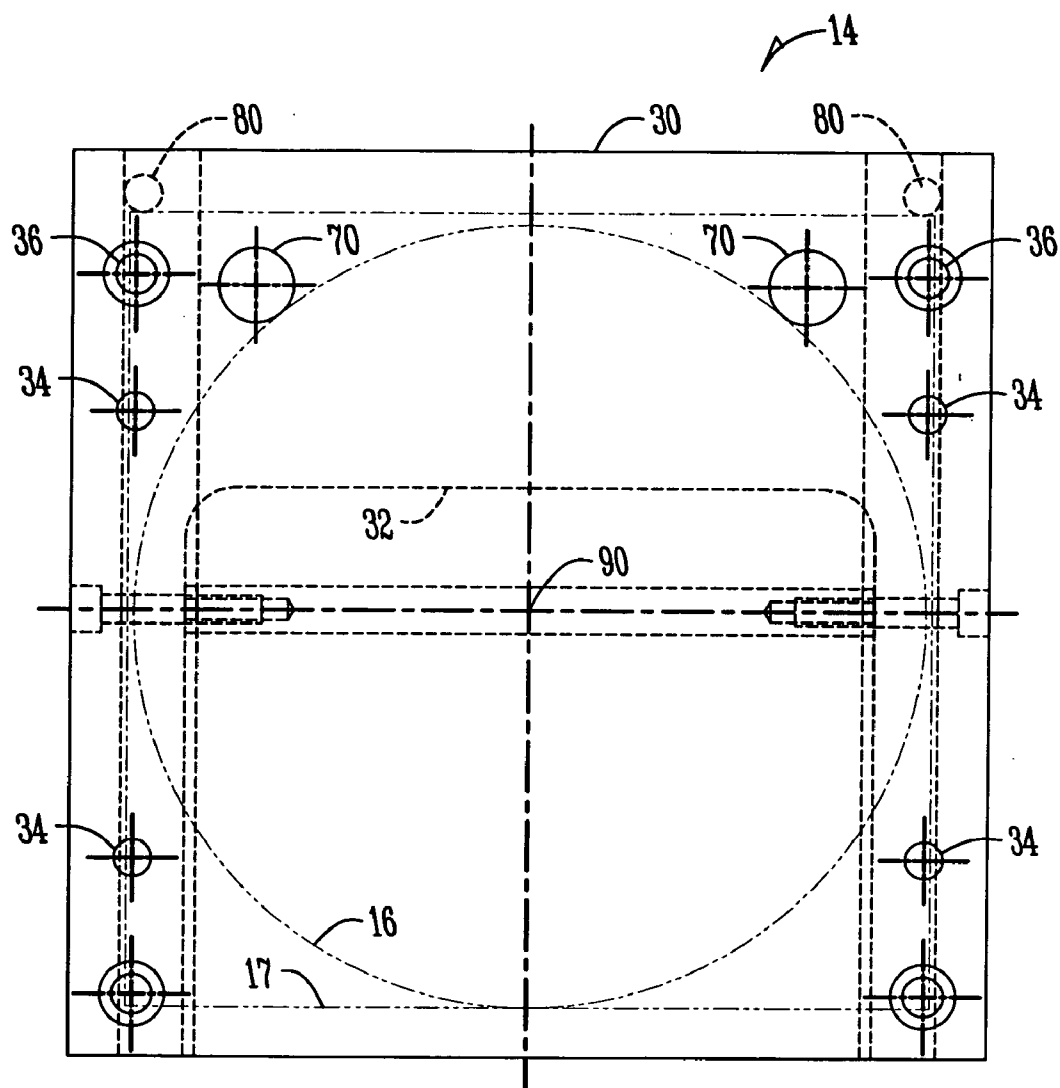


Fig. 3B

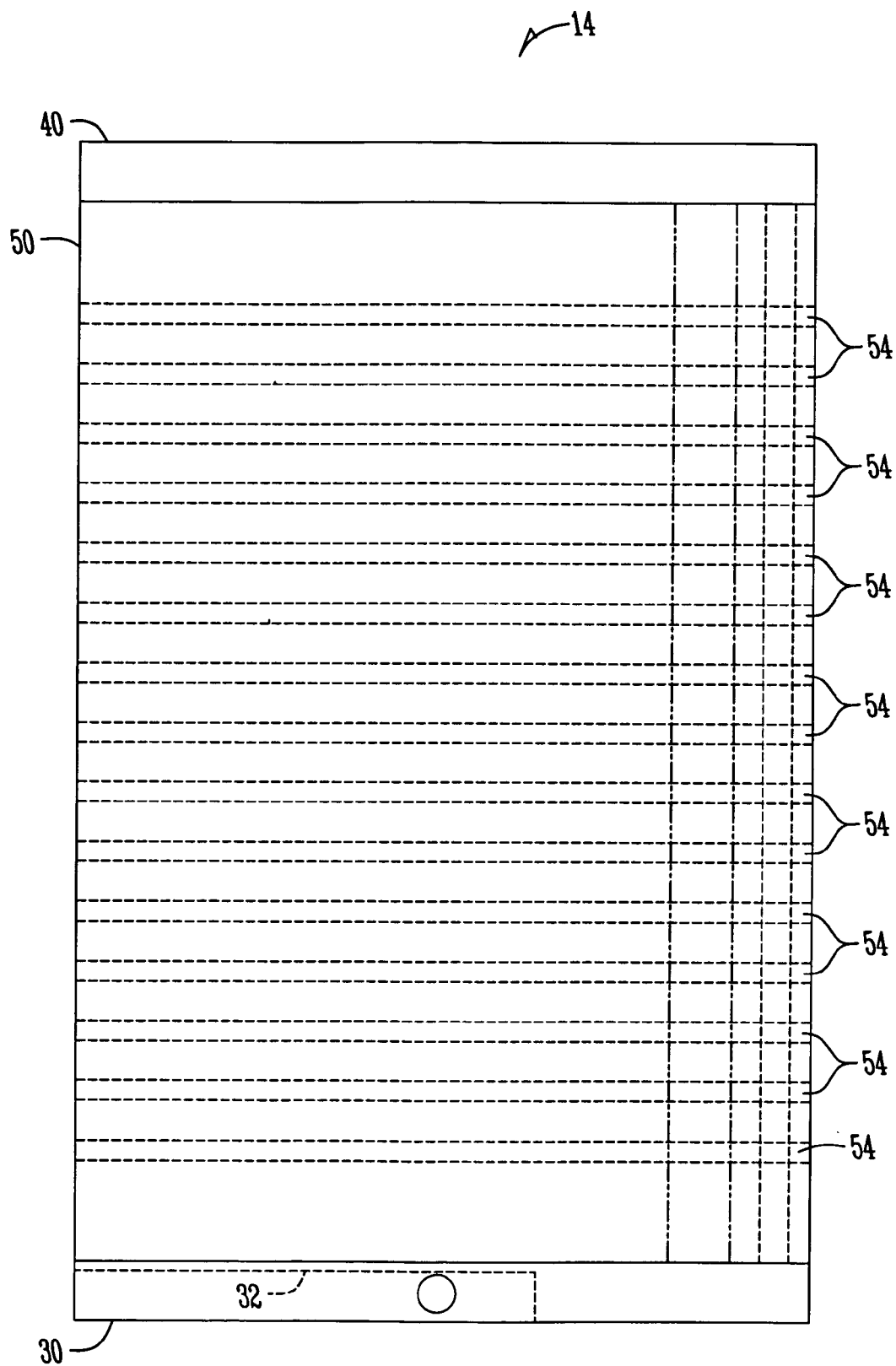


Fig. 3C

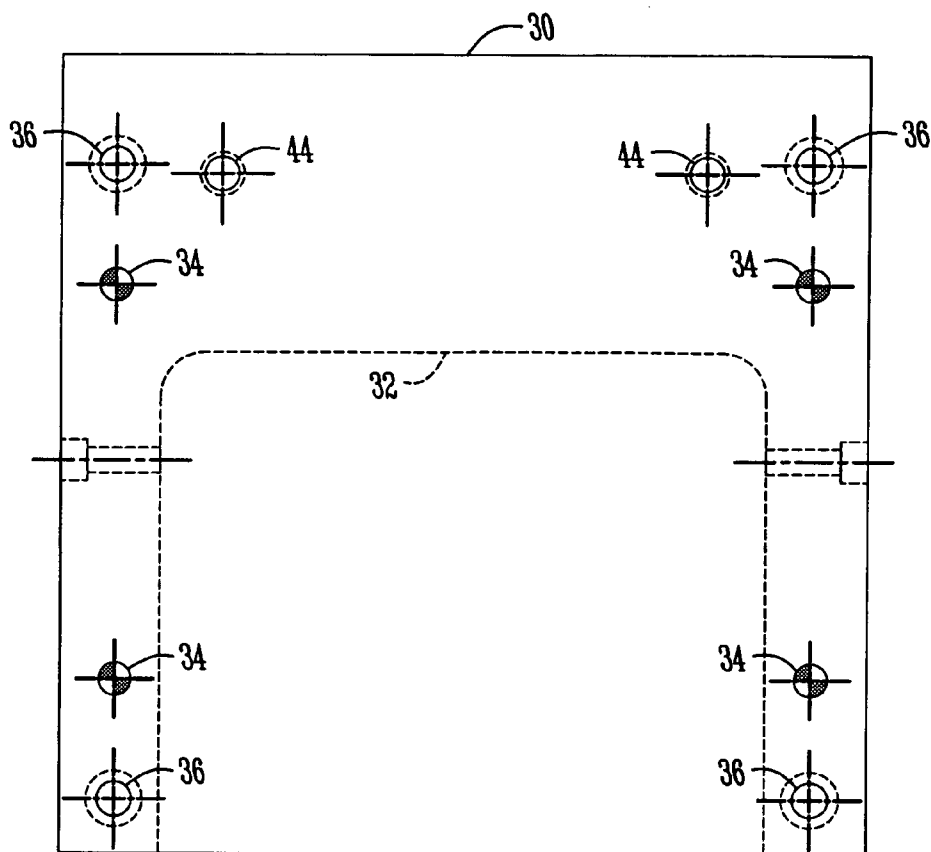


Fig. 4A

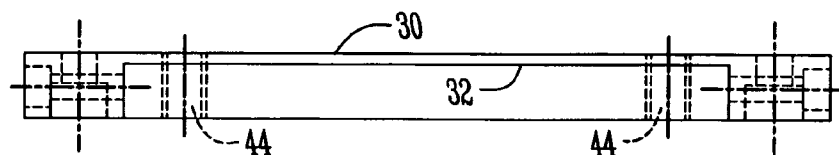


Fig. 4B

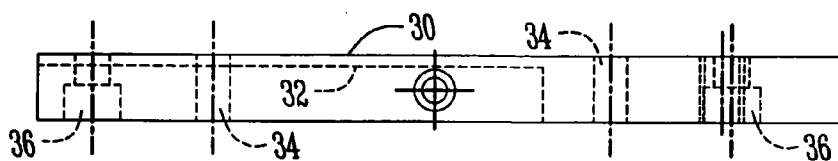


Fig. 4C

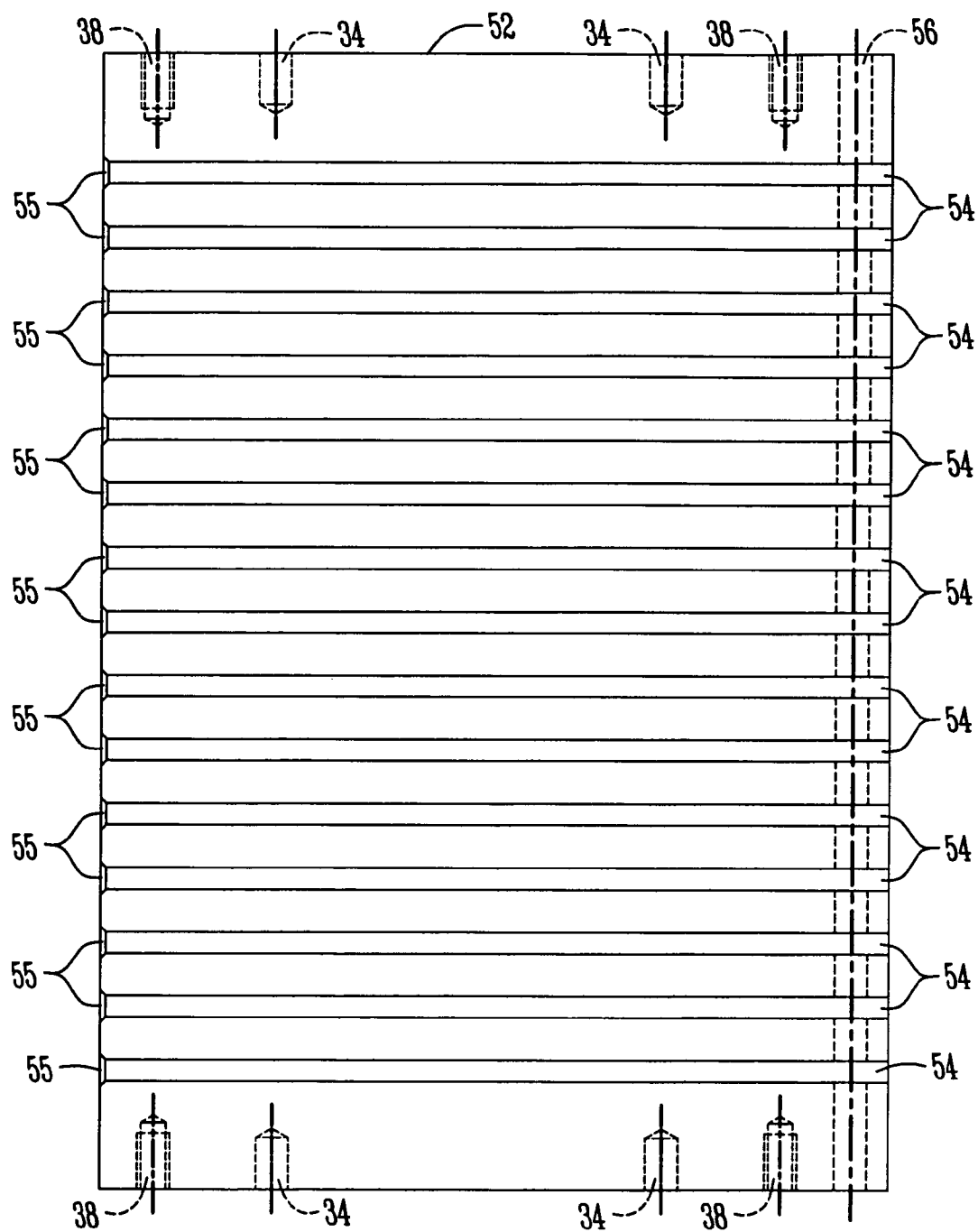


Fig. 5A

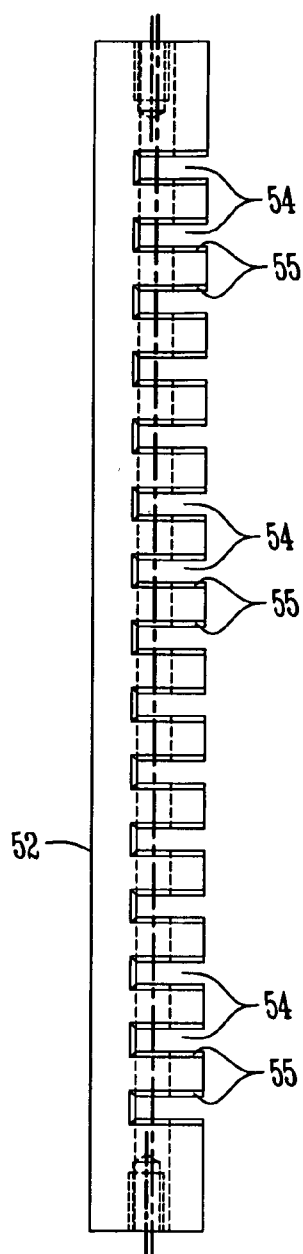


Fig. 5B

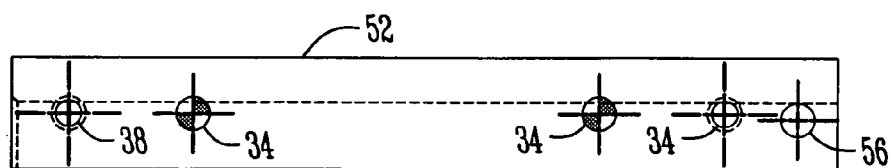


Fig. 5C

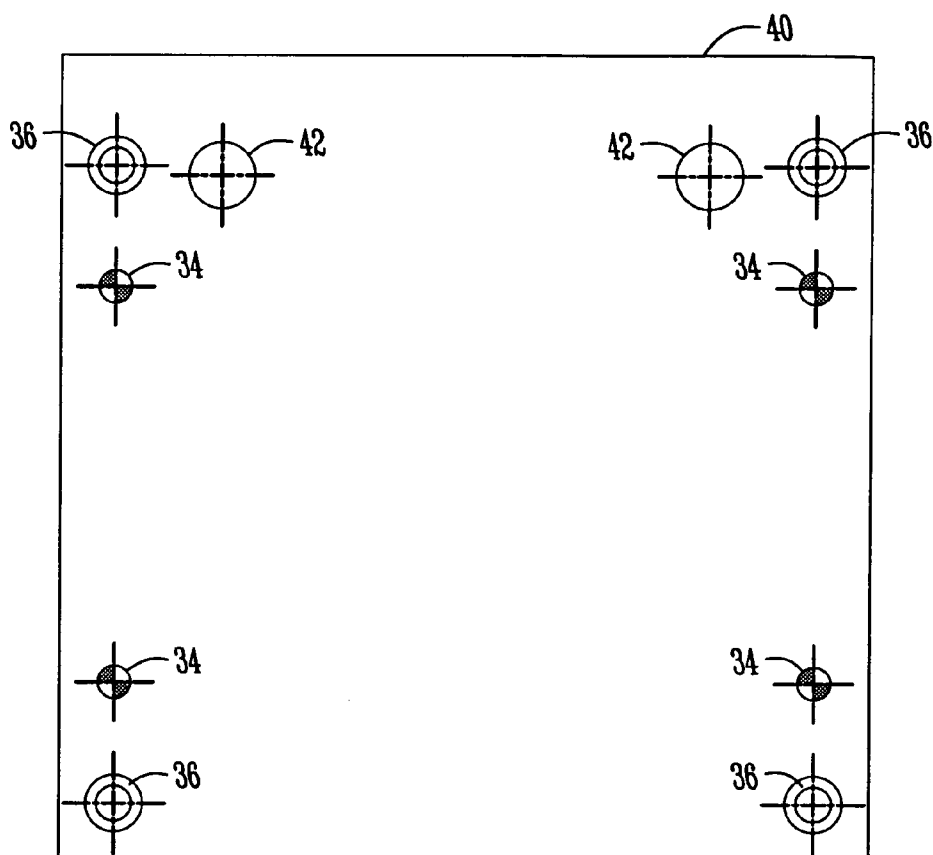


Fig. 6A

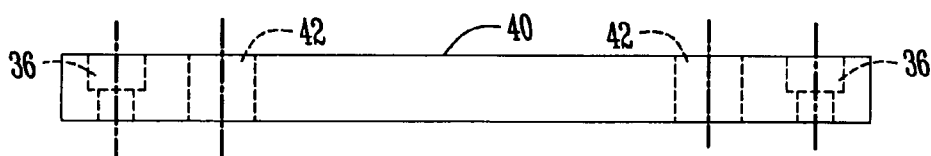


Fig. 6B

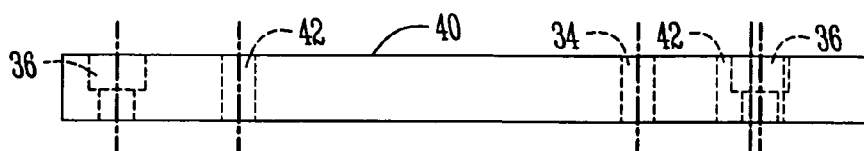


Fig. 6C

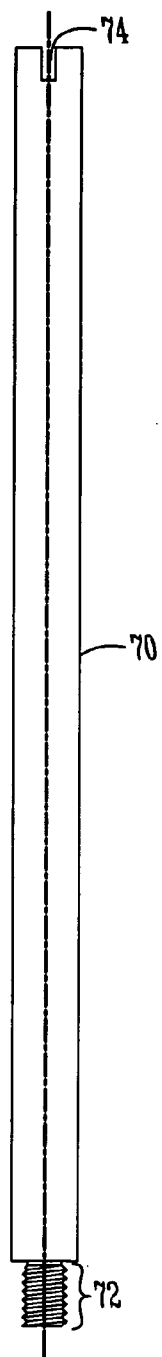


Fig. 7A

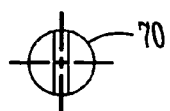


Fig. 7B



Fig. 8A

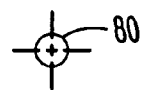


Fig. 8B

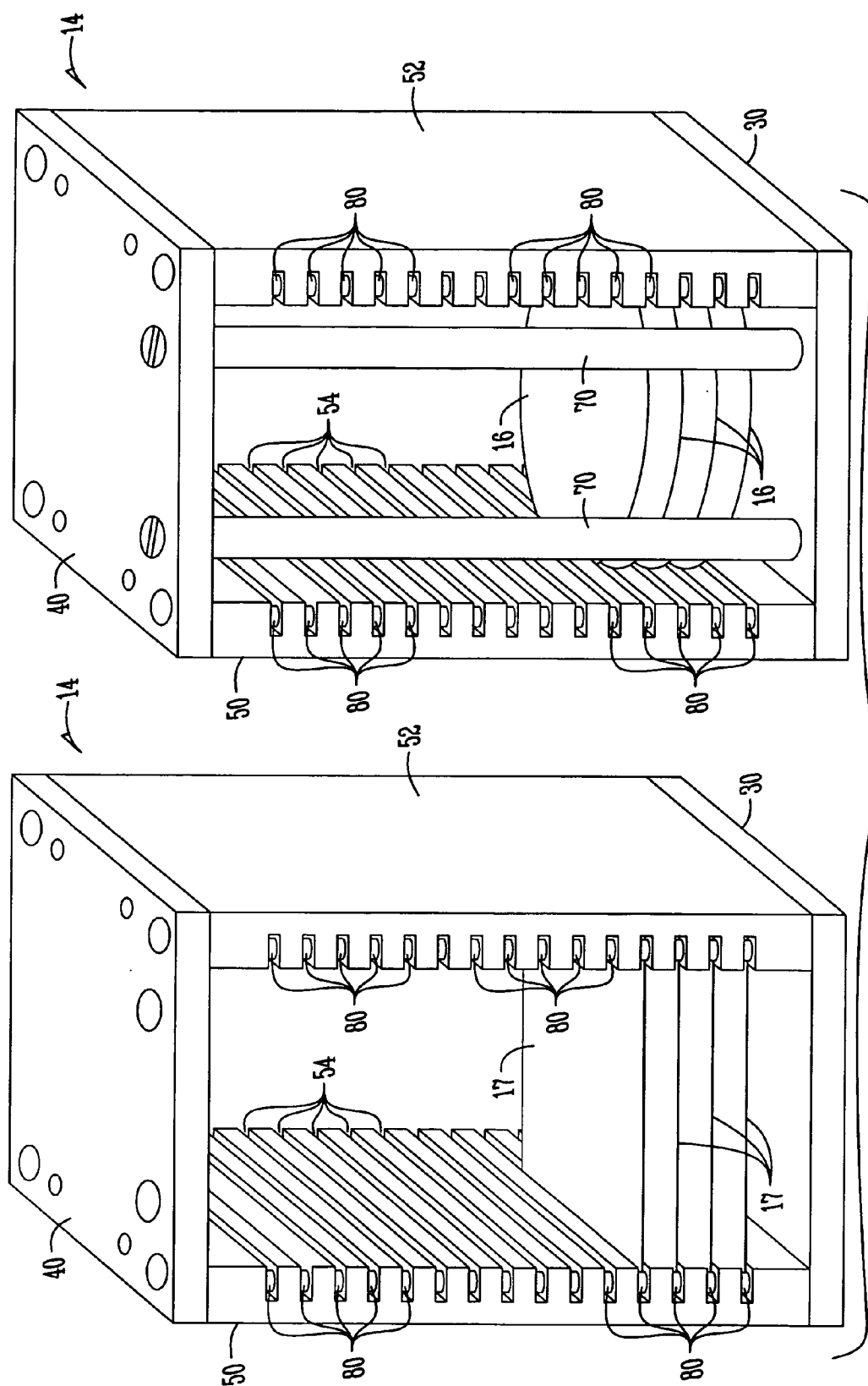


Fig. 9

UNIVERSAL CASSETTE

BACKGROUND OF THE INVENTION

[0001] This invention relates to cassettes for holding disks, wafers and/or plates during thin film manufacturing processes. Specifically, this invention relates to a universal cassette.

[0002] It is common today to use cassettes for holding and transporting semi-conductor type devices during processing in reusable cassettes. Generally, the silicon disks used with these cassettes are circular. However, advances in nontraditional materials, such as alumina, aluminum nitride, and fused silica are becoming more widespread. These nontraditional materials however, are generally square shaped during processing. Thus, it is desirable to have a cassette capable of holding and storing both the round silicon disks as well as the square nontraditional disks. Furthermore, it is desirable to have a universal cassette design which allows existing, robotic processing equipment to handle both the round and square devices without modification to the robotic or processing equipment.

[0003] In light of the foregoing, the primary feature or advantage of the present invention is to provide an improved universal cassette.

[0004] A further feature or advantage of the present invention is a cassette which can easily be converted from a configuration for holding round semi-conductor type disks to a configuration for holding square plates.

[0005] Another feature or advantage of the present invention is a cassette which is capable of holding both round disks and square plates for processing so that the geometric center of each is in the same location within the cassette.

[0006] A still further feature or advantage of the present invention is a provision of a universal cassette design which is economical to manufacture, durable in use, and efficient in operation.

[0007] One or more of these and/or other features or advantages of the current invention will be apparent from the specification and claims that follow.

BRIEF SUMMARY OF THE INVENTION

[0008] One or more of the foregoing features or advantages may be achieved by cassette assembly for holding circular and non-circular disks having a cassette body with a top wall, a bottom wall, opposite side walls, and an open front, creating an inside and an outside of the cassette body. The side walls having horizontal grooves adapted to receive and hold the disks. One or more first stops are inside the cassette body adjacent the grooves for stopping non-circular disks at a location in the grooves, as the non-circular disks are placed in the grooves from the front, and one or more removable second stops inside the cassette body spaced inwardly from the first stops for stopping the circular disks at the location in the grooves as the circular disks are placed in the grooves from the front, so that the geometric center of the circular disk approximately aligns with the geometric center of the non-circular disks.

[0009] Another aspect of the current invention is a cassette assembly wherein grooves open toward the inside of the cassette body and extend from the front towards the rear of the cassette body.

[0010] Another aspect of the current invention is a cassette assembly having linear grooves.

[0011] Another aspect of the current invention is a cassette assembly having one or more removable stops extending from the top wall to the bottom wall. In addition, these stops may be constructed of stainless steel.

[0012] A still further aspect of the current invention is a cassette assembly using stops which may be constructed from a plastic material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 shows one embodiment of a robotic transfer station assembly in association with a process chamber and one embodiment of the current invention.

[0014] FIG. 2 shows a perspective view of one embodiment of the current invention.

[0015] FIGS. 3A-C respectively show a front, top and side view of one embodiment of the current invention.

[0016] FIGS. 4A-C respectively show a top, front and side view of one embodiment of the bottom plate.

[0017] FIGS. 5A-C respectively show a front, side, and top view of one embodiment of the side plates.

[0018] FIGS. 6A-C respectively show a top, front and side view of one embodiment of the top plate.

[0019] FIGS. 7A-B respectively show a side and top view of one embodiment of a spacer post.

[0020] FIGS. 8A-B respectively show a side and top view of one embodiment of a stop rod.

[0021] FIG. 9 shows a rear perspective view of two cassette assemblies, one configured for holding square plates and one configured for holding round disks.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] The invention is an improved universal cassette for holding semi conductor or other materials for thin film processing. One embodiment of the invention is shown in FIGS. 1-9. This embodiment incorporates removable spacer posts 70 used within the universal cassette assembly 14 to hold round disks 16 when the spacer posts 70 are installed and non-round disks 17, such as square plates, when the spacer posts 70 are removed. Additionally, the geometric centers of both the round disk 16 and square plates 17 are located within the same approximate front to rear location within the cassette assembly grooves 54.

[0023] FIG. 1 shows a typical robotic transfer station 10 which is controlled by a computer control panel 11. The robotic transfer station 10 generally has a lift arm 12 for extending into a cassette assembly 14 and lifting a disk 16, 17 and placing the disk 16, 17 into a process chamber 18. Process chambers 18 are typically used to remove impurities, such as photo resist. A common process chamber is a Matrix System 1 Plasma Asher or stripper.

[0024] In operation, an elevator 20 raises a cassette assembly 14 to the proper height for the lift arm 12 to extend underneath the proper disk 16, 17. The lift arm 12 then slightly lifts the disk 16, 17 and slides the disk 16, 17 out of

the cassette assembly 14. The lift arm 12 can then rotate to the proper orientation and insert the disk 16, 17 into the process chamber 18 for processing. Once processing is completed in the process chamber 18, the lift arm 12 can then enter the processing chamber 18, lift the disk 16, 17, remove the disk 16, 17, and return the disk 16, 17 to the cassette assembly 14. This cycle is repeated for each disk 16, 17 in the cassette assembly 14. Any number of disks 16, 17 can be held in the contemplated cassette assembly 14. The processing procedure is well-known to one ordinarily skilled in the art.

[0025] FIGS. 1-3 and 9 show the preferred embodiment of an assembled wafer cassette assembly 14. FIG. 1 shows a typical set-up utilizing the wafer cassette assembly 14 in process. FIG. 2 shows an isometric view of the preferred embodiment of the cassette assembly 14. FIG. 3A-C show front, top and side views of the wafer cassette assembly 14. FIG. 9 shows a perspective view of two wafer cassette assemblies 14 side-by-side, one having spacer posts 70 installed and the other not having spacer posts 70 installed.

[0026] FIGS. 4A-C shows a preferred embodiment of the bottom plate 30 of the wafer cassette assembly 14. The bottom plate 30 may have a cut-out 32 on the bottom side of the bottom plate 30. In addition, it is preferred that the bottom plate 30 have one or more locating pin points 34 which are holes that can help align the bottom plate 30 to the side plates 50, 52 with dowel pins (not shown). This helps to create a proper alignment of the bottom plate 30 to the side plates 50, 52. The bottom plate 30 is also preferred to have one or more machine bolt through holes 36. These machine bolt through holes 36 allow a machine bolt (not shown) to pass through the hole 36 and into machine bolt threaded holes 38 in the side plates 50, 52. The machine bolt(s) tighten into the threaded holes 38 to hold the pieces together.

[0027] The top plate 40, shown in FIG. 6, additionally has machine bolt through holes 36 and locating pin points 34 for locating and attaching the top plate 40 to the side plates 50, 52. The preferred material for the top plate 40, bottom plate 30 and side plates 50, 52 is anodized aluminum, however other materials will work.

[0028] The side plates, 50, 52 shown in FIG. 5, have a plurality of grooves 54. The grooves 54 are preferred to have a chamfer 55. The grooves 54 should be deep enough, wide enough and spaced apart enough to allow the desired size plates 16, 17 to easily slide in and out of the grooves 54 when used with a cassette assembly 14. In addition, the chambers 55 smooth the sharp edges on the corners of the groove 54 to reduce damaging the disks 16, 17. Furthermore, the grooves 54 should be wide enough and deep enough to also allow the cassette assembly 14 to hold alumina, aluminum nitride, and fused silica, and other types of square plates as well as round silica disks for thin film processing.

[0029] The side plates 50, 52 are preferred to have a rod stop hole 56. The rod stop hole 56 is sized to receive a rod stop 80, as shown in FIG. 8. The rod stop is preferred to be made of Teflon®, Delrin®, or other types of plastic type material to stop the travel of the plates 17 as they slide into the groove 54 of the cassette assembly 14. A plastic type stop rod 80 is preferred so that it doesn't damage the disk 16 or plate 17 within the cassette assembly 14. The rod stop 80 passes through the stop rod hole 56 in the side plates 50, 52

and extends into the grooves 54. Additionally, the rod stop 80 is held into the rod stop hole 56 in the side plates 50, 52 by the bottom plate 30 and the top plate 40.

[0030] The top plate 40 additionally is preferred to have one or more spacer post through holes 42 for allowing spacer posts 70 to pass through the through hole 42 and to the spacer post threaded holes 44 in the bottom plate 30. The spacer post 70, as seen in FIG. 7, is preferred to be a stainless steel rod with a screw driver slot 74 on one end and threads 72 on the other end. This allows the spacer post 70 to pass through a spacer post through hole 42 in the top plate 40 and thread into and tighten in the spacer post threaded holes 44 in the bottom plate 30. The spacer post 70 is to be placed in a location which stops the travel of round silicon disks 16 within the grooves 54 in the same location within the grooves 54 that the square plates 17 are stopped with the stop rod 80. In other words, the geometric center 90 of both the round disk 16 and the square plate 17 should be located in the same position in the groove 54.

[0031] Constructed in this manner, the wafer cassette assembly 14 can easily be transformed from holding square plates 17, with the square plates 17 being stopped by the stop rod 80, to being capable of holding round disks 16 in the grooves 54 such that the geometric centers 90 align. This allows for a cassette assembly 14 to be easily transformed into holding either round disks 16 or square plates 17 so that a robotic transfer station 10 can easily pick up the geometric center 90 of either the round disk 16 or the square plate 17 and properly locate it into and out of a process chamber 18 and back into the cassette assembly 14. This allows any substrate to be used without reprogramming or realignment of the robotic transfer station 10. To convert a cassette assembly 14 from using round disk 16 to square plate 17, one simply has to remove the spacer post 70. On the other hand, to convert a cassette assembly 14 which is using square plates 17 to be able to use round disk 16, one simply has to install spacer post 70.

[0032] Traditionally, when substrate media was changed, individualized or customized cassette assemblies had to be constructed and used. This invention allows for a single design of cassette assembly 14 to be used for any type of substrate material for use in thin film processing. In addition, the preferred embodiment is configured to hold substrates ranging in size from about 0.015" to about 0.060" nominal thickness. However, the invention can be built to hold any size substrate.

[0033] The words circular and non circular disk and plate are used in this application interchangeably. Generally, a disk was referred to a round material and a plate was referred to a square shaped material. However, any shape of devices can be used with the current invention. Furthermore, circular and round disks or plates are used for exemplary purposes only. Any shape or sets of shapes of disks may be used with this invention.

[0034] In the drawings and specification there has been set forth preferred embodiment of the invention, and all those specific terms are employed, these are used in a generic and descriptive sense only and not for purposes of limitation. Changes in the form and the portions of parts as well as in the substitution of equivalence are contemplated as circumstance may suggest or render expedient without departing from the spirit or scope of the invention as further defined in

the following claims. For example, the present invention contemplates variations in structure of the top plate, bottom plate and side plates. Additionally, it is contemplated that other types or shapes of substrate materials can be used within the present invention. These and other variations are within the spirit and scope of the invention.

What is claimed is:

1. A cassette assembly for holding circular and non-circular disks comprising:

a cassette body having a top wall, a bottom wall, opposite side walls, and an open front, creating an inside and an outside of the cassette body, the side walls having horizontal grooves adapted to receive and hold the disks;

one or more first stops inside the cassette body adjacent the grooves for stopping non-circular disks at a location in the grooves as the non-circular disks are placed in the grooves from the front; and

one or more removable second stops inside the cassette body spaced inwardly from the first stops, for stopping the circular disks at the location in the grooves as the circular disks are placed in the grooves from the front, so that the geometric center of the circular disk approximately aligns with the geometric center of the non-circular disks.

2. The cassette assembly of claim 1 wherein the grooves open toward the inside of the cassette body and extend from the front towards a rear of the cassette assembly.

3. The cassette assembly of claim 1 wherein the grooves are linear.

4. The cassette assembly of claim 1 wherein the one or more removable second stops extend from the top wall to the bottom wall.

5. The cassette assembly of claim 1 wherein the one or more first stops are plastic.

6. The cassette assembly of claim 1 wherein the one or more removable second stops are stainless steel.

7. The cassette assembly of claim 1 wherein the grooves are chamfered.

8. A cassette assembly for holding circular and non-circular disks comprising:

a top plate;

a bottom plate;

two opposite side plates extending between the top and bottom plates and relatively parallel to one another, the side plates having parallel grooves from a front edge of the side plates extending towards a rear edge of the side plates, the grooves opening towards an inside of the cassette assembly and adapted to slideably receive the disks;

one or more removable spacer posts connected inside the cassette assembly relatively perpendicular to the grooves.

9. The cassette assembly of claim 8 further comprising one or more stops in the grooves, near the rear edge of the side plates.

10. The cassette assembly of claim 9 wherein the stops in the grooves are nearer the rear edge of the side plates than the removable spacer posts are.

11. The cassette assembly of claim 8 wherein the grooves are chamfered.

12. The cassette assembly of claim 8 further comprising one or more locating pins for locating the top and/or bottom plate to the side plates.

13. A cassette assembly for holding circular and non-circular disks comprising:

a top wall;

a bottom wall;

a pair of spaced apart side walls connected by the top and bottom wall, the side walls having multiple grooves adapted to slideably receive the disks between the side walls, the grooves extending from a front of the walls toward a rear of the walls;

one or more removable stops extending from the top wall to the bottom wall for stopping travel of the circular disks at a location within the grooves; and

one or more stops adjacent the grooves for stopping the non-circular disks in the same relative location within the groove when the removable stops are removed.

* * * * *