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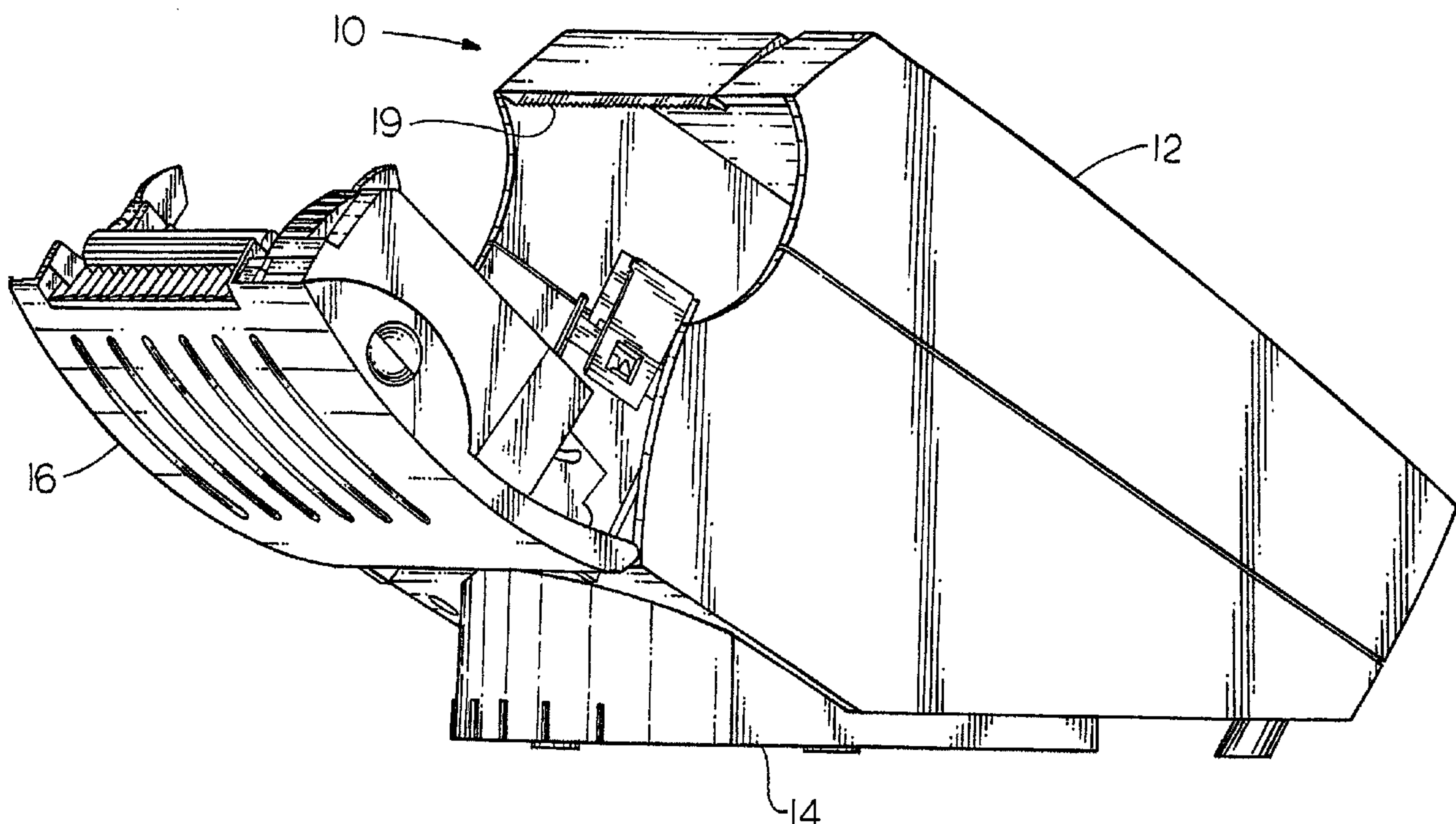
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(54) Titre : IMPRIMANTE THERMIQUE A ROULEAU/PLAQUE D'ENTRAINEMENT SOLLICITE PAR UN RESSORT
(54) Title: THERMAL PRINTER WITH SPRING BIASED DRIVE ROLLER/PLATEN



(57) Abrégé/Abstract:

A low-cost small footprint thermal printer (10) including a thermal print head (26) and a motor drive roller/platen (32) mounted opposite to the print head (26) for pinching web material therebetween to draw the material from a supply roll and advance it past the print head (26). The roller/platen (32) is mounted on a hinged door which can be opened to provide access to a supply roll compartment and closed to position the roller/platen (32) in operative relationship adjacent to the print head (26). In its closed operative position, the roller/platen (32) is spring biased against the fixedly mounted print head (26).

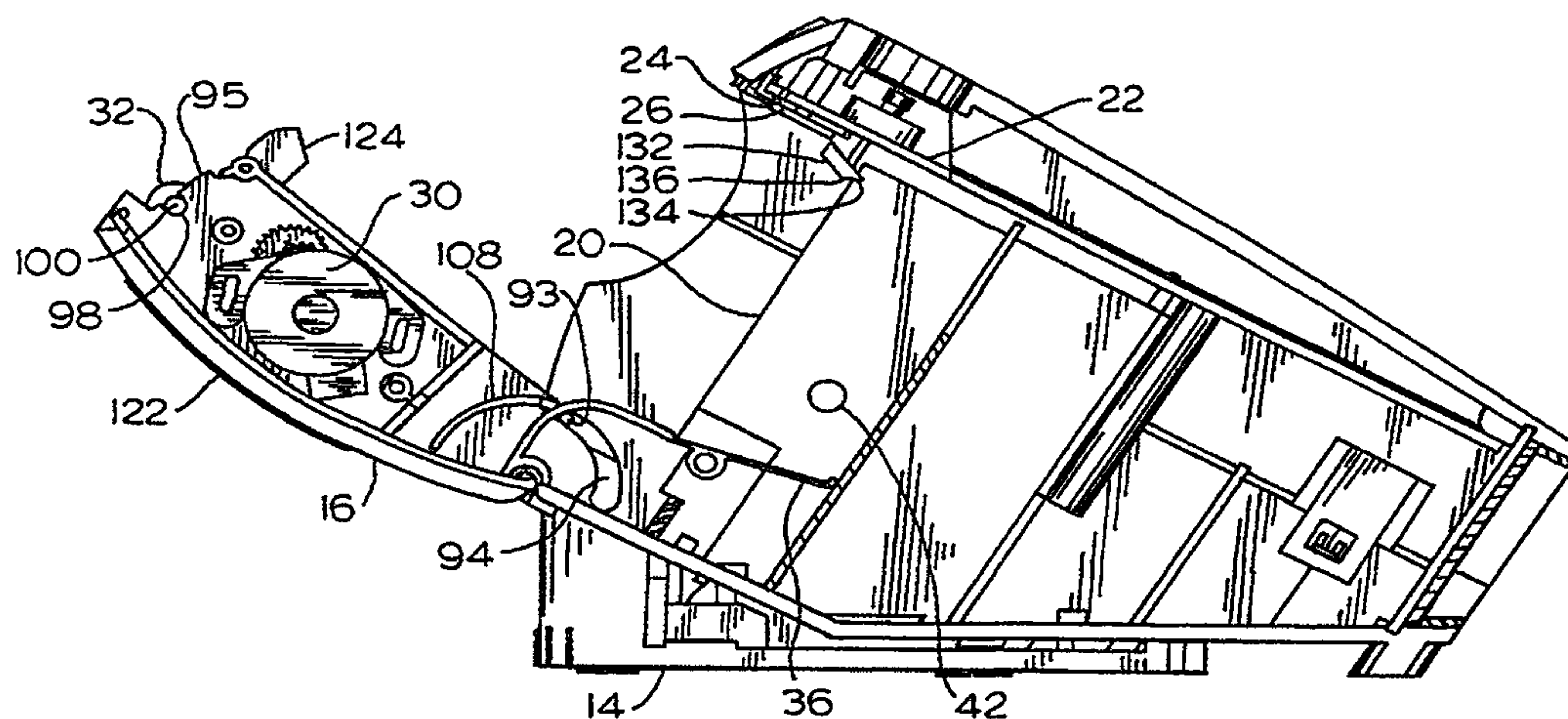
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A low-cost small footprint thermal printer (10) including a thermal print head (26) and a motor drive roller/platen (32) mounted opposite to the print head (26) for pinching web material therebetween to draw the material from a supply roll and advance it past the print head (26). The roller/platen (32) is mounted on a hinged door which can be opened to provide access to a supply roll compartment and closed to position the roller/platen (32) in operative relationship adjacent to the print head (26). In its closed operative position, the roller/platen (32) is spring biased against the fixedly mounted print head (26).

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TITLE: THERMAL PRINTER WITH SPRING
BIASED DRIVE ROLLER/PLATEN

BACKGROUND OF THE INVENTION

5 This invention relates generally to printers
capable of being driven by computer output for printing
receipts, labels, and the like, and more particularly to thermal
printers for printing on web material peeled from a paper (or
other printing media) supply roll.

10 Computer driven thermal printers are widely used
in diverse applications for printing receipts, labels, etc.
Such printers typically use a paper supply roll from which web
material is peeled and then advanced along a web path between a
thermal print head and a motor driven roller/platen. Typically,
15 the print head is spring mounted and urged against the
roller/platen, pinching the web therebetween, thus enabling the
roller/platen to pull the web from the supply roll and feed it
past the head for printing.

20 SUMMARY OF THE INVENTION

The present invention is directed to a low cost
small footprint thermal printer including a thermal print head
and a motor driven roller/platen mounted opposite to the print
head for pinching web material therebetween to draw said
25 material from a supply roll and advance it past said print head.
In accordance with the invention, the roller/platen is mounted
on a hinged door subassembly which can be opened to provide
access to a supply roll compartment and closed to position the
roller/platen in operative relationship adjacent to the print

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head. In its closed operative position, the roller/platen is spring biased against a fixedly mounted print head.

In a preferred embodiment, the print head is carried by a circuit board which is mounted on a frame. The door subassembly is spring mounted on the frame and movable between an open position which allows access to an internal compartment for accommodating a web supply roll and a closed position in which the roller/platen is located immediately adjacent to the print head. The spring mounting between the frame and the door subassembly biases the roller/platen against the print head.

In accordance with a significant feature of the preferred embodiment, the door subassembly includes a door, the roller/platen (or "drive roller") and a motor and drive, train for driving the roller.

In accordance with a further aspect of the preferred embodiment, the thermal print head is mounted to a heat sink which, in turn, is mounted adjacent an edge of the circuit board. An edge surface of the heat sink is positioned to facilitate alignment of the door as it is moved from its open position to its closed position to thereby align the print head and drive roller.

In accordance with a still further aspect of the preferred embodiment a latch is provided for automatically detenting the door subassembly in the closed position. The preferred latch structure is comprised of a block element mounted on the frame and a cam element mounted on the door subassembly. The block and cam elements define complementary surfaces enabling the cam element to move past the block element

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by bending the spring to allow the door subassembly to translate perpendicular to its hinge axis as it is rotated to its closed position. When in the closed position, the spring positions the cam element so that it is blocked by the block element thus detenting the door subassembly in the closed position.

In accordance with a still further feature of the preferred embodiment, a sensor is mounted on the circuit board proximate to the print head for detecting "top-of-form" and a "paper out" condition.

In accordance with another aspect of the preferred embodiment, guide ribs are provided on the inner surface of the door to project into the compartment to contact and position the supply roll to guide the web along a path between the roller and print head.

The invention may be summarized as a printer comprising: (a) a frame having at least one frame latch member and a compartment adapted to accommodate a roll of print media; (b) a printhead operatively coupled to said frame; (c) a door subassembly having one end hinged to said frame and adapted for translation substantially toward/away from said printhead and an opposite end including a platen and at least one door subassembly latch member adapted to mate with said at least one frame latch member, said hinged door subassembly adapted to rotate relative to said frame between an open position affording access to said frame and a closed position disposing said platen against said printhead; and (d) at least one spring operatively coupled between said door subassembly and said frame for biasing

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said hinged end of said door subassembly substantially toward said printhead to enable pinching of print media between said platen and said printhead and mating of said at least one door subassembly latch member with said at least one frame latch member when said hinged door subassembly is in said closed position.

Although plain thermal paper is perhaps the most frequently used printing media in typical applications of the invention, it should be understood that various other media in various web roll formats can also be used. For example only, embodiments of the invention can be used with various forms of label paper on rolls with or without central cores, and either with or without a web backing.

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least one resilient member being adapted to urge said drive roller against said print head and to urge said at least one door subassembly latch member and said at least one housing latch member together to latch said door subassembly when said
5 door subassembly is in said closed position for printing.

Although plain thermal paper is perhaps the most frequently used printing media in typical applications of the invention, it should be understood that various other media in various web roll formats can also be used. For example only,
10 embodiments of the invention can be used with various forms of label paper on rolls with or without central cores, and either with or without a web backing.

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BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is an isometric side view of a printer housing in accordance with the invention showing the door subassembly in a closed position;

5 Figure 2 is an isometric side view similar to Figure 1 but showing the door subassembly in its open position;

Figure 3 is an isometric front view of the housing with most of the door subassembly removed to show the frame and internal roll compartment;

10 Figure 4 is an isometric view showing the inner surface of the door subassembly relative to the frame;

Figure 5 is a side sectional view of the printer of Figure 1 showing its basic internal configuration with the door subassembly in its open position;

15 Figure 6 is a side sectional view similar to Figure 5 but showing the door subassembly in the closed position;

Figure 7 is an isometric view of the circuit board bottom surface primarily showing the print head, heat sink, and
20 web sensor; and

Figure 8 is an isometric view of the circuit board top surface.

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DETAILED DESCRIPTION

Attention is initially directed to Figures 1 and 2 which comprise isometric views of a low cost small foot print thermal printer 10 in accordance with the invention respectively showing the printer door subassembly closed and open. Printer 10 is suitable for printing receipts, labels, and the like in various applications such as point-of-sale (POS) situations. As seen in Figures 1 and 2, the printer 10 is primarily comprised of a main housing 12, supported on a detachable base 14, preferably at an inclined orientation, and a door subassembly 16 which is hinged for movement between the closed position shown in Figure 1 and the open position shown in Figure 2. A web discharge slot 18 is positioned between the door subassembly 16 and a tear bar 19 carried by housing 12.

With continuing reference to Figures 3-6, the printer 10 is comprised primarily of the following major components:

A frame 20;

A circuit board 22 supported on frame 20 and carrying a heat sink 24 and thermal print head 26;

A door subassembly 16 carrying a motor 30 coupled to drive roller/platen 32 via drive train 33; and

A pair of springs 36 mounted between the frame 20 and the door subassembly 16 for biasing the door upward to urge the roller/platen 32 against the print head 26 when the door is in its closed position.

The frame 20 defines an internal compartment 40, between side walls 41, dimensioned to accommodate a printing media, typically paper, web supply roll (not shown) so as to

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enable web material to be drawn from the roll by roller/platen 32 and fed past the print head 26 out through discharge slot 18. The roll is either loosely accommodated in compartment 40 or may be mounted for rotation about an axis defined by sidewall 5 holes 42.

The printed circuit board 22 shown in Figures 5 and 6 is depicted in detail in Figures 7 and 8. Note that heat sink 24 is mounted on the circuit board proximate to its leading edge 52. The print head 26 is in turn mounted on the heat sink 10 24. The print head typically comprises a slice of ceramic material 56 carrying a plurality of heating elements 58 aligned along print line 60. Note that the ends 62, 64 of the heat sink 24 are shown as extending beyond the print head 26. As will be mentioned hereinafter, these ends 62, 64 cooperate with stops 70 15 formed on the frame to facilitate precise positioning of the board 22 relative to the frame 20.

Additionally, the board 22 defines a mounting hole 74 positioned to receive a fastener (not shown) extending into frame hole 76. When the circuit board 22 is installed on the 20 frame, posts 78 align with board holes 79 and frame hole 76 aligns with board hole 74. Consequently, the board 22 is positioned with the heat sink ends 62, 64 against the stops 70 to precisely position the heat sink and print head line 60 relative to the frame 20.

25 The door subassembly 16 is comprised of a substantially arcuate panel or door 80 having outer and inner surfaces 82, 84. Moreover, the panel 80 defines an upper edge 86 and a lower edge 88. A hinge member 90 is formed adjacent the lower edge 88 and is configured to be received for rotation

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in recesses 92 formed by the frame 20. The door subassembly is thus able to pivot from the closed position depicted in Figure 1 to the open position depicted in Figure 2. The door subassembly 16 carries a short guide pin 93 which extends parallel to hinge member 90 and is positioned to be received in arcuate slot 94 formed in frame 20. As the door subassembly 16 is rotated around the axis of hinge member 90 from its closed to its open position, pin 93 moves along slot 94 from its lower end to its upper end. It should be noted that the recesses 92 which accommodate the hinge member 90 are configured, e.g., open at the bottom, to permit limited translation of the hinge member 90 essentially perpendicular to its axis of rotation.

Extending rearwardly from the door inner surface 84 are first and second spaced walls 95, 96 which define recesses 98 at their upper ends for accommodating axle 100 fixed to the drive roller/platen 32. Axle 100 is fixed to gear 104 which, via intermediate gears 106 is coupled to drive motor 30 carried by wall 95. Energization of the motor 30 rotates the drive roller/platen 32.

Walls 95, 96 respectively, define arcuate slots 108 which accommodate inwardly turned forward ends 112 of springs 36. Each spring 36 includes a rearward end 114 which is anchored to the frame and a center portion 116 configured for mounting on frame post 118. Each spring 36 is configured so that it acts to bias the door subassembly 16 upward, i.e. to urge hinge member 90 to the top of recess 92. Thus, when the door subassembly 16 is in its closed position as depicted in Figure 2, springs 36 urge drive roller/platen 32 upwardly against print head 26. The contact line between the cylindrical

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roller/platen 32 and the print head 26 is along print line 60. In use, prior to moving the door subassembly to the closed position, the web is pulled forwardly through slot 18 past tear bar 19, and beyond the print station defined by print line 60.

5 When the door subassembly 16 is closed, the web is pinched between the spring urged roller/platen 32 and the print head 26. As a consequence, when the roller/platen 32 is driven in a counterclockwise direction (as viewed in Figure 6), it will peel the web from the top of the supply roll (not shown) and advance
10 it past the print line 60.

It should be noted, e.g., Figure 4, that the upper edge of the door subassembly 16 defines a serrated surface comprised of sharp peaks 121. These peaks are desirable to minimize contact between the back surface of the web material
15 and surfaces of the door subassembly 16 for the purpose of enabling adhesive backed linerless material to be used. The outer surface 82 of door 80 is also preferably provided with peaked ribs 122.

The door walls 95, 96 respectively carry cam
20 elements 124 which are used for latching the door subassembly 16 in the closed position. The cam elements 124 each define a rearward inclined surface 126 and a forward inclined surface 128 meeting at an intermediate vertex 130. The cam elements 124 are positioned to cooperate with blocks 131 carried by the frame 20
25 for latching or detenting the door subassembly 16 in a closed position. The blocks 131 each define a forward inclined surface 132 and a rearward incline surface 134 meeting at an intermediate vertex 136.

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As the door subassembly 16 is pivoted from the open to the closed position, the rearward surfaces 126 of cam elements 124 will slide along surfaces 132 of blocks 131. As a consequence of the orientation of the surfaces 126 and 132, the door subassembly 16 will be forced to translate slightly downwardly against the urging of springs 36. Once vertex 130 of cam elements 124 passes vertex 136 of blocks 131 the normal resiliency of springs 36 will move the door and cam elements upwardly to place forward surfaces 128 of elements 124 adjacent to rearward surfaces 134 of blocks 131 to thus latch the door subassembly 16 in the closed position. The door subassembly can be readily opened by a user manually grasping finger holes 137 and pulling. The cooperating surfaces will force the door subassembly slightly downwardly stressing the springs 36 and allowing cam elements 124 to move past blocks 131.

As previously mentioned, the heat sink 24 is precisely positioned relative to the frame 20 as a consequence of stops 70. The print head 26 and print line 60 are preferably referenced to the heat sink 24 when installed thereon. The roller/platen is precisely positioned relative to the door subassembly 16 by the axle 100 and recesses 98. In order to assure optimum registration of the roller/platen 32 to the print line 60, it is preferable to utilize the heat sink block 24 leading edge 138 as a reference stop against which a portion 139 of the door subassembly 16 engages in its closed position.

It is further pointed out that one or more guide ribs 140 is provided on the door subassembly 16 projecting rearwardly from the panel inner surface 84. The ribs define an arcuate guide surface 142 intended to peripherally engage the

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web supply roll (not shown). The guide surface 142 helps to maintain the supply roll toward the rear of compartment 40 and guide the web material peeling from the top of the roll along a direct path past roller/platen 32. The ribs preferably define sharp edges 143 at their upper ends to minimize surface contact with the rear face of the web material.

A web sensor 144 is preferably provided proximate to the forward edge of the circuit board 22 adjacent to the discharge slot 18 for sensing "top-of-form" and a "paper out" condition.

From the foregoing, it should now be understood that a low cost small foot print thermal printer has been disclosed herein which utilizes a spring urged door subassembly for engaging a drive roller/platen against a thermal print head. Although a specific preferred embodiment of the invention has been described, it should be understood that various modifications, well within the spirit and scope of the invention, may occur to those skilled in the art.

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CLAIMS:

1. A printer comprising:

(a) a frame having at least one frame latch member and a compartment adapted to accommodate a roll of print
5 media;

(b) a printhead operatively coupled to said frame;

(c) a door subassembly having one end hinged to said frame and adapted for translation substantially toward/away from said printhead and an opposite end
10 including a platen and at least one door subassembly latch member adapted to mate with said at least one frame latch member, said hinged door subassembly adapted to rotate relative to said frame between an open position affording access to said frame and a closed position disposing said
15 platen against said printhead; and

(d) at least one spring operatively coupled between said door subassembly and said frame for biasing said hinged end of said door subassembly substantially toward said printhead to enable pinching of print media
20 between said platen and said printhead and mating of said at least one door subassembly latch member with said at least one frame latch member when said hinged door subassembly is in said closed position.

2. The printer of Claim 1, further comprising a
25 circuit board coupled to said frame.

3. The printer of Claim 2, further comprising a heat sink mounted on said circuit board, said heat sink and said

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frame adapted to facilitate precise positioning of said circuit board relative to said frame.

4. The printer of Claim 2, wherein said printhead is mounted on said heat sink.

5 5. The printer of Claim 4, further comprising a print media sensor coupled to said frame proximate said circuit board.

6. The printer of Claim 4, wherein said opposite end of said door subassembly is adapted to engage said heat sink
10 to assure optimal disposition of said platen against said printhead when said hinged door subassembly is in said closed position.

7. The printer of Claim 1, wherein said at least one frame latch member includes a block element and said at
15 least one door subassembly latch member includes a cam element positioned to cooperate with said block element, said block and cam elements having complementary bearing surfaces adapted to slide along each other for latching said hinged door subassembly to said frame when said hinged door
20 assembly is in said closed position.

8. The printer of Claim 1, wherein said hinged door subassembly further includes a motor for driving said platen.

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PATENT AGENTS

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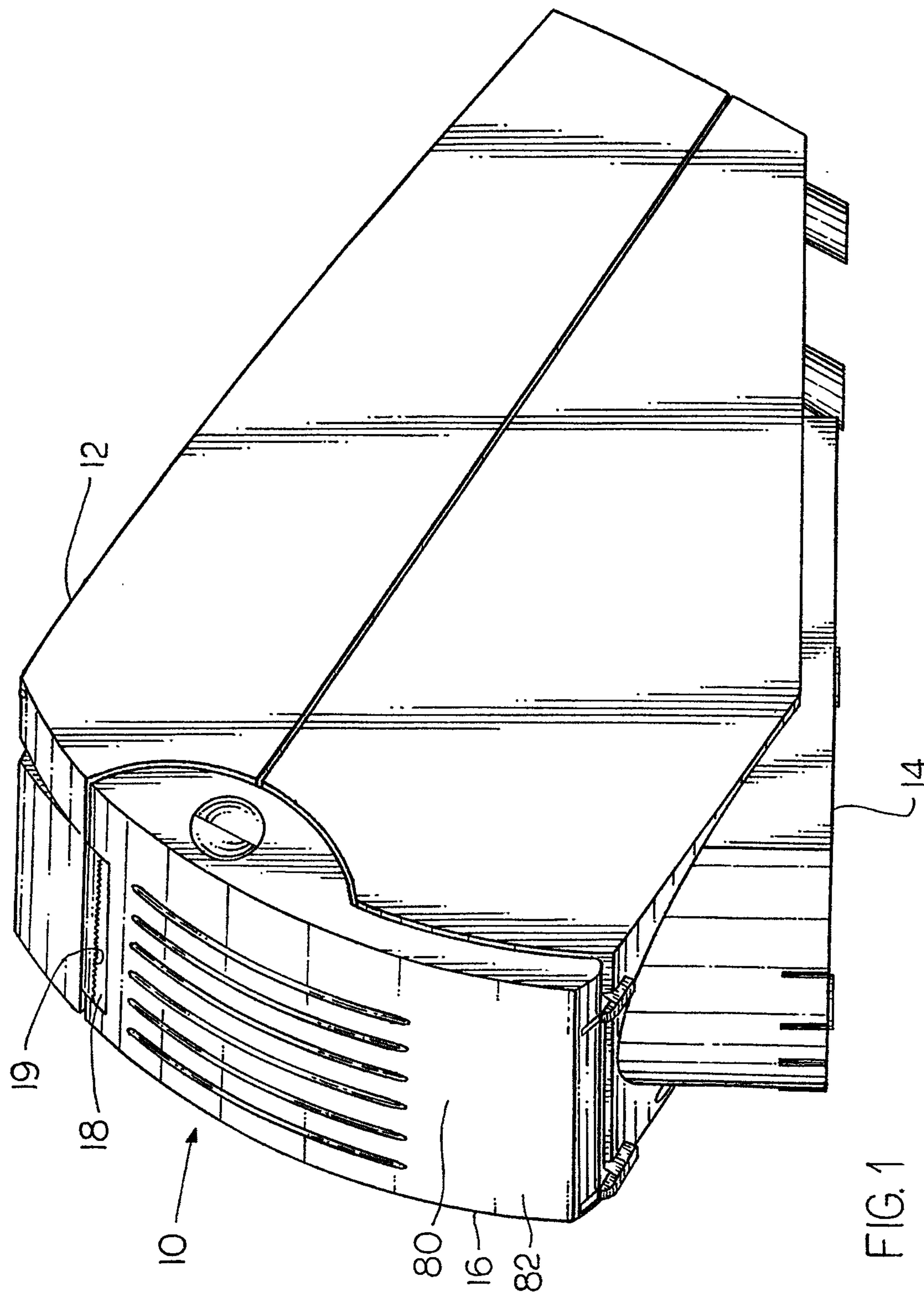
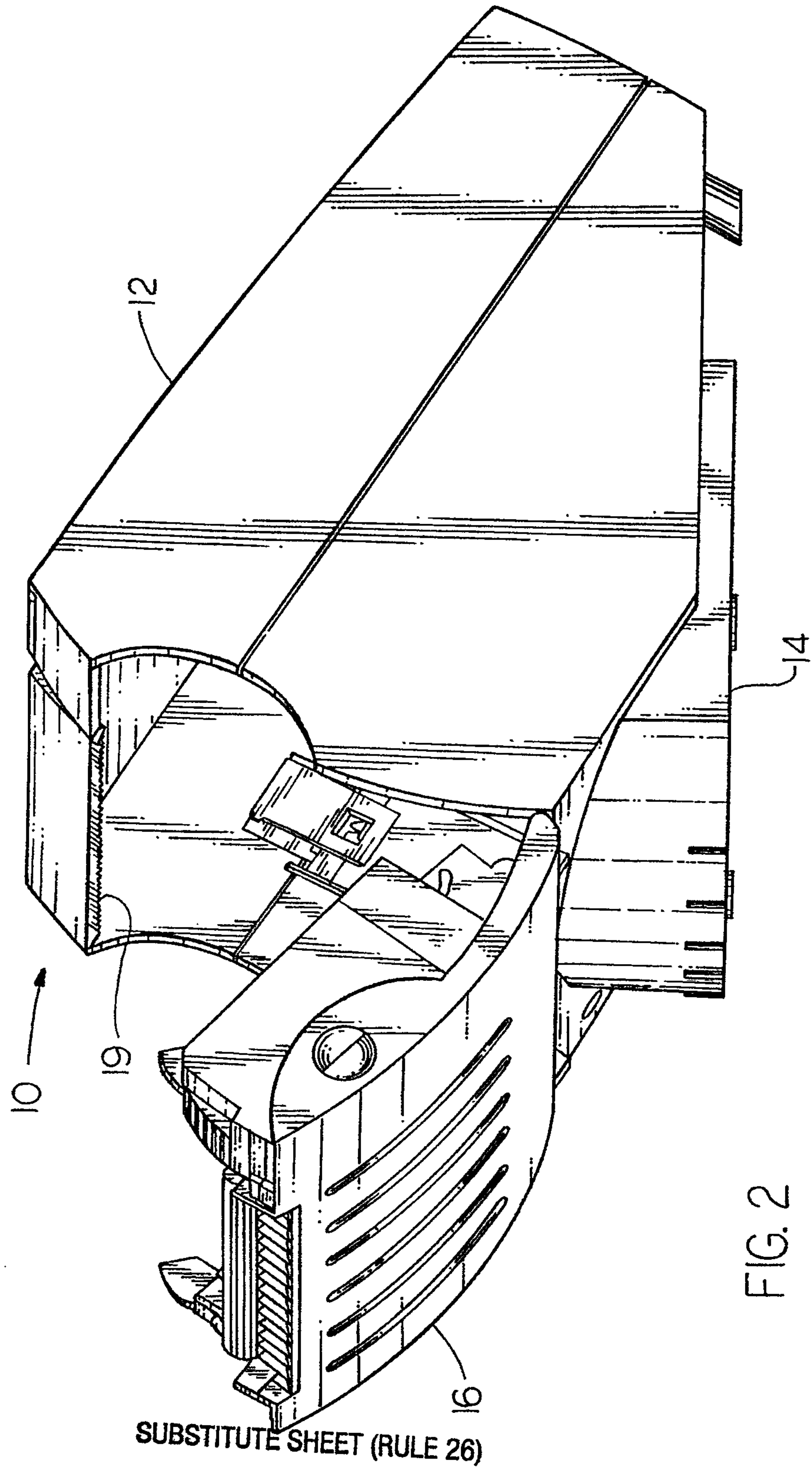


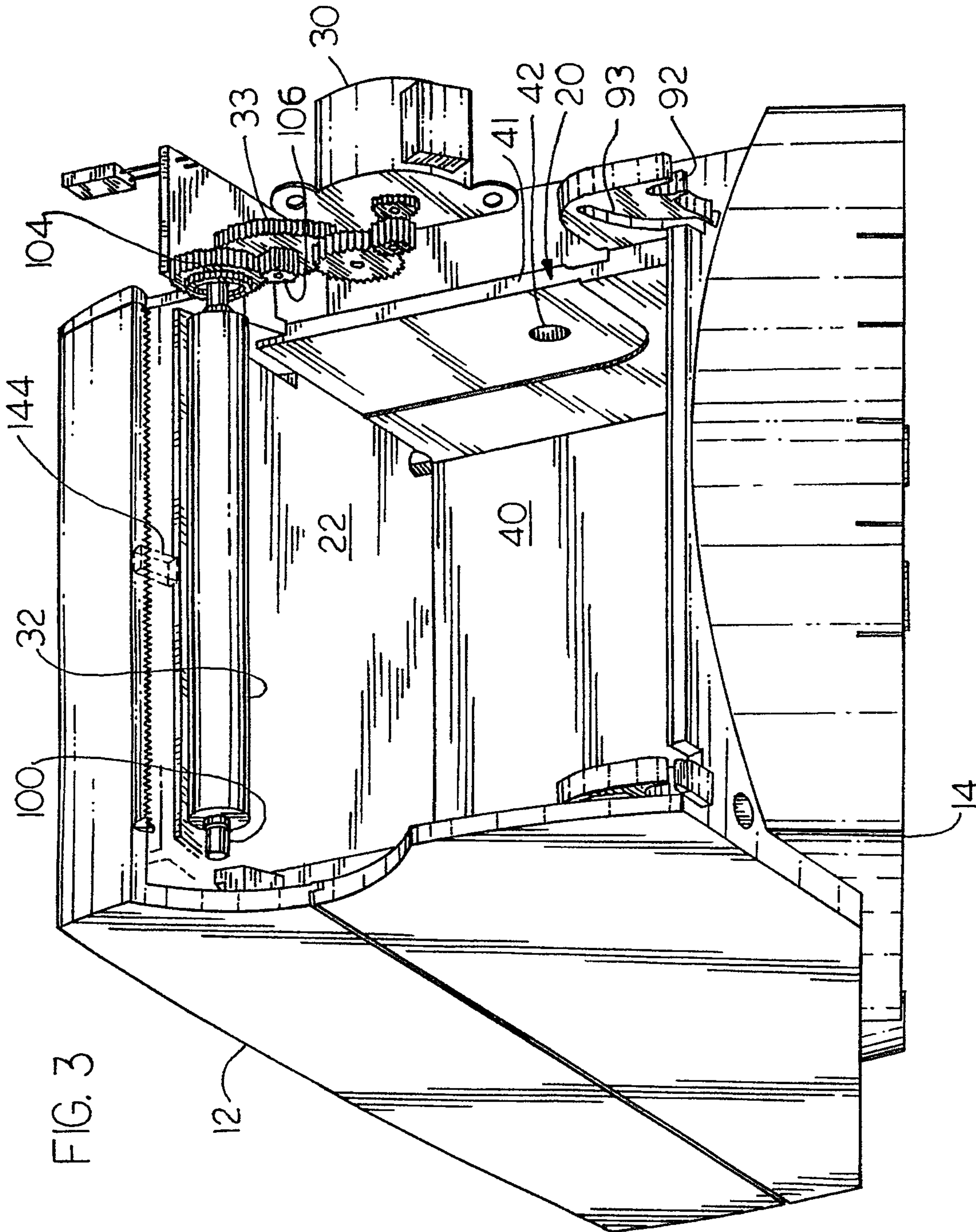
FIG. 1

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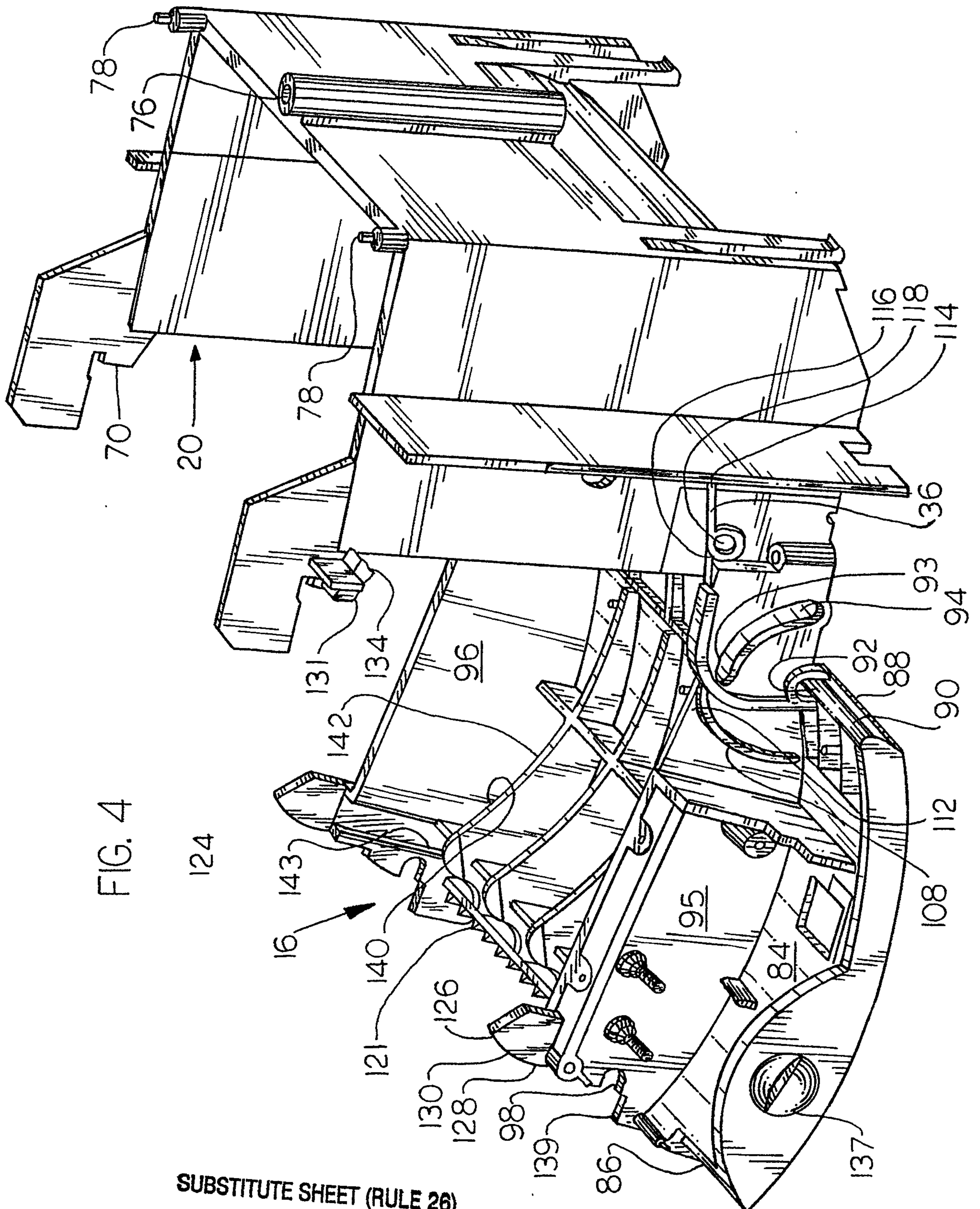


FIG. 4

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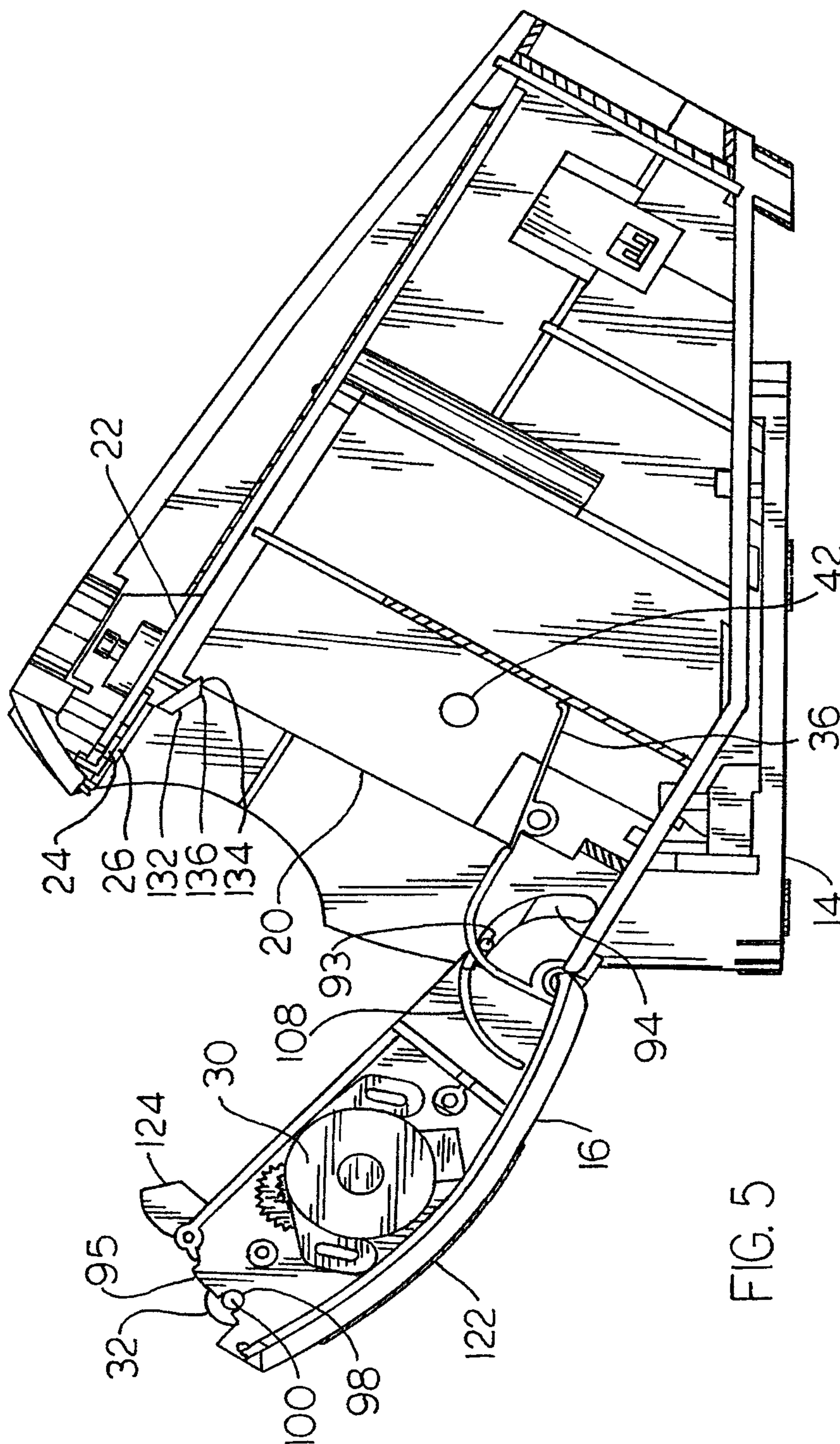


FIG. 5

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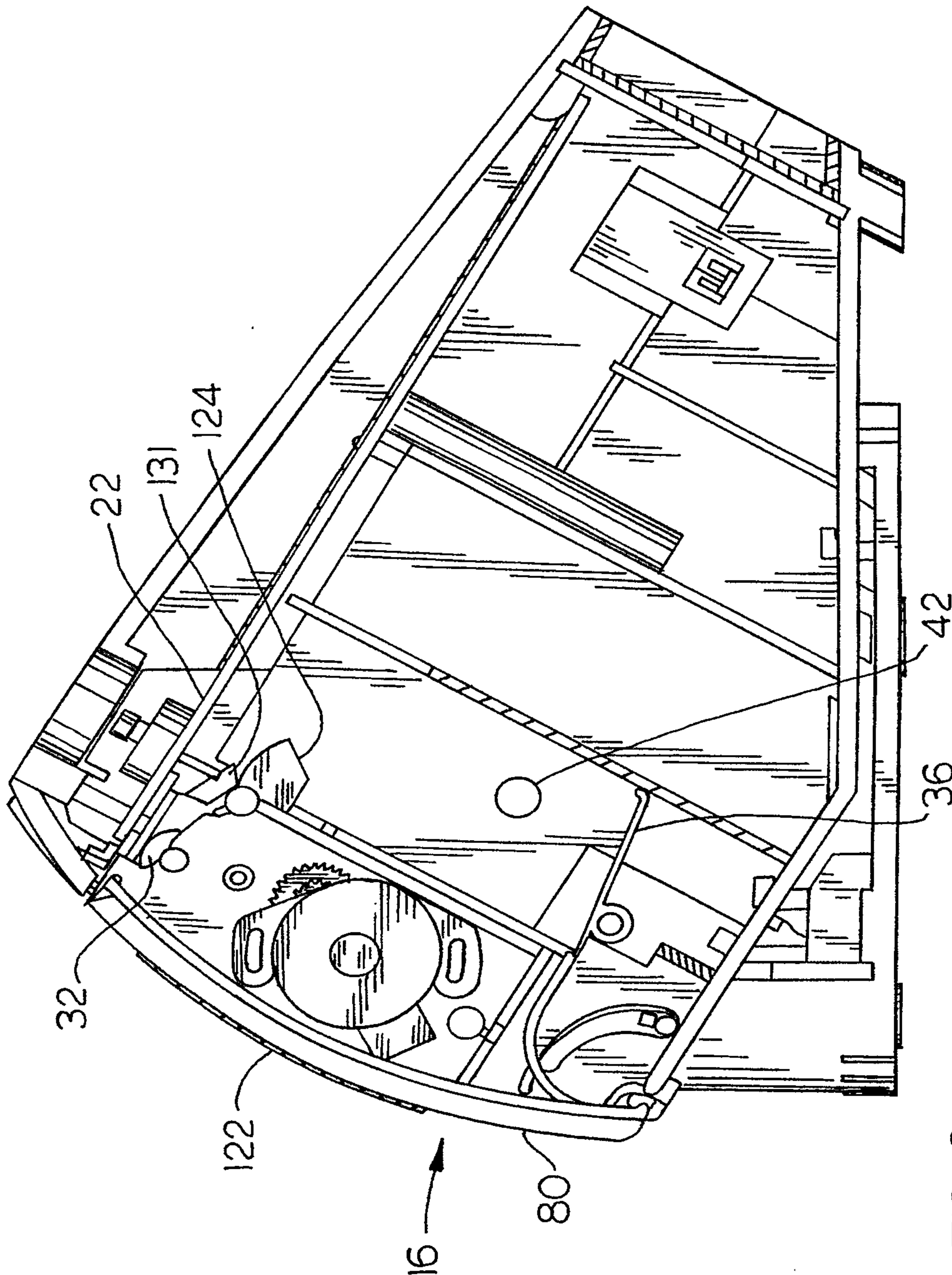


FIG. 6

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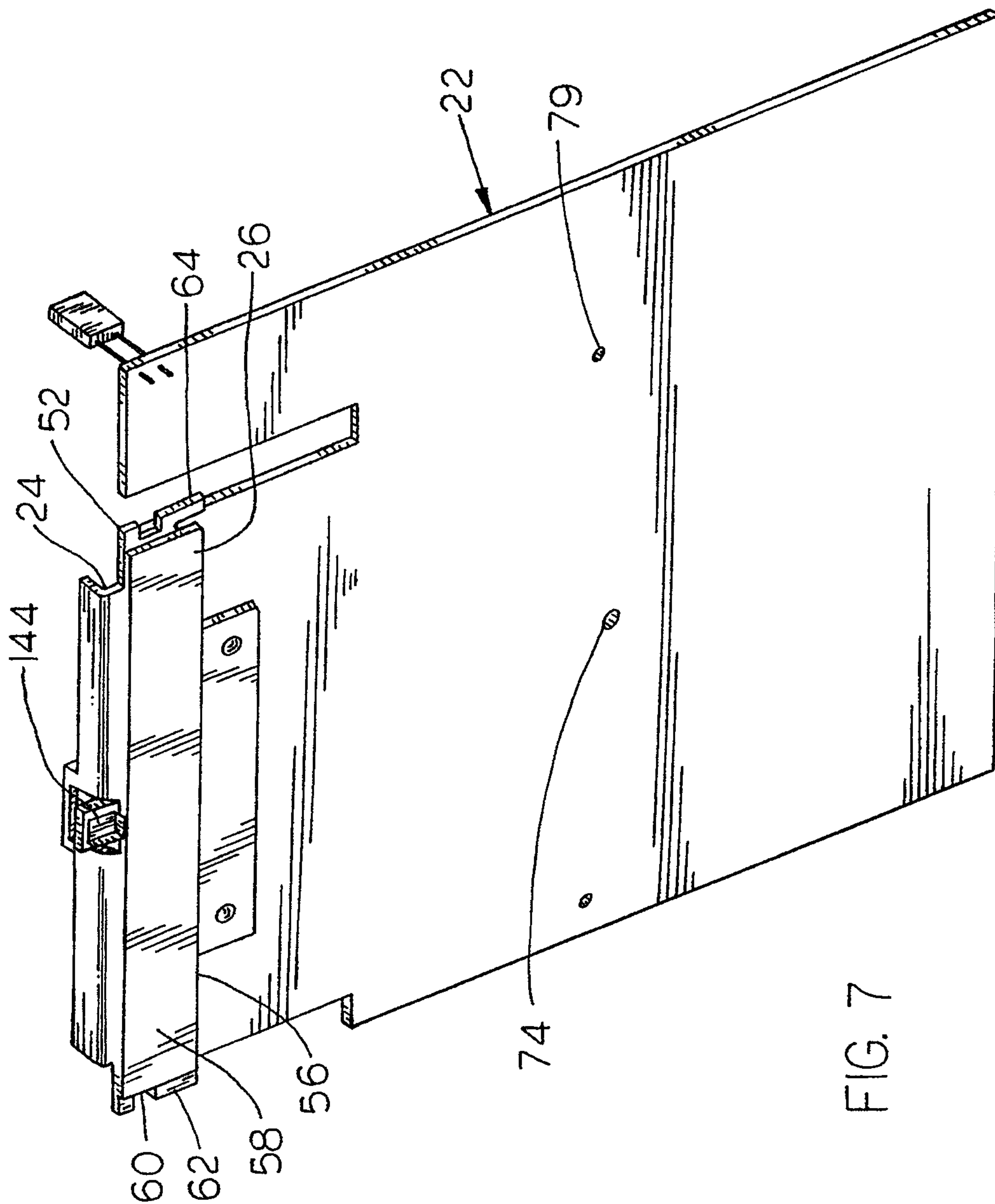
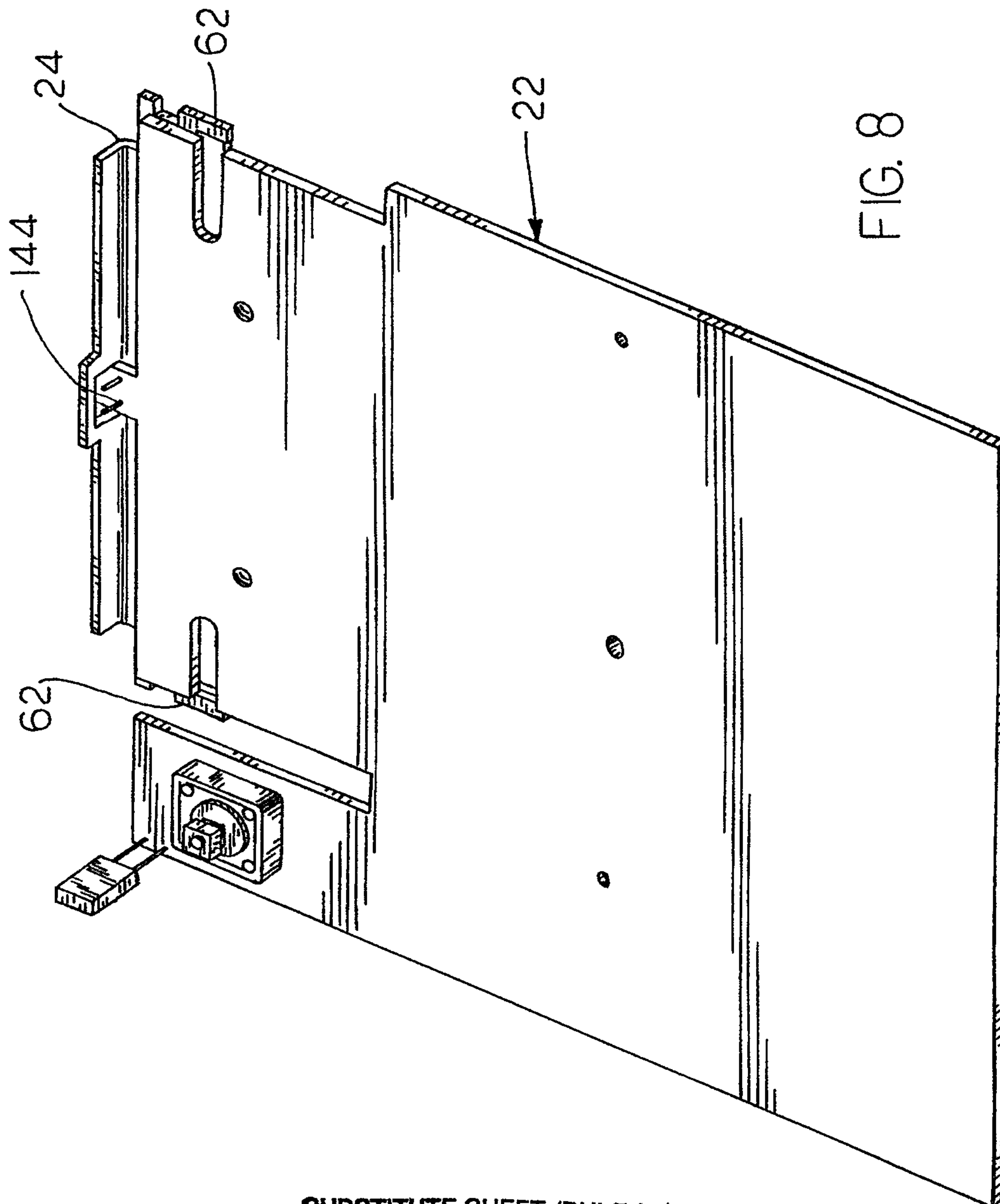


FIG. 7

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