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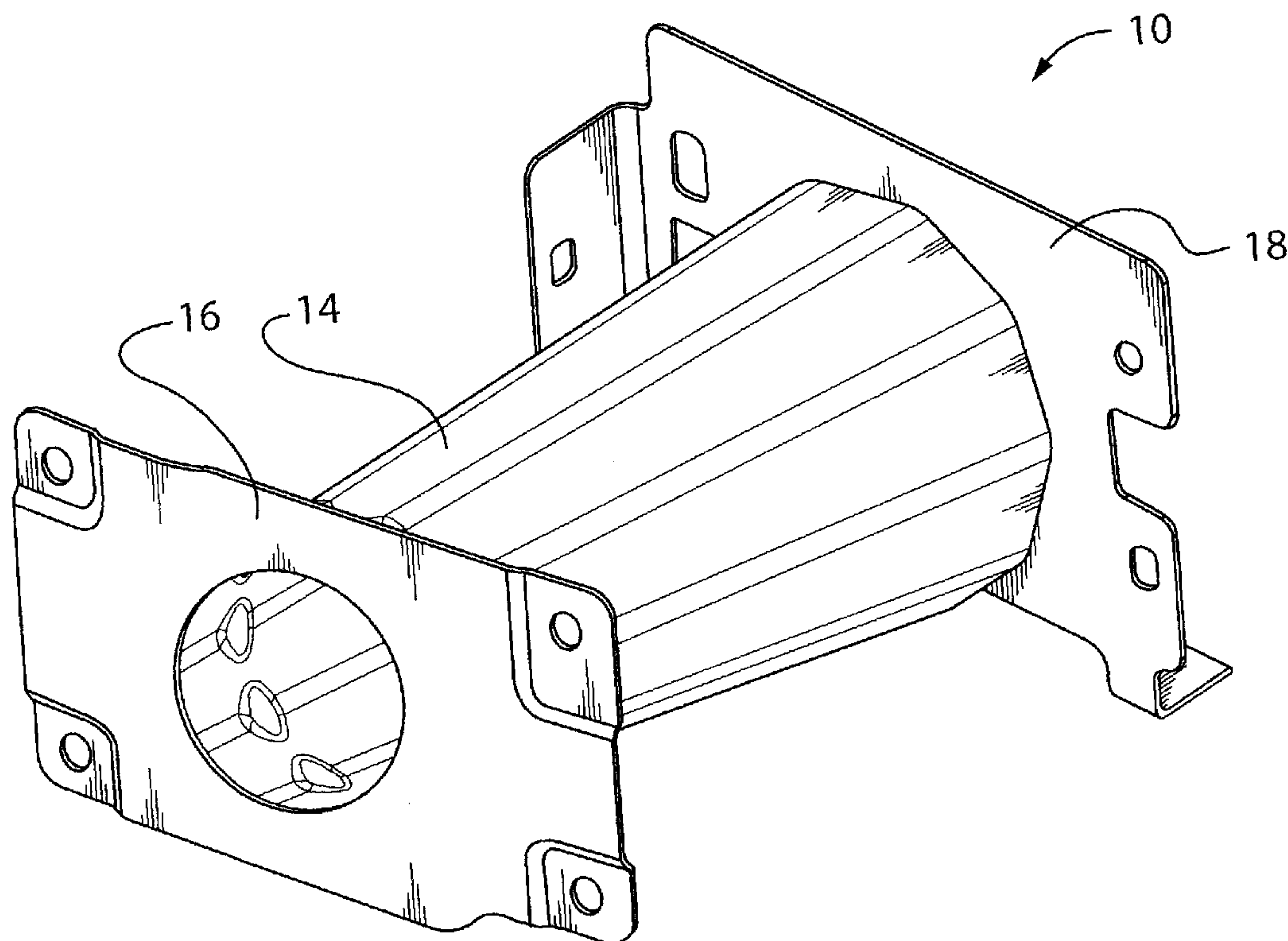


FIG. 2

(57) **Abrégé/Abstract:**

In one aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that is at least approximately a 10-sided polygon. In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes.

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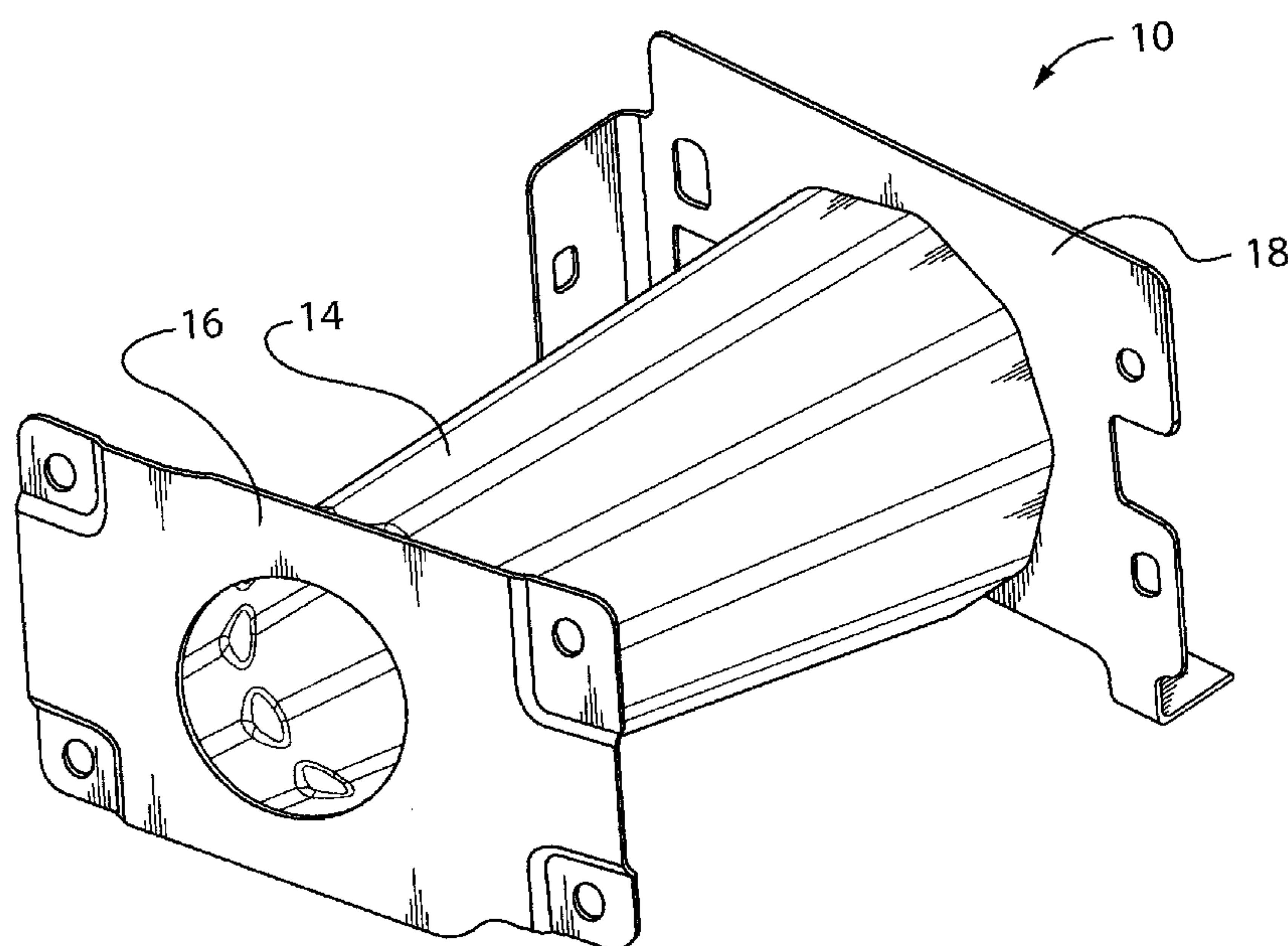


FIG. 2

(57) Abstract: In one aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that is at least approximately a 10-sided polygon. In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes.

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SCALABLE CRUSH CAN FOR VEHICLE**FIELD OF THE INVENTION**

[0001] The present invention relates to a crush cans for vehicles, and more particularly to a crush can that is scalable for use on a plurality of models of vehicles having different masses, crush specifications and other parameters.

BACKGROUND OF THE INVENTION

[0002] Vehicle structures sometimes include an element referred to as a crush can. The crush can is typically a member that mounts between the vehicle's bumper and the vehicle frame, and provides a region for controlled energy absorption in the event of a collision, so as to inhibit the collision energy from entering the passenger cabin or damaging the vehicle frame. The crush cans used on vehicle structures currently typically needed to be custom-designed for different vehicles particularly if the different vehicles had different weights and/or different crush resistance requirements. However having several custom-designed crush cans is costly in terms of consuming technical resources and inventory.

[0003] It would be beneficial to provide a crush can configuration that was easily scalable to fit different vehicles with different weights and different crush resistance requirements.

SUMMARY OF THE INVENTION

[0004] In one aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that is at least approximately a 10-sided polygon.

[0005] In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape

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that includes a plurality of outwardly pointing apexes alternating with a plurality of inwardly pointing apexes.

[0006] In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes.

[0007] In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape formed by a wall including at least two wall portions that abut each other. The wall portions that are in abutment may optionally be joined together. The wall portions that are in abutment may separate a first hollow shape, (eg. a central hollow shape) from a second hollow shape (eg. a distal hollow shape). The central hollow shape may include a plurality of apexes. The distal hollow shape may include one or more apexes.

[0008] In another aspect, the invention is directed to a method for forming a crush can including: extruding a crush can body having a cross-sectional shape that may include, for example, a central spine and a plurality of arms extending therefrom.

[0009] In another aspect, the invention is directed to a crush can for a vehicle frame including a crush can body having a longitudinal axis and a cross-sectional shape that is a non-hollow shape. The shape may include a central spine and a plurality of arms extending from the spine. The shape may include a plurality of apexes therein. In embodiments wherein the shape includes a central spine and a plurality of arms extending therefrom, the apexes may be provided as bends in the arms.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will now be described by way of example only with reference to the attached drawings, in which:

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[0011] Figure 1 is a perspective view of a portion of a vehicle frame with two crush cans thereon, which are in turn connected to a bumper, in accordance with an embodiment of the present invention;

[0012] Figure 2 is a perspective view of one of the crush cans shown in Figure 1;

[0013] Figure 3 is a perspective view of a crush can body from the crush can shown in Figure 2;

[0014] Figure 4 is a sectional end view of the crush can body shown in Figure 3;

[0015] Figure 5 is a side view of the crush can body shown in Figure 3;

[0016] Figure 6 is a perspective view of a crush can in accordance with another embodiment of the present invention, wherein the crush can has a body that includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes;

[0017] Figure 7 is a sectional end view of a crush can body from the crush can shown in Figure 6;

[0018] Figure 8 is a perspective view of the crush can body shown in Figure 7;

[0019] Figure 9 is a side view of the crush can body shown in Figure 7;

[0020] Figure 10 is a sectional end view of a crush can body in accordance with another embodiment of the present invention, which includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes, in a pattern of two outwardly pointing apexes alternating with two inwardly pointing apexes;

[0021] Figure 11 is a sectional end view of a crush can body in accordance with another embodiment of the present invention, which includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes, wherein an odd number of each type of apex is provided;

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[0022] Figures 12-14 are sectional end views of crush can bodies in accordance with other embodiments of the present invention, each of which includes a plurality of outwardly pointing apexes and a plurality of inwardly pointing apexes;

[0023] Figure 15 is a sectional end view of a crush can body in accordance with another embodiment of the present invention, which includes a central spine and a plurality of arms extending therefrom, and which can be formed using an extrusion process; and

[0024] Figures 16-18 are sectional end views of crush can bodies in accordance with other embodiments of the present invention, each of which includes a wall, portions of which are in abutment with each other.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Reference is made to Figure 1, which shows a crush can 10 for use in absorbing collision energy during a vehicular collision. In the embodiment shown in Figure 1, two crush cans 10 are provided between a vehicle frame shown at 12 and a bumper shown at 25. Referring to Figure 2, the crush can 10 includes a crush can body 14, a front plate 16 and a rear plate 18. The crush can body 14 is shown more clearly in Figure 3. The crush can body 14 has a longitudinal axis shown at 20. The longitudinal body 14 has a cross-sectional shape that is shown in Figure 4. As can be seen in Figure 3, the cross-sectional shape is a 10-sided polygon. In a preferred embodiment, the polygon is a regular polygon (ie. each of its 10 sides is the same width, and the angles between adjacent pairs of sides are all the same (36 degrees)). In other words, the polygon in this embodiment is a regular decagon, albeit with rounded corners.

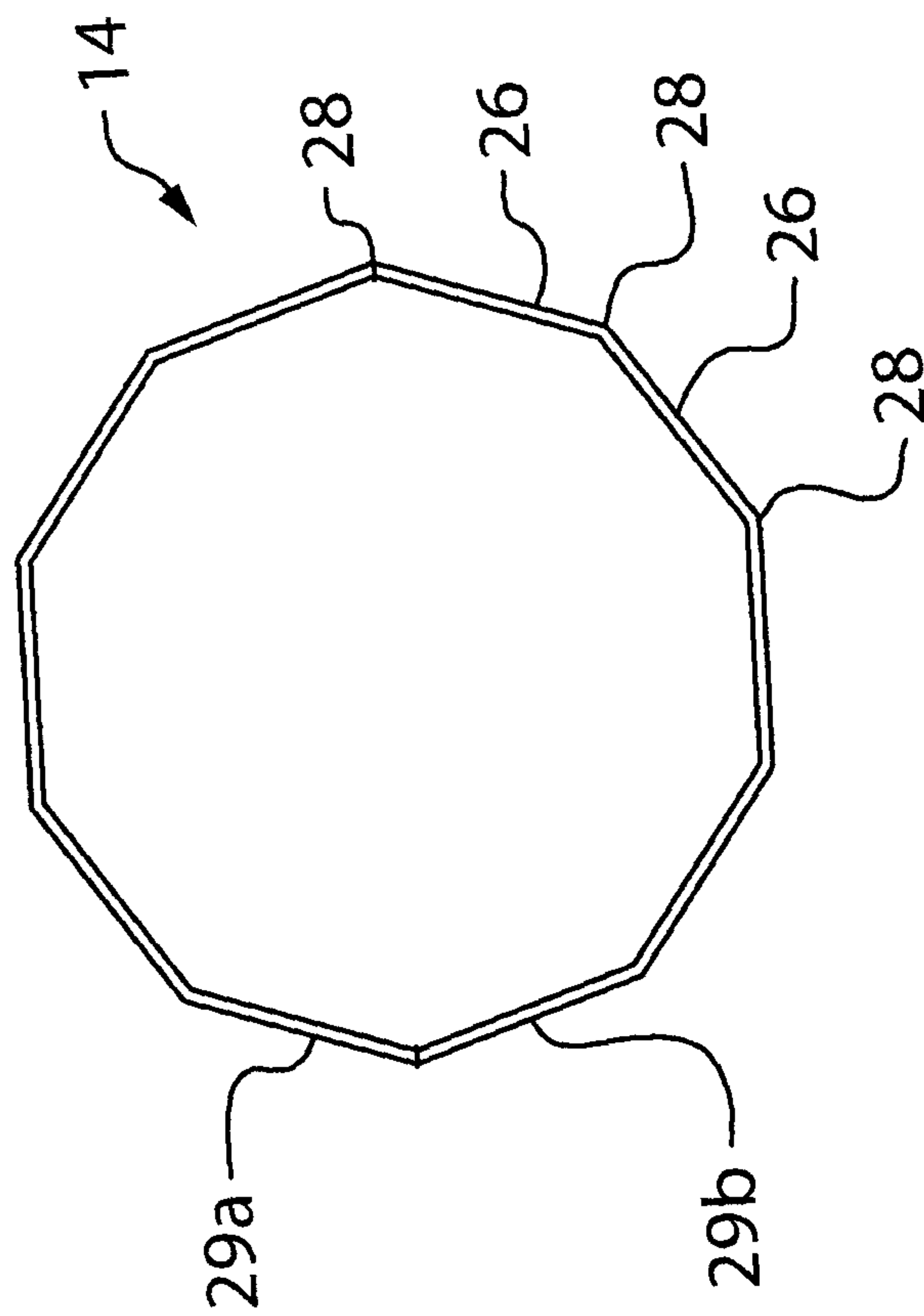
[0026] Referring to Figure 5, the crush can body 14 may be tapered axially. The taper ratio for the crush can body 14 is the ratio of the cross-sectional dimension A at the front end (shown at 22) of the crush can body 14, to the cross-sectional dimension B at the rear end (shown at 24) of the crush can body 14. In embodiments wherein there is a taper to the crush can body 14 as shown in Figures 2 and 4, one end (eg. end 22) is a small end, and one end (eg. end 24) is a large end. The taper ratio may

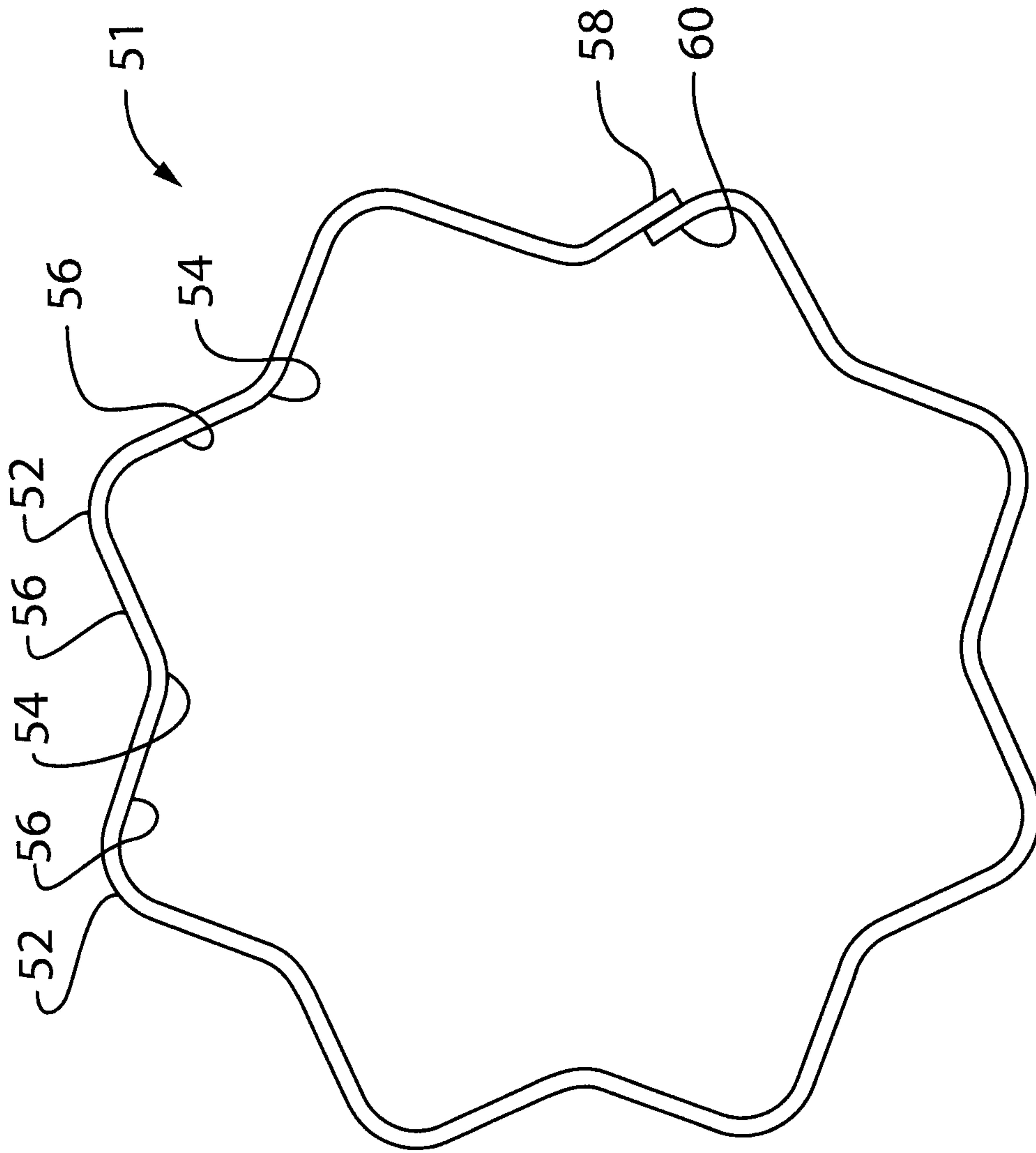
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[0047] While the above description constitutes a plurality of embodiments of the present invention, it will be appreciated that the present invention is susceptible to further modification and change without departing from the fair meaning of the accompanying claims.

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34. A method for making a crush can, comprising:
extruding a non-hollow cross-sectional shape including a central spine and a plurality of arms extending from the spine.

**FIG. 4**

**FIG. 7**

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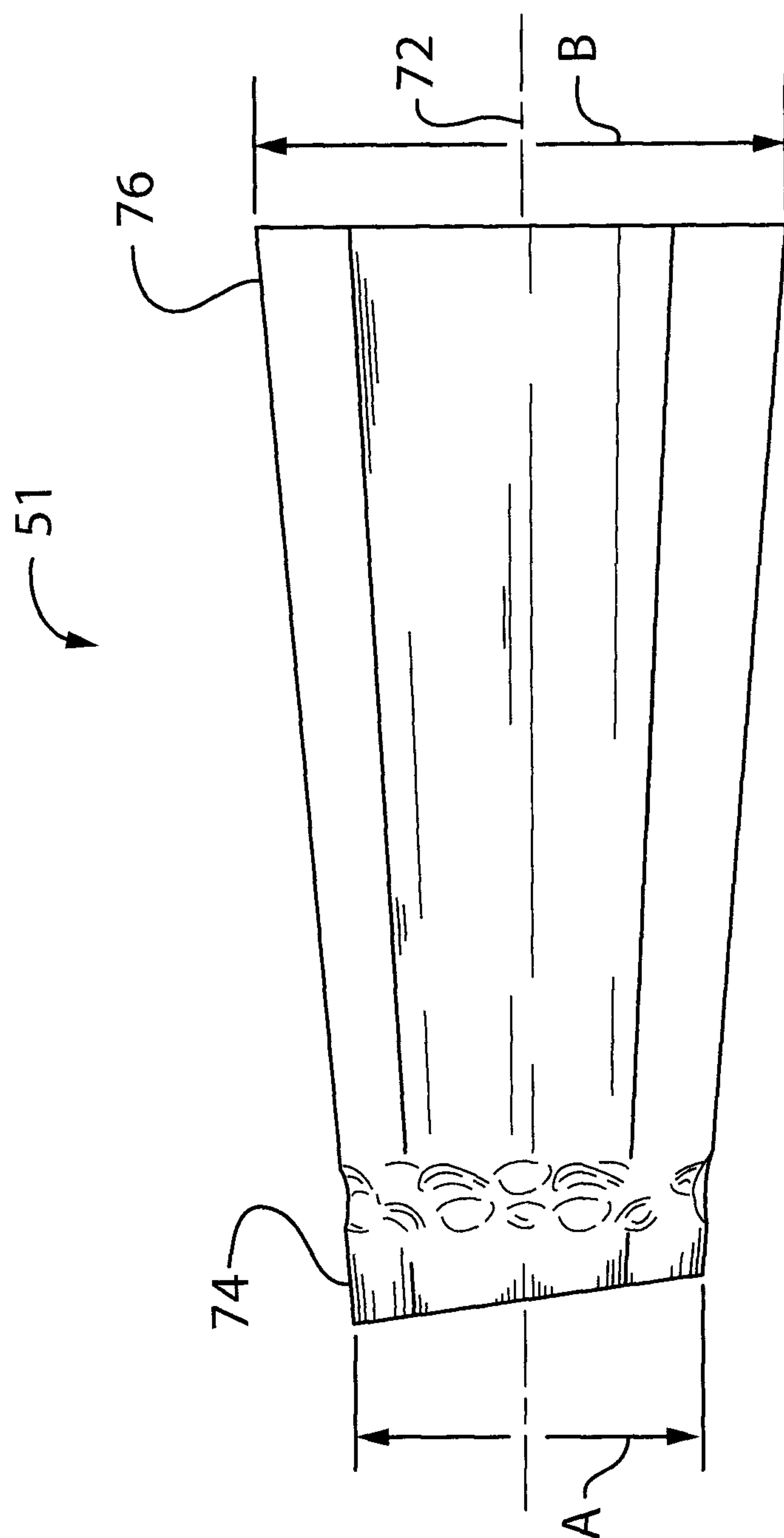


FIG. 9

