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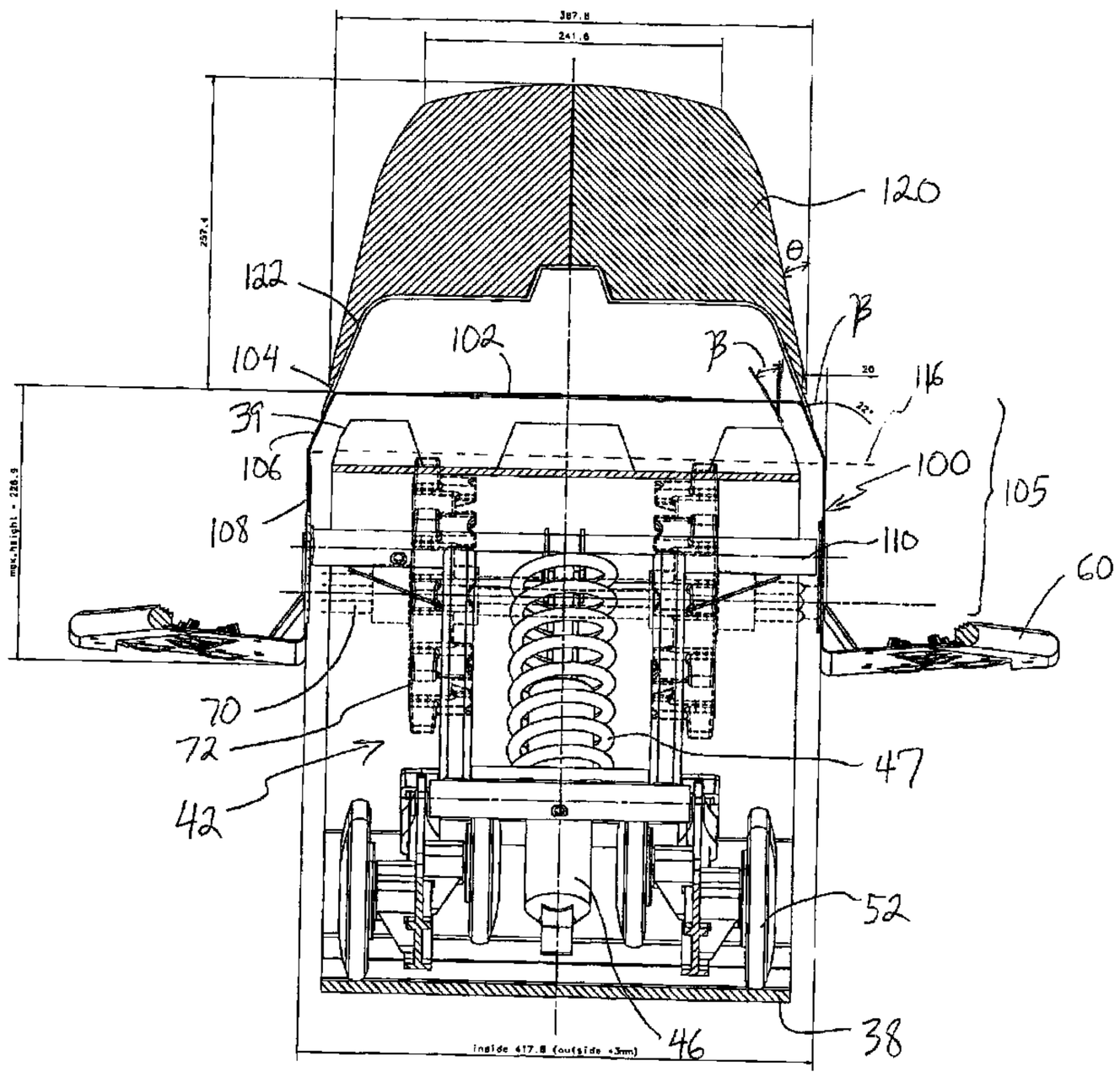
(54) Titre : MOTONEIGE A TUNNEL BISEAUTE
(54) Title: SNOWMOBILE WITH BEVELED TUNNEL



(57) Abrégé/Abstract:
A snowmobile tunnel has a top surface for supporting a seat and a pair of beveled surfaces that connect to and flare outwardly and downwardly from side edges of the top surface. The tunnel also has a pair of spaced-apart, substantially vertical side surfaces connected to, and depending downwardly from, each of the beveled surfaces. Whereas the side edges of a prior-art, square-profile tunnel tend to dig into the rider's legs when cornering and/or when riding a wide-track snowmobile, the beveled tunnel design of the present invention greatly diminishes this problem and thus enhances rider comfort.

ABSTRACT OF THE DISCLOSURE

A snowmobile tunnel has a top surface for supporting a seat and a pair of beveled surfaces that connect to and flare outwardly and downwardly from side edges of the top surface. The tunnel also has a pair of spaced-apart, substantially vertical side surfaces connected to, and depending downwardly from, each of the beveled surfaces. Whereas the side edges of a prior-art, square-profile tunnel tend to dig into the rider's legs when cornering and/or when riding a wide-track snowmobile, the beveled tunnel design of the present invention greatly diminishes this problem and thus enhances rider comfort.

SNOWMOBILE WITH BEVELED TUNNEL

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This is the first application filed for the present invention.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a snowmobile and, more particularly, to a snowmobile tunnel.

BACKGROUND OF THE INVENTION

[0003] Prior-art snowmobile tunnels conventionally have a "square profile", meaning that side portions 18b of the tunnel 18 are substantially perpendicular to a top portion 18a, or top surface, of the tunnel, as illustrated in FIG. 1. In other words, the side portions 18b of the tunnel depend downwardly from side edges 18c of the top portion 18a in a generally orthogonal manner. The side portions are spaced apart to accommodate an endless drive track 38 and to provide mounting points for the rear suspension 42, as is known in the art. The side portions typically support footrests 60 that help position the rider in a comfortable posture on a seat 58 while providing adequate ground clearance, as is also known in the art.

[0004] FIG. 1 shows a snowmobile having a standard 15-inch track. When aggressively cornering, however, the side edges 18c tend to dig into the legs 4 of the rider 2, causing discomfort and thus rendering the entire driving experience less pleasant.

[0005] For a wide-tracked snowmobile, as depicted in FIG. 2, the seat 58 is often made to be as wide as the tunnel 18, which makes it quite uncomfortable for a rider to

straddle the seat. Furthermore, with an extra wide seat, it is difficult to lean into a turn without having to lift one's foot off the outside footrest.

[0006] One solution to the problems associated with extra-wide seats has been to place a standard-size seat, *i.e.* a seat designed for a standard 15-inch tunnel, on a tunnel that is designed for a 20- or 24-inch wide track. However, during cornering, the side edges of the standard-size tunnel tend to dig into the rider's legs, causing discomfort and, furthermore, diminishing control of the snowmobile.

[0007] Therefore, it would be highly desirable to provide a snowmobile tunnel that improves rider comfort while enabling the rider to maintain good control of the snowmobile.

SUMMARY OF THE INVENTION

[0008] It is an object of the present invention to provide a snowmobile tunnel that improves rider comfort while enabling the rider to maintain good control of the snowmobile, especially when cornering aggressively and/or when riding a wide-track snowmobile.

[0009] In accordance with one aspect of the present invention, a snowmobile includes a frame including a tunnel, an engine disposed on the frame, a drive track disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile, a straddle seat disposed on the tunnel above the drive track and rearward of the engine, and two steerable skis disposed on the frame, each via a front suspension. The tunnel includes a top portion for supporting a seat, and a pair of

side walls depending downwardly from side edges of the top portion, the side walls being spaced apart to accommodate an endless drive track, the side walls having beveled upper portions and substantially vertical lower portions, the upper beveled portions connecting the top portion of the tunnel to the substantially vertical lower portions.

[0010] In one embodiment, the seat has beveled sides to further increase rider comfort.

[0011] In another embodiment, the beveled portion has a bevel angle of 20 to 24 degrees from the vertical.

[0012] In accordance with yet another aspect of the present invention, a snowmobile includes a frame including a tunnel, an engine disposed on the frame, a drive track disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile, a straddle seat disposed on the tunnel above the drive track and rearward of the engine, and two steerable skis disposed on the frame, each via a front suspension. The tunnel includes a top surface for supporting a seat, a pair of beveled surfaces that connect to and flare outwardly and downwardly from side edges of the top surface, and a pair of spaced-apart, substantially vertical side surfaces, each side surface being connected to and depending downwardly from a respective beveled surface for supporting a footrest.

[0013] In one embodiment, the seat has beveled sides to further increase rider comfort.

[0014] In another embodiment, the beveled surfaces have bevel angles of 21 to 23 degrees from the vertical.

[0015] In another embodiment, the top surface has a width equal to 88% to 92% of a width of the tunnel and a width of a horizontal projection of each beveled surface is equal to 4% to 6% of the width of the tunnel.

[0016] In yet another embodiment, a vertical projection of each beveled surface has a height equal to 27%-29% of a height of each vertical side wall.

[0017] The beveled tunnel improves rider comfort, as compared with prior-art, square-profile tunnels that tend to dig into the rider's legs when cornering aggressively on a snowmobile with a standard (*e.g.* 15-inch) track or when straddling wide-tracked snowmobiles, *e.g.* snowmobiles with 20-inch or 24 inch tracks. The beveled tunnel enhances rider comfort while permitting transverse structural members to be connected to the side walls beneath the beveled portions. Since the beveled tunnel design does not require repackaging or re-engineering of the rear suspension or the endless track drive, the beveled tunnel can be readily integrated into current snowmobile designs.

[0018] Other features and advantages of the present invention will be better understood with reference to the preferred embodiment described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Having thus generally described the nature of the present invention, reference will now be made to the accompanying drawings by way of illustration showing a preferred embodiment, in which:

[0020] FIG. 1 is a rear view of a prior-art snowmobile having a standard-size, conventional, square-profile tunnel;

[0021] FIG. 2 is a rear view of a wide-track prior-art snowmobile, depicting a rider uncomfortably straddling a wide seat mounted on a wide tunnel;

[0022] FIG. 3 is a side view of a snowmobile capable of incorporating a beveled tunnel in accordance with embodiments of the present invention;

[0023] FIG. 4 is a rear view of a snowmobile having a beveled tunnel in accordance with a preferred embodiment of the present invention; and

[0024] FIG. 5 is a rear view of a rider on a snowmobile having a beveled tunnel in accordance with embodiments of the present invention;

[0025] FIG. 6 is an isometric perspective view of an endless drive track and associated rear suspension, depicted with a beveled tunnel in accordance with the preferred embodiment of the present invention, viewed from a rear left side of the snowmobile; and

[0026] FIG. 7 is a rear view of the beveled tunnel shown in FIG. 6; and

[0027] FIG. 8 is a side elevational view of the drive track, rear suspension and beveled tunnel shown in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0028] Referring now to FIG. 3, a snowmobile incorporating an embodiment of the present invention is designated generally by references numeral 10. Although certain aspects of the present invention are applicable in other types of vehicles, the present invention has particular utility in connection with snowmobiles.

[0029] The snowmobile 10 includes a forward end 12 and a rearward end 14 which are defined consistently with a travel direction of the vehicle. The snowmobile 10 has a frame or chassis 16 which includes a beveled tunnel 100 in accordance with embodiments of the present invention, and which will be described in detail below, an engine cradle portion 20 and a front suspension assembly portion 22. An engine 24, which is schematically illustrated in FIG. 3, is carried by the engine cradle portion 20 of the frame 16. A ski and steering assembly (not indicated) is provided, in which two skis 26 are positioned at the forward end 12 of the snowmobile 10 and are attached to the front suspension assembly portion 22 of the frame 16 through a front suspension assembly 28. The front suspension assembly 28 includes ski legs 30, supporting arms 32 and ball joints (not shown) for operatively joining the respective ski legs 30, supporting arms 32 and a steering column 34. The steering column 34 at its upper end is attached to a steering device such as a handlebar 36 which is positioned forward of a rider and behind the engine 24 to rotate the ski legs 30 and thus the skis 26, in order to steer the vehicle.

[0030] An endless drive track 38 is positioned at the rear end 14 of the snowmobile 10 and is disposed under the beveled tunnel 100, being connected operatively to the engine 24 through a belt transmission system 40 which is schematically illustrated by broken lines in FIG. 3. Thus, the endless drive track 38 is driven to run about a rear suspension assembly 42 for propulsion of the snowmobile 10. The rear suspension assembly 42 includes a pair of slide rails 44 in sliding contact with the endless drive track 38. The rear suspension assembly 42 also includes one or more shock absorbers 46 which may further include a coil

spring (not shown) surrounding the individual shock absorbers 46. Front and rear suspension arms 48 and 50 are provided to attach the slide rails 44 to the frame (chassis) 16. One or more idler wheels 52 are also provided in the rear suspension assembly 42.

[0031] At the front end 12 of the snowmobile 10, fairings 54 enclose the engine 24 and the belt transmission system 40, thereby providing an external shell that not only protects the engine 24 and the belt transmission system 40, but can also be decorated to make the snowmobile 10 more aesthetically pleasing. Typically, the fairings 54 include a hood (not indicated) and one or more side panels which can be opened to allow access to the engine 24 and the belt transmission system 40 when this is required, for example, for inspection or maintenance of the engine 24 and/or the belt transmission system 40. In the particular snowmobile 10 shown in FIG. 3, the side panels can be opened along a vertical axis to swing away from the snowmobile 10. A windshield 56 may be connected to the fairings 54 near the front end 12 of the snowmobile 10 or directly to the handlebar 36. The windshield 56 acts as a wind screen to lessen the force of the air on the rider while the snowmobile 10 is moving.

[0032] The engine 24 is a type of internal combustion engine that is supported on the frame 16 and is located at the engine cradle portion 20. The internal construction of the engine 24 may be of any known type, however the engine 24 drives an engine output shaft (not shown) that rotates about a horizontally disposed axis that extends generally transversely to a longitudinal centerline 61 of the snowmobile 10. The engine output shaft drives the belt

transmission system 40 for transmitting torque to the endless drive track 38 for propulsion of the snowmobile 10.

[0033] A straddle-type seat 58 is positioned atop the frame 16 and extends from the rear end 14 of the snowmobile 10 to the fairings 54. A rear portion of the seat 58 may include a storage compartment or can be used to accommodate a passenger seat (not indicated). Two footrests 60 are positioned on opposite sides of the snowmobile 10 below the seat 58 to accommodate the driver's feet.

[0034] FIG. 4 is a rear view of a snowmobile having a beveled tunnel 100 in accordance with a preferred embodiment of the present invention. As illustrated in FIG. 4, the beveled tunnel 100 has a top portion 102 for supporting a seat 120. The tunnel 100 also includes a pair of side walls 105 depending downwardly from side edges 104 of the top portion 102, the side walls 105 being spaced apart to accommodate an endless drive track 38, the side walls having beveled upper portions 106 and substantially vertical lower portions 108, the upper beveled portions 106 connecting the top portion 102 of the tunnel 100 to the substantially vertical lower portions 108.

[0035] In the preferred embodiment, as illustrated in FIG. 4, the top portion 102 is a generally flat top surface upon which the seat 120 is mounted. In the preferred embodiment, the upper beveled portions 106 are a pair of beveled surfaces that connect to and flare outwardly and downwardly from the side edges 104 of the top surface, *i.e.* top portion 102. In the preferred embodiment, the substantially vertical lower portions 108 are a pair of spaced-apart, substantially vertical side surfaces, each side surface being connected to and depending downwardly

from a respective beveled surface for supporting a footrest 60, as shown in FIG. 4.

[0036] As further illustrated in FIG. 4, the beveled surfaces (beveled portions 106) preferably have symmetrical bevel angles ß of 20° to 24°. More preferably, the bevel angle ß is 21° to 23° and, most preferably, ß = 22°.

[0037] As further illustrated in FIG. 4, the seat 120 can also be beveled to further enhance rider comfort. The seat 120 can be beveled either at the same angle as the beveled portions 106 or at a different angle. As shown in FIG. 4, a molded plastic understructure 122 of the seat 120 is preferably beveled at the same bevel angle ß while a padded upper portion of the seat is angled at a more shallow angle θ.

[0038] As further illustrated in FIG. 4, the beveled tunnel 100 can be readily integrated into most snowmobiles without having to repackage or re-engineer the rear suspension 42 and endless drive track 38. The position and layout of rear suspension components such as, for example, the shock absorber 46, coil spring 47, and idler wheels 52, need not be modified or relocated. Similarly, any transversely mounted shafts used for connecting the rear suspension 42 to the tunnel, *e.g.* the transverse shaft 110 used to anchor the top end of the shock 46, is preferably mounted to the substantially vertical lower portions 108, *i.e.* beneath the beveled portions 106. Since the beveled tunnel can be readily used on a snowmobile without repackaging the components of the rear suspension, the tunnel therefore provides a practical and useful improvement in snowmobile tunnel technology.

[0039] FIG. 4 illustrates, by way of example only, a snowmobile having a 15-inch track in which the seat 120 on the beveled tunnel 100 preferably has a width equal to 90-95% of a width of the tunnel, although this proportion can of course be varied beyond this range. It should be expressly understood that the beveled tunnel can be applied to snowmobiles having any track size, including wide-track snowmobiles having 20-inch or 24-inch tracks and therefore the ranges, percentages and ratios mentioned herein are merely meant to serve as an example, and are therefore not intended to be limiting in any manner whatsoever. In the example shown in FIG. 4 (where the tunnel is sized to accommodate a standard 15-inch track), the top portion 102 preferably has a width that is between 85% and 95% of the width of the tunnel, whereby a horizontal projection of each beveled portion correspondingly has a width between 2.5% and 7.5% of the width of the tunnel. More preferably, and again by way of example only, the width of the top portion is equal to 88% to 92% of the width of the tunnel and the width of the horizontal projection of each beveled portion is equal to 4% to 6% of the width of the tunnel. Most preferably, and again by way of example only, the width of the top portion is equal to 90% of the width of the tunnel and the width of the horizontal projection of each beveled portion is equal to %5 of the width of the tunnel.

[0040] Preferably, and again by way of example only, a vertical projection of each beveled portion has a height equal to 26-30% (and more preferably 28%) of a height of each lower vertical portion. For greater certainty, it bears repeating that the foregoing ranges, percentages and ratios are presented solely for the purposes of example to illustrate the best mode known to the applicant(s) of

implementing the invention on a snowmobile tunnel designed for a standard-size 15-inch track, and therefore should not be construed in any way as delimiting the scope of the invention.

[0041] As further illustrated in FIG. 4, the endless drive track 38 has a plurality of lugs 39 extending outwardly from the endless drive track for increasing traction in the snow, as is known in the art. Each of the lugs 39 has a base attached to the outer surface of the track 38 and a tip extending away from the base. The lugs are beveled toward the tip, as shown in FIG. 4. Preferably, at least a portion of each lug extends above a horizontal plane 116 that demarcates the lowest point of the beveled portion 106 of the tunnel 100, *i.e.* where the beveled portion 106 of the tunnel meets the lower vertical portion 108 of the tunnel. Preferably, the lugs 39 are beveled at the same bevel angle (*e.g.* ß = 22°) as the beveled portion 106 in order to enable compact but interference-free packaging of the drive track 38 under the beveled tunnel 100.

[0042] As further illustrated in FIG. 4, a front drive axle 70 (which is operatively connected to the transmission system 40 in a manner well known in the art) is, in turn, rotatably mounted to the vertical side surfaces 108 (*i.e.* the substantially vertical side portions). In other words, the front drive axle 70 is mounted beneath the horizontal plane 116 defined by where the beveled surfaces and vertical side surfaces connect. As further shown in FIG. 4, a drive sprocket 72 is driven by the front drive axle 70 to drive the endless drive track 38, as is well known in the art. Preferably, the drive sprocket 72 rotates entirely below the horizontal plane 116 that is defined by where the beveled surfaces and vertical side surfaces

connect. In other words, as the drive sprocket 72 rotates, its outermost periphery remains beneath the horizontal plane 116.

[0043] As shown in FIG. 5, the beveled tunnel 100 enhances rider comfort. Compared to the "square-profile" prior-art tunnel shown in FIG. 2, the beveled tunnel shown in FIG. 5 greatly reduces the discomfort on the legs 4 of the rider 2. As shown in FIG. 5, the bevel angles of the beveled portions 106 and of the seat 120 are chosen to optimize comfort without sacrificing vehicle control. Accordingly, as will be appreciated by those of ordinary skill in the art, the bevel angles of the beveled portion 106 and of the seat 120 can be varied for different types of snowmobiles and to accommodate the varying tastes of different types of riders. As will be further appreciated by those of ordinary skill in the art, the design of a narrow, beveled seat 120 might require the footrests 60 to be raised since the rider who straddles the narrow, beveled seat is seated slightly more upright than in the traditionally seated posture.

[0044] FIG. 6 is an isometric perspective view of an endless drive track 38 and associated rear suspension 42, depicted with a beveled tunnel 100 in accordance with the preferred embodiment of the present invention, viewed from a rear left side of the snowmobile. As shown in FIG. 6, forward mounting points 112 and rearward mounting points 114 can be provided in the beveled portion 106 to enable the seat 120 to be mounted to the tunnel 100.

[0045] FIG. 7 is a rear view of the beveled tunnel 100. The beveled tunnel 100 is preferably manufactured from aluminum or a suitable aluminum alloy, although other high-stiffness, high-strength, lightweight materials could be

substituted. The beveled tunnel 100 can be manufactured by applying known metal-bending techniques and by riveting other aluminum components to the tunnel, such as the footrests 60. The footrests are preferably attached to the substantially vertical lower portions (side surfaces) 108 as shown in FIG. 7.

[0046] FIG. 8 is a side elevational view of the drive track 38, rear suspension 42 and beveled tunnel 100. As shown in FIG. 8, the rear suspension 42 includes front and rear shocks 46 and associated coil springs 47. Slide rails 44 and idler wheels 52 guide the endless drive track 38 around the rear suspension, as is known in the art. Although the beveled tunnel 100 enhances rider comfort, ground clearance and the degree to which the tunnel partially enshrouds the top of the rear suspension remains substantially the same as in prior-art snowmobiles, as shown in FIG. 8. Therefore, the beveled tunnel 100 improves rider comfort without detrimentally affecting the layout and configuration of the rear components of the snowmobile.

[0047] Modifications and improvements to the above-described embodiment of the present invention may become apparent to those skilled in the art. The foregoing description is intended to be exemplary rather than limiting. The scope of the present invention is therefore intended to be limited solely by the scope of the appended claims.

I/WE CLAIM:

1. A snowmobile comprising:

a frame including a tunnel;

an engine disposed on the frame;

a drive track disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile;

a straddle seat disposed above the tunnel, above the drive track and rearward of the engine; and

two steerable skis disposed on the frame, each via a front suspension;

wherein the tunnel includes

a top portion below the straddle seat; and

a pair of side walls depending downwardly from side edges of the top portion, the side walls being spaced apart to accommodate the drive track, the side walls having beveled upper portions and substantially vertical lower portions.

2. The snowmobile as claimed in claim 1 wherein the seat has beveled sides.

3. The snowmobile as claimed in claim 1 wherein each beveled portion has a bevel angle of 20 to 24 degrees from vertical.

4. The snowmobile as claimed in claim 1 wherein each beveled portion has a bevel angle of 21 to 23 degrees from vertical.

5. The snowmobile as claimed in claim 1 wherein each beveled portion has a bevel angle of 22 degrees from vertical.

6. The snowmobile as claimed in claim 1 wherein the seat has a width equal to 90-95% of a width of the tunnel.

7. The snowmobile as claimed in claim 1 wherein the top portion has a width that is between 85% and 95% of a width of the tunnel, such that a horizontal projection of each beveled portion has a width between 2.5% and 7.5% of the width of the tunnel.

8. The snowmobile as claimed in claim 7 wherein the top portion has the width of the top portion is equal to 90% of the width of the tunnel and the width of the horizontal projection of each beveled portion is equal to 5% of the width of the tunnel.

9. The snowmobile as claimed in claim 1 wherein a vertical projection of each beveled portion has a height equal to 26-30% of a height of each lower portion.

10. The snowmobile as claimed in claim 9 wherein the height of the vertical projection of each beveled portion has a height equal to 28% of the height of each lower portion.

11. A snowmobile comprising:

a frame including a tunnel;

an engine disposed on the frame;

a drive track disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile;

a straddle seat disposed above the tunnel, above the drive track and rearward of the engine; and

two steerable skis disposed on the frame, each via a front suspension,

wherein the tunnel includes

a top surface below the straddle seat;

a pair of beveled surfaces that connect to and flare outwardly and downwardly from the top surface; and

a pair of spaced-apart, substantially vertical side surfaces, each side surface being connected to and depending downwardly from a respective one of the beveled surfaces.

12. The snowmobile as claimed in claim 11 wherein the seat has beveled sides.

13. The snowmobile as claimed in claim 11 wherein each beveled surface has bevel angles of 21 to 23 degrees from vertical.

14. The snowmobile as claimed in claim 11 wherein the top surface has a width equal to 88% to 92% of a width of the tunnel and a width of a horizontal projection of each beveled surface is equal to 4% to 6% of the width of the tunnel.

15. The snowmobile as claimed in claim 11 wherein a vertical projection of each beveled surface has a

height equal to 27%-29% of a height of each vertical side surface.

16. The snowmobile as claimed in claim 11 wherein lugs on the drive track extend above a horizontal plane defined by where the beveled surfaces and the vertical side surfaces connect.

17. The snowmobile as claimed in claim 16 wherein the lugs are beveled at a same bevel angle as the beveled surfaces.

18. The snowmobile as claimed in claim 11 wherein a front drive axle is connected to the vertical side surfaces below a horizontal plane defined by where the beveled surfaces and the vertical side surfaces connect.

19. The snowmobile as claimed in claim 18 wherein a drive sprocket that is driven by the drive axle rotates entirely below the horizontal plane where the beveled surfaces and the vertical side surfaces connect.

20. The snowmobile as claimed in claim 11 wherein each pair of beveled surfaces comprises a plurality of beveled surfaces.

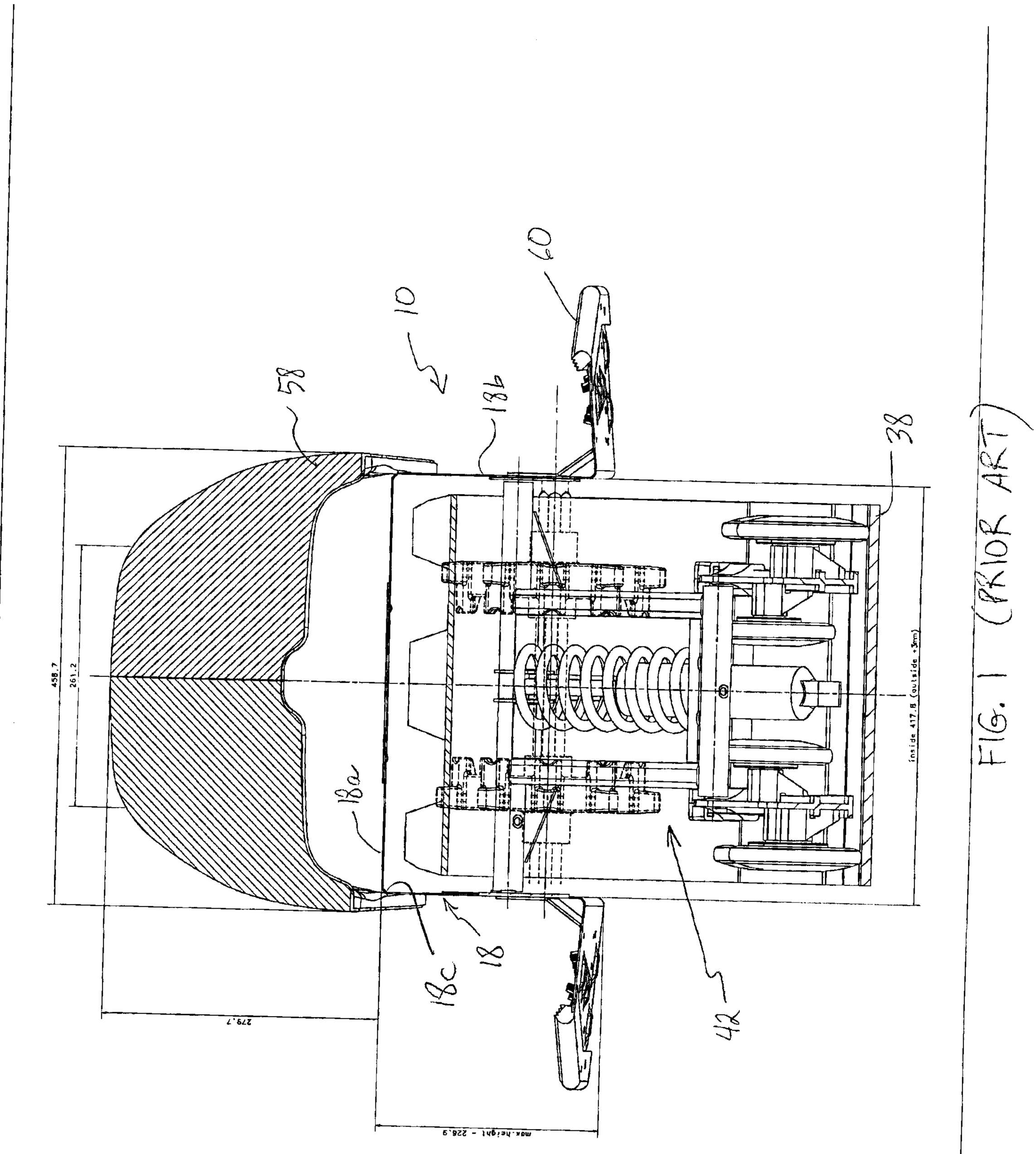
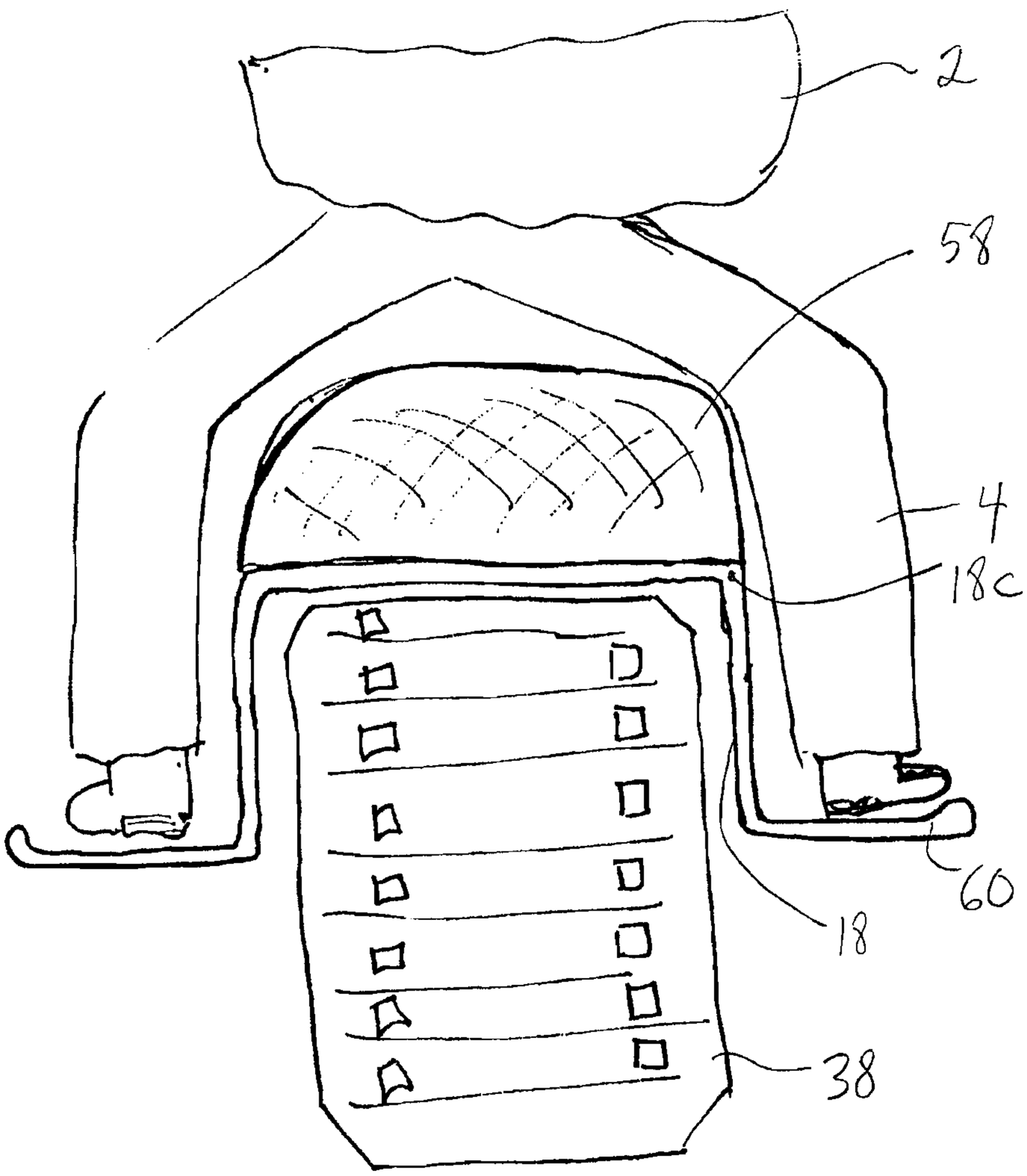


FIG. 1 (PRIOR ART)



(Prior Art)

FIG. 2

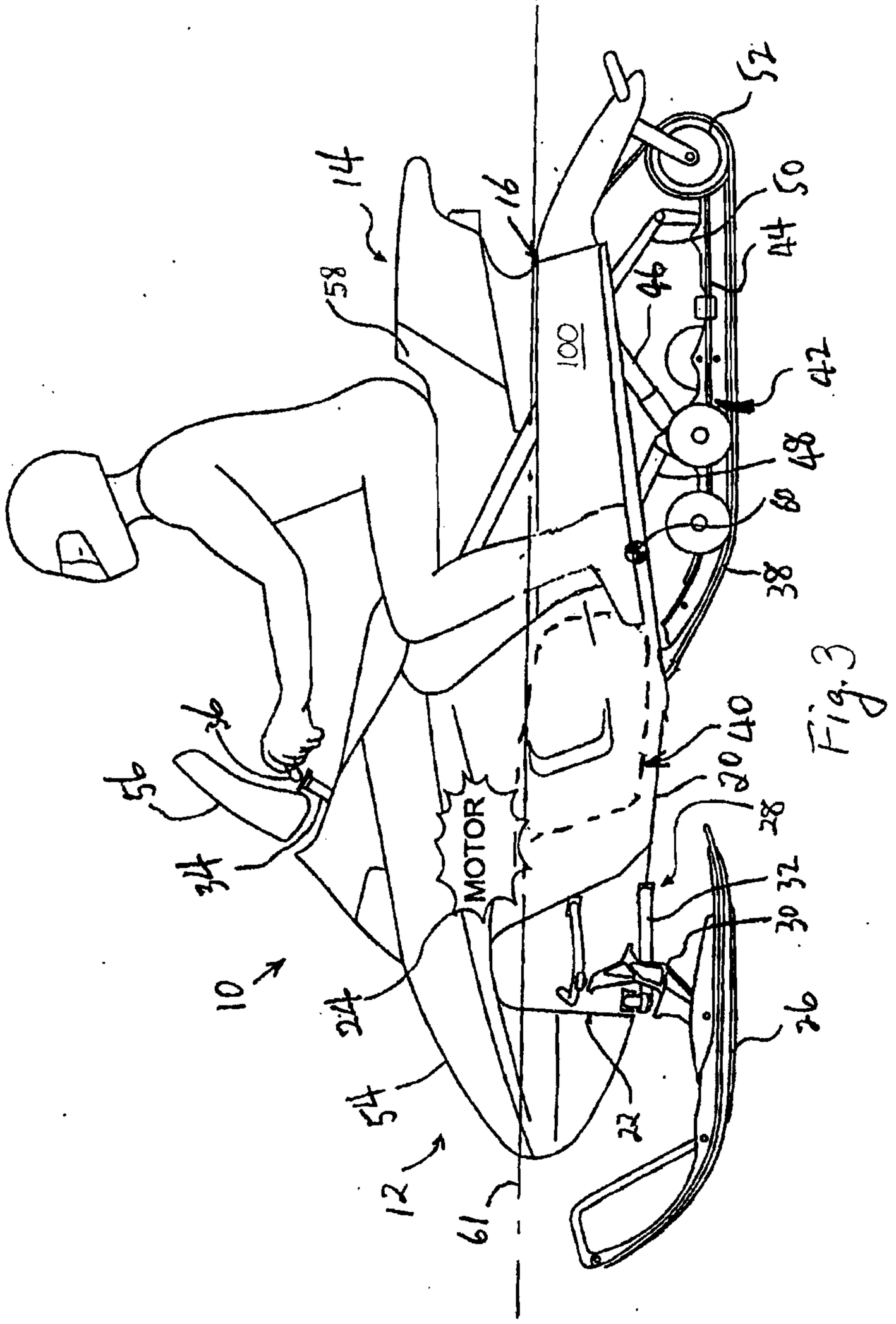

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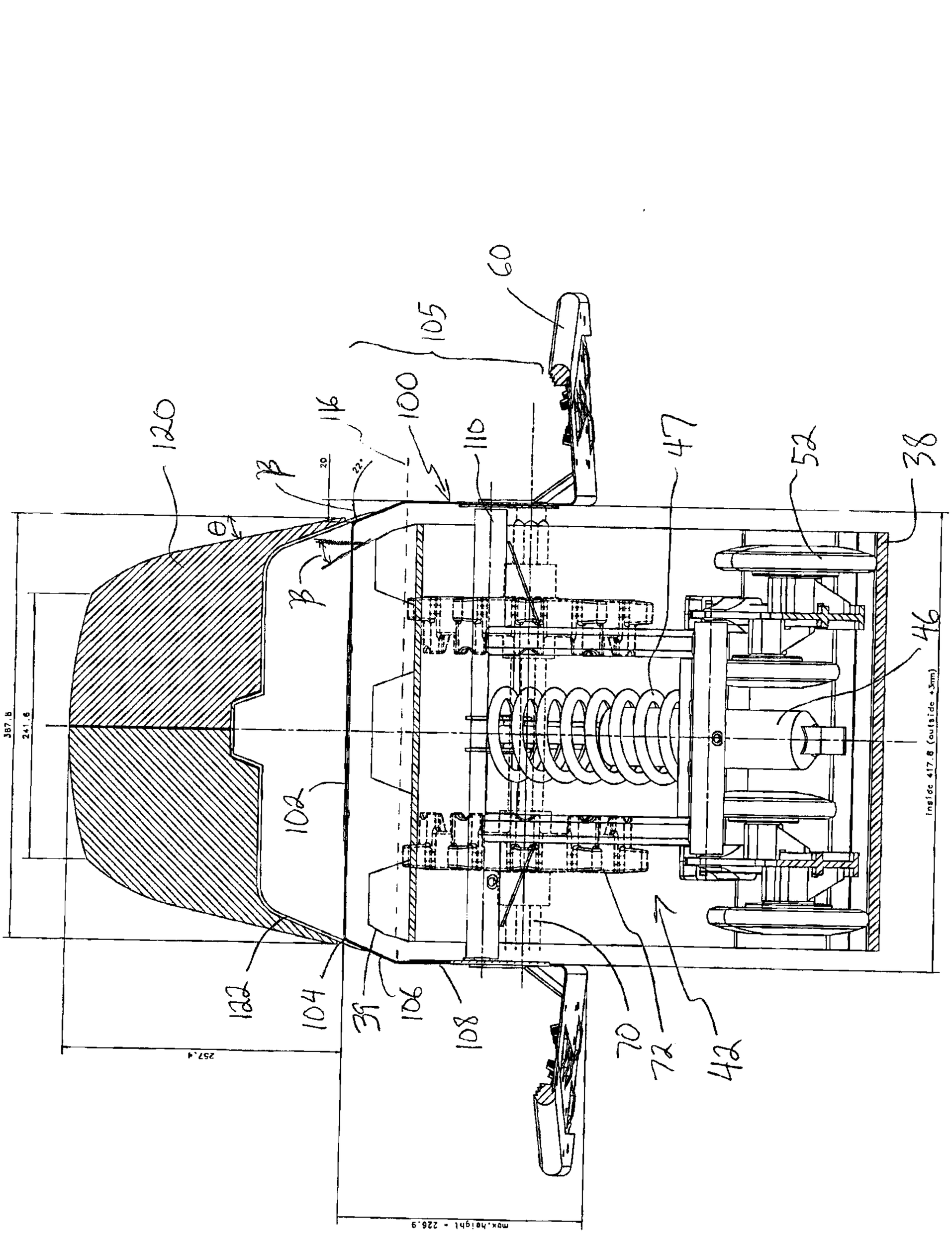
Fig. 3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46
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72
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241.6
257.4
max.height = 226.9
inside 417.8 (outside +3mm)

FIG. 4

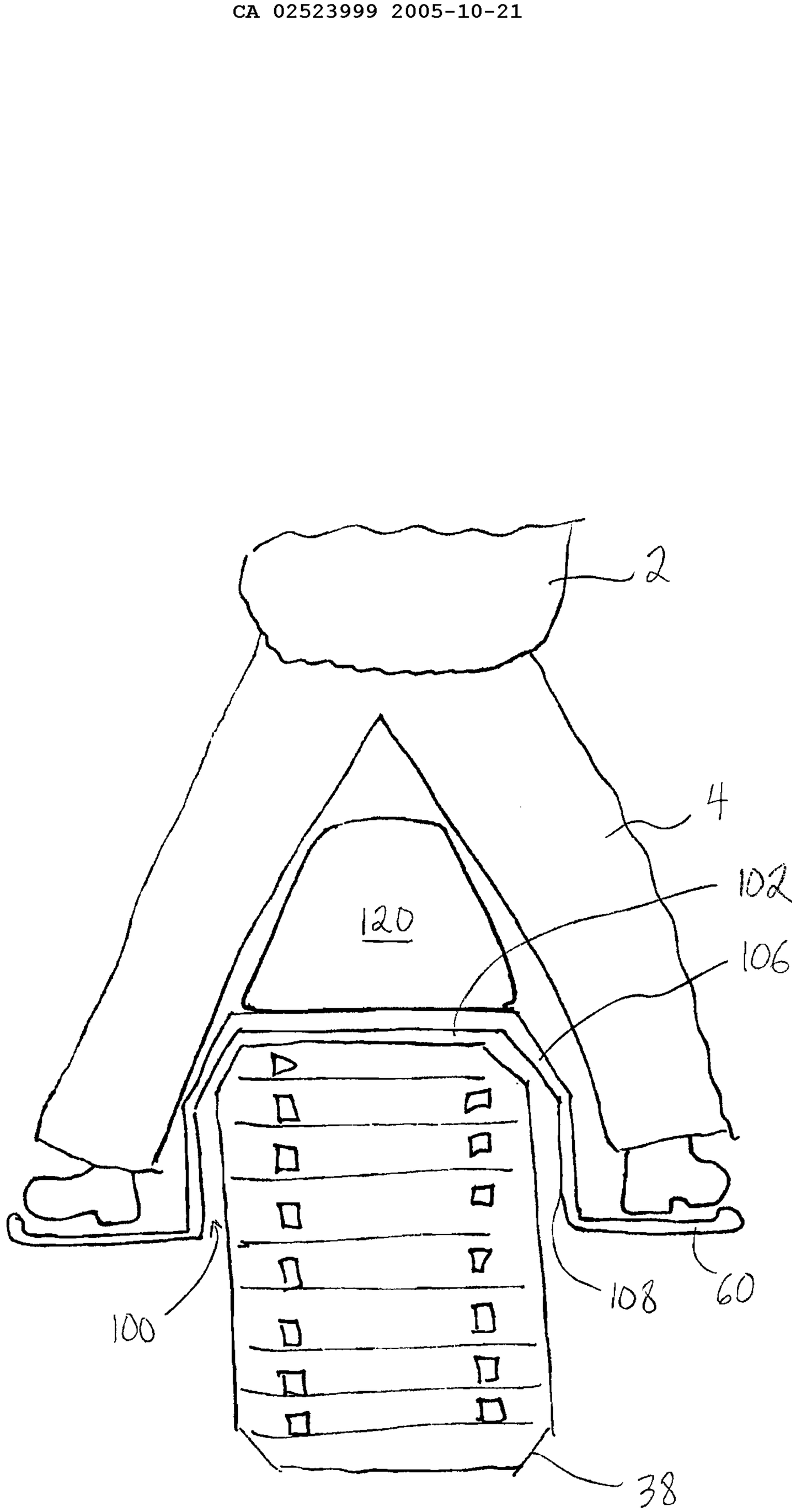


FIG. 5

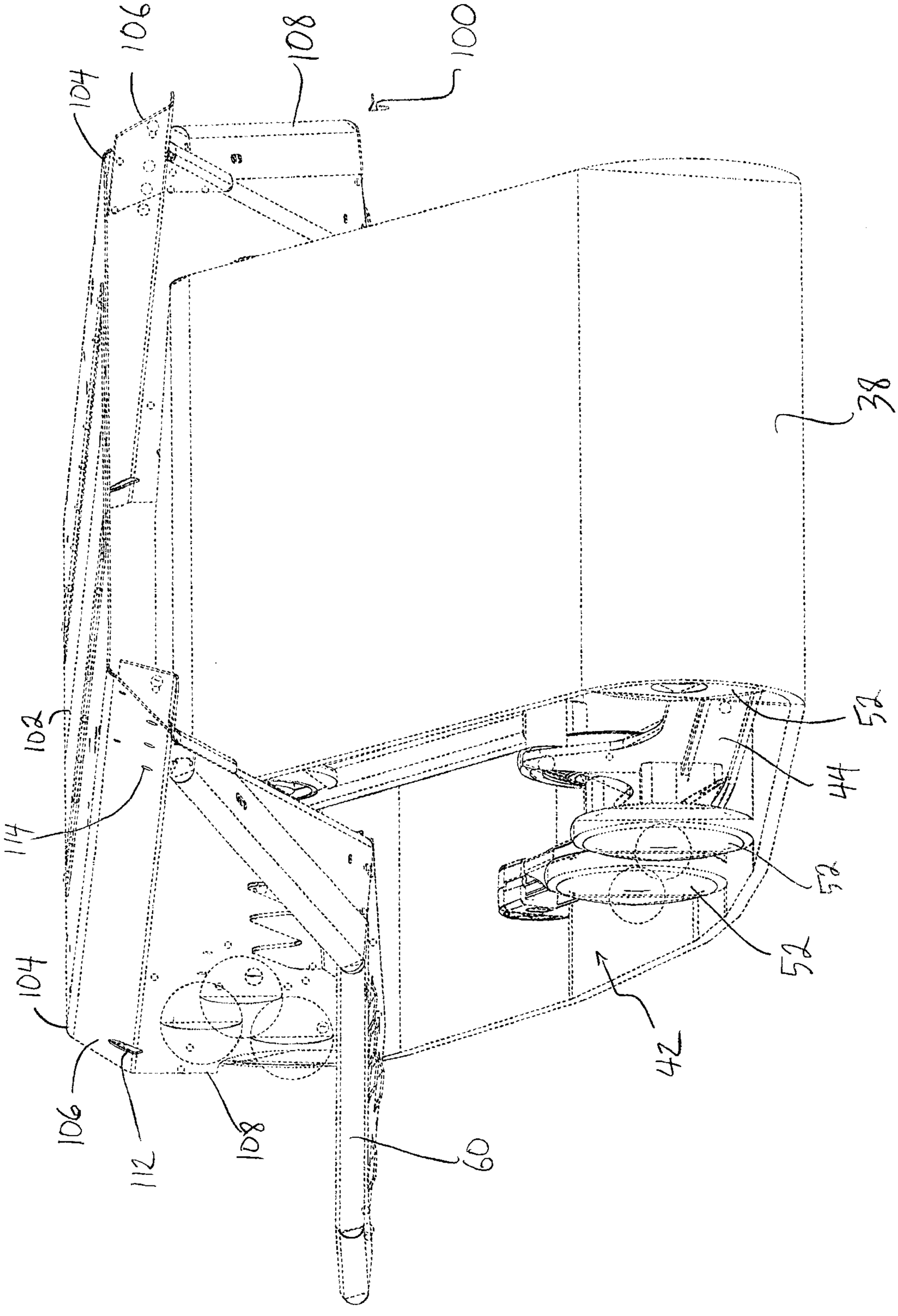


FIG. 6

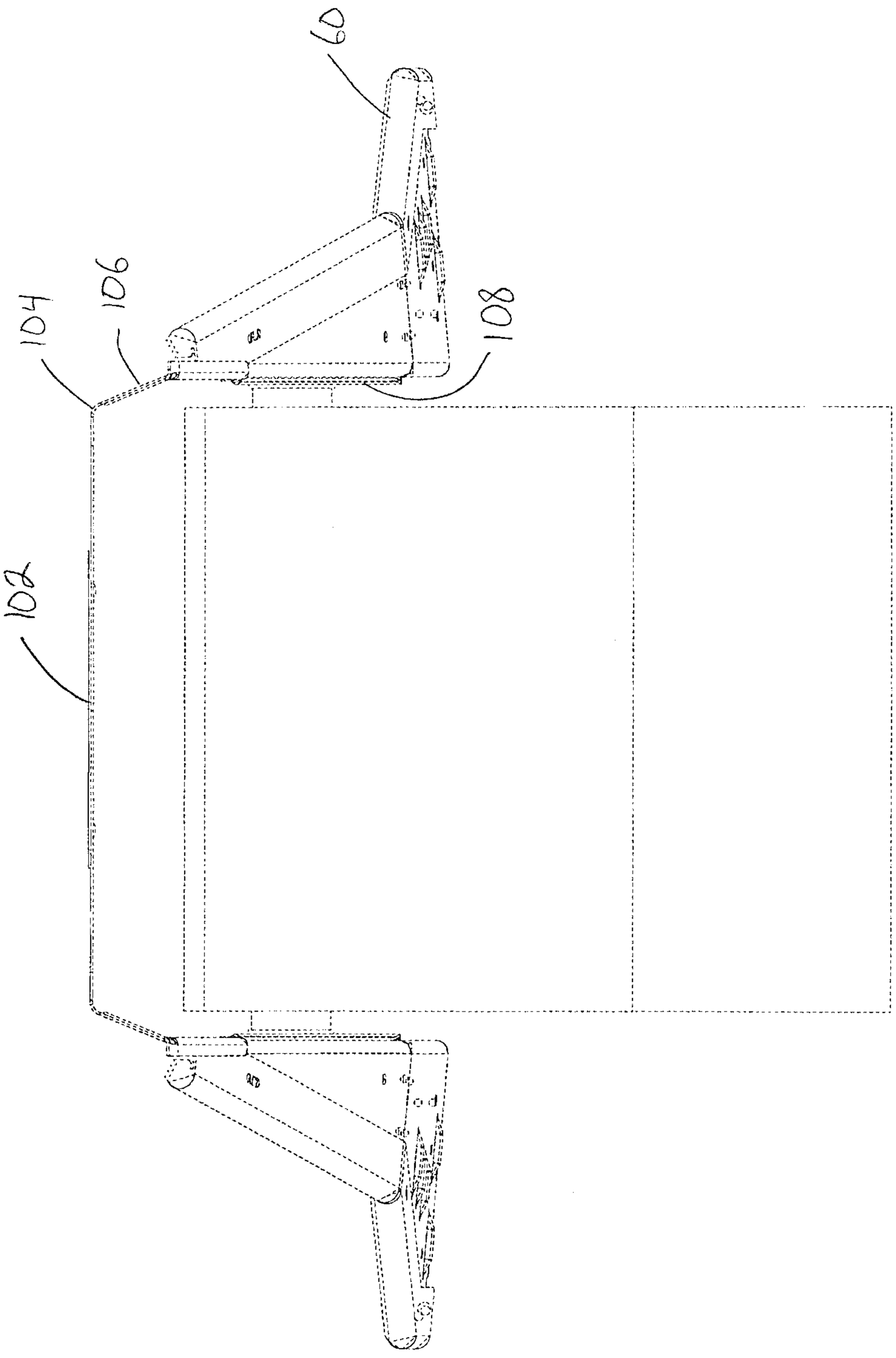


FIG. 7

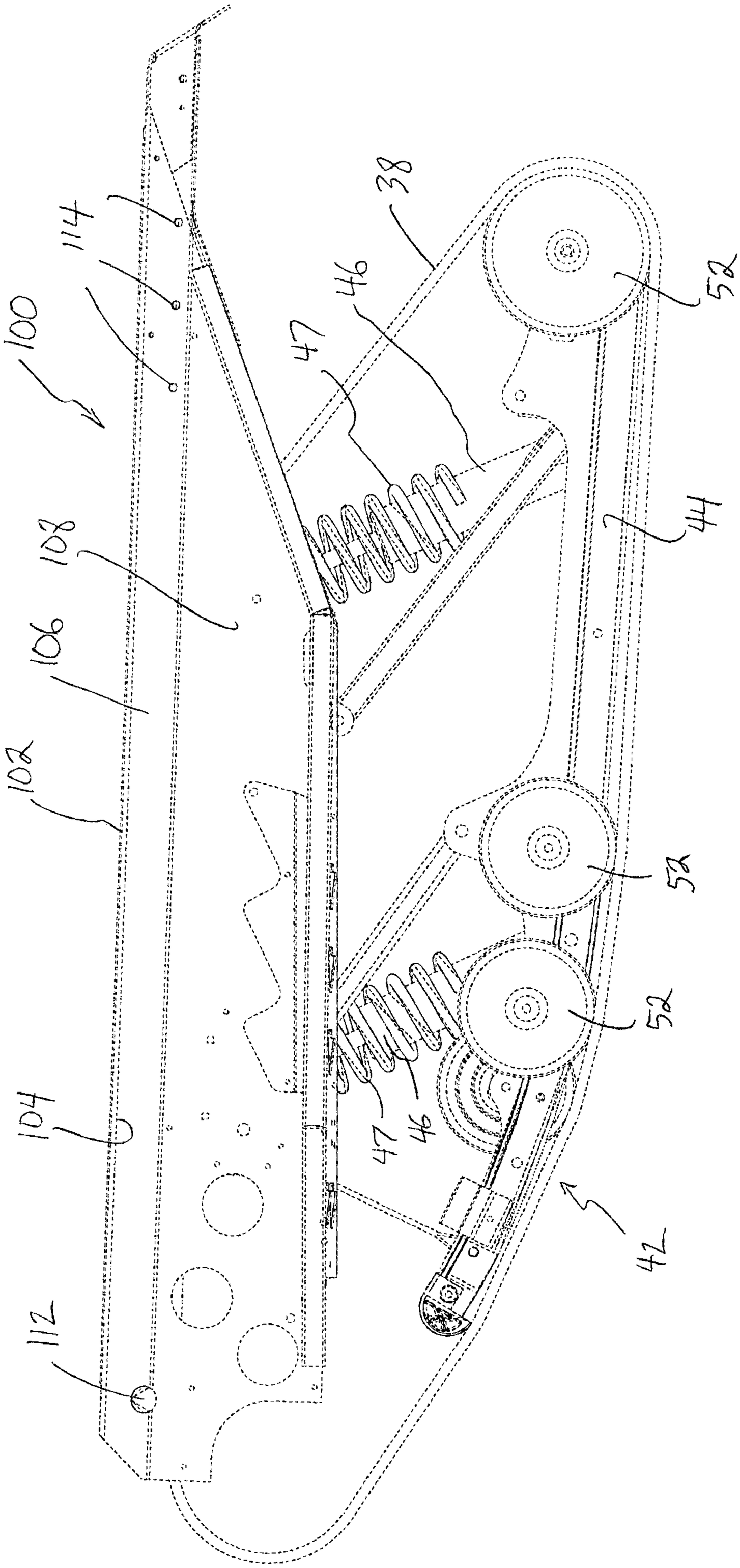
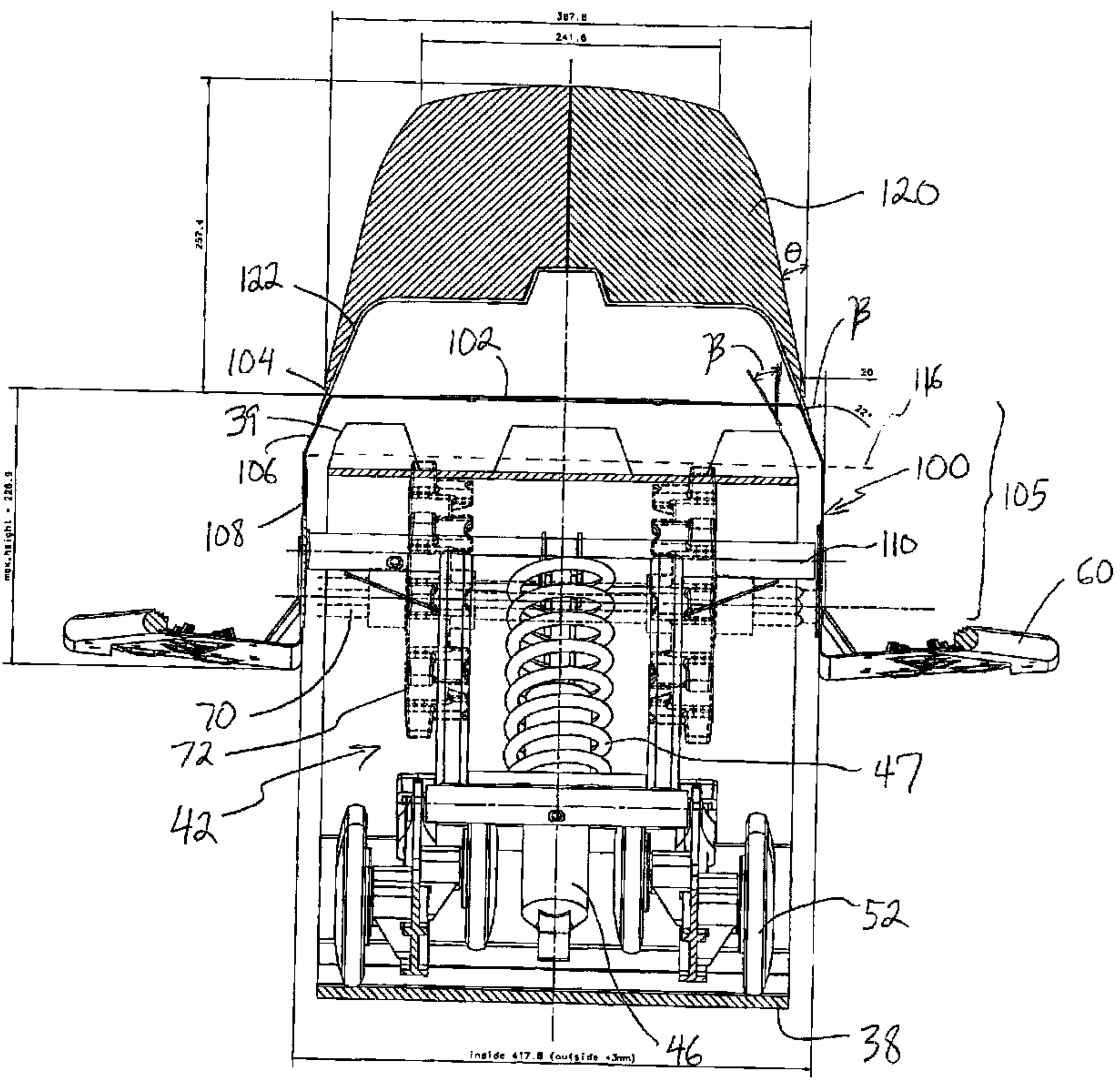


FIG. 8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