# PROVISIONAL PATENT APPLICATION

## Inventor – John Lawrecne Coulson

**Title of the Invention:** System and Apparatus for a Smart Tethered Closure, Interactive Post-Purchase Data Gateway, and Multi-Functional Security Mechanism.

**Background of the Invention:**

The present invention relates generally to the field of closures, seals, and caps for containers, vessels, and bottles. More specifically, it relates to an improved tethered container closure apparatus with integrated flow regulation, combined with an embedded digital communication node configured to act as an Internet of Things (IoT) gateway for post-purchase consumer data acquisition and gamified engagement.

The Fast-Moving Consumer Goods (FMCG) and global packaging industries currently face two distinct but concurrent challenges. First, regulatory frameworks, such as the 2024 European Union Single-Use Plastics Directive, mandate that closures remain tethered to their mated containers. Current industry solutions predominantly rely on fragile "living hinge" mechanisms that degrade the ergonomic user experience and fail to provide optimal hermetic resealing.

Second, a profound deficit exists in post-purchase data tracking. Global brands lack an integrated, physical-to-digital mechanism to acquire first-party data regarding exact geographic consumption locations, time-of-use metrics, and direct consumer engagement once a product leaves the retail environment.

There is a distinct need for a mechanically superior, permanently tethered closure that solves physical compliance mandates, enhances consumer safety and ergonomics, and simultaneously transforms the passive container into an active, digitally communicative data node.

**Summary of the Invention:**

The present invention comprises an improved closure apparatus featuring a generally cylindrical inner sealer ring assembly and a permanent tamper-evident seal that mates directly to the neck of a container. The closure utilizes a multi-piece configuration permanently affixed together to form a highly durable construction.

The inner assembly hermetically seals and reseals the container. Crucially, the closure remains permanently attached to its mated container during primary use, achieving complete compliance with tethering mandates without obtrusive hinge mechanisms. The internal valve control acts as an adjustable flow regulation mechanism, allowing atmosphere in as product is dispensed, thereby reducing gurgling and spillage.

Furthermore, the invention integrates a digital communication apparatus, preferably a Near Field Communication (NFC) or Radio Frequency Identification (RFID) transmitter, embedded within the top-facing "billboard" of the closure. This node functions as a physical-to-digital bridge, triggering networked applications, gamified platforms, and Augmented Reality (AR) environments on proximate mobile devices while capturing opt-in consumer data. (e.g., a consumer smartphone).

Upon physical interaction or proximity, the embedded digital node triggers the mobile device to launch a specific networked application, interactive protocol, augmented reality (AR) environment, or gamified engagement platform. This physical-to-digital bridge allows the system to capture highly specific, opt-in consumer data—including geolocation and time of consumption—while delivering interactive media or rewards directly to the consumer, thereby functioning as an integrated post-purchase IoT gateway.

**Detailed Description of the Invention:**

1. **Mechanical Configuration and Flow Regulation**

In its preferred embodiment, the closure is constructed as a two-piece bonded assembly. An inner sealer ring assembly mates directly with the threaded neck of the container. The internal valve mechanism operates as an adjustable, self-venting flow control apparatus. As viscous or liquid product is dispensed, the valve enables atmospheric air to enter the vessel concurrently, substantially reducing spillage. The permanent attachment to the container drastically reduces environmental plastic waste and ensures 100% compliance with tethered-cap mandates.

**2. Dynamic Anti-Leak Sealing Mechanism**

To address capillary-action leakage—wherein residual liquid or hazardous materials cling to the interior of the closure and leak down the mating threads—the present invention introduces a secondary dynamic sealing mechanism. Positioned along the upper interior roof of the closure is a flexible, continuous annular lip or elastomeric grommet. As the closure rotates downward, this flexible lip engages the thin upper rim of the container, reliably flexing downward to create a temporary, secondary hermetic barrier that stops residual liquids from bypassing the primary seal and entering the threaded section.

**3. Hygiene, Anti-Contamination, and Security Safeguards**

Furthermore, the hermetically resealing nature of the two-piece valve acts as a vital personal security feature. Unlike open cans or wide-mouth cups, the closure strictly limits access to the vessel's contents between sips, making the surreptitious introduction of foreign, toxic, or illicit substances (e.g., date-rape drugs) exceptionally difficult, thereby protecting the consumer in public or social environments.

In a further embodiment, to prevent public health vulnerabilities and the surreptitious introduction of illicit substances (e.g., date-rape drugs), the closure system features an integrated articulating environmental shield, molded as a single contiguous component with the primary upper valve structure. This shield comprises a hinged over-cap positioned directly above the dispensing orifice.

In operation, this dual-action mechanism allows the user to rotate the primary closure counterclockwise to open the internal flow-regulation valve, while the dispensing orifice remains physically blocked from environmental intrusion until the user manually disengages the hinged over-cap. This provides immediate, temporary protection against airborne contaminants, insects (such as bees or wasps), and foreign debris during periods of active, intermittent use in outdoor environments. Following consumption, the user simply snaps the hinged shield back into its seated position over the orifice and rotates the primary closure clockwise to re-engage the primary internal hermetic seal.

The user rotates the primary closure counterclockwise to open the internal valve, while the orifice remains physically blocked from environmental intrusion (e.g., dust, airborne pathogens, insects) until the user manually disengages the hinged over-cap.

**4. Digital IoT Gateway and Augmented Reality Integration**

The closure houses a securely embedded digital node (NFC/RFID) integrated into the top-facing "billboard" surface. When a consumer interacts with the closure utilizing a mobile device, the digital node intercepts the user's digital stream to launch an interactive post-purchase gateway. This initiates a gamified promotional platform, an Augmented Reality (AR) environment, or a targeted advertising protocol. Both the exterior and interior surfaces of the hinged over-cap further function as physical indicia-bearing surfaces, establishing a sequenced physical engagement loop (e.g., a physical trivia query revealing a digital reward trigger) that captures high-intent user attention immediately prior to digital gamification.

**5. Functional Indicia and Branded Tactile Knurling**

To facilitate the rotational force required for operation, the exterior circumferential wall features a high-friction gripping surface utilizing "Functional Indicia." This surface comprises raised, three-dimensional alphanumeric characters, corporate logos, or brand insignias. This provides the necessary mechanical friction for users with compromised hand strength while transforming the gripping surface into a high-visibility tactile marketing asset.

**6. Photoluminescent and Active Illumination**

To prevent accidental spillage in low-light environments, the closure system incorporates advanced illumination. Passive embodiments utilize photoluminescent (day-glow) polymers. Active embodiments house a micro-electronic illumination circuit featuring a micro-LED and a kinetic or capacitive trigger. The illumination is activated mechanically upon rotation or via tactile input (a gentle tap on the billboard surface), providing temporary visual guidance to the dispensing orifice.

**7. Alternative Articulating Dispensing Mechanisms**

As an alternative to the hinged shield, the closure may feature a push-pull or pop-up actuating nozzle. This secondary mechanism rests flush within the primary closure body for security and hygiene. The consumer manually translates the nozzle axially upwards to expose the dispensing orifice, providing a secure, single-handed, tactile opening experience.

**8. Rotational Billboard Shield and Auxiliary Venting**

In a further embodiment, the closure features a secondary, top-tier rotational shield that functions as a high-visibility indicia-bearing surface. To access the fluid, the consumer twists this secondary shield to align a specifically dimensioned aperture with the primary dispensing orifice. This rotation simultaneously exposes a secondary micro-aperture engineered specifically to vent the interior atmospheric pressure, ensuring smooth fluid flow.

**9. Load-Bearing Ergonomic Transport Mechanism**

To address the lack of ergonomic transport solutions for high-volume vessels (e.g., multi-quart containers), the exterior architecture of the primary closure is structurally reinforced. Utilizing the functional indicia grip, it is engineered to bear the full tensile load and kinetic weight of the mated container, allowing a consumer to easily grasp and transport heavy vessels directly via the closure apparatus.

**10. Cryptographic Anti-Counterfeiting & Supply Chain Provenance**

The embedded digital node acts as an immutable cryptographic supply-chain tracker. Distributors scan the node to verify product authenticity, preventing the distribution of counterfeit goods. Upon final retail purchase, consumer interaction transfers digital ownership protocols and permanently alters the retail state of the digital node, preventing the container from being illicitly refilled and resold as authentic.

**11. Thermochromic and Integrity Indication**

The closure apparatus incorporates smart materials acting as visual safety mechanisms. Thermochromic polymers within the structure change color based on the internal temperature of the fluid. Furthermore, the dynamic wiper lip or primary seal components may permanently alter their physical state or color if breached prior to purchase, acting as a visual and tactile tamper-evident alarm.

**12. Accessibility and Audio-Spatial Ingredient Routing**

Transforming the apparatus into an accessibility device for visually impaired consumers, the embedded digital node is configured to bypass standard visual engagement when scanned. It immediately executes an audio-spatial readout dictating exact dosage instructions, allergen warnings, or expiration dates directly to the user's connected audio device.

**(Physical Engagement & Promotional Surfaces):**

Furthermore, the articulating environmental shield serves a secondary, synergistic purpose as a multi-surface promotional and physical engagement platform. Both the exterior (top-facing) and interior (underside) surfaces of the hinged over-cap are configured to function as indicia-bearing surfaces (i.e., "billboard space").

These surfaces may display physical printed media, promotional messaging, alphanumeric trivia, or machine-readable triggers (such as QR codes). In a preferred embodiment, a sequenced physical engagement loop is established by presenting a query or call-to-action (e.g., a trivia question) on the exterior surface, with the corresponding answer or digital reward trigger concealed on the interior surface. This physical interaction—requiring the consumer to manually actuate the hinge to reveal the hidden information—creates a high-intent, tactile engagement moment. This physical mechanic serves to capture user attention immediately prior to, or in parallel with, the digital gamification protocol (e.g., the integrated NFC gateway and networked reward systems) housed within the primary closure architecture, thereby maximizing the advertising value of the physical packaging real estate.

**13. 3D Sculpted Novelty Architecture and Collectability**

The primary closure, the articulating environmental shield, or the secondary rotational shield may be structurally molded into distinct, three-dimensional novelty configurations. These non-standard geometries (e.g., vehicular, extraterrestrial, or character-based topographies) serve a dual purpose. Physically, they establish a line of collectible, semi-permanent consumer accessories. Digitally, these specific 3D geometries are engineered to function as complex fiducial markers, providing highly accurate spatial anchoring for the system's Augmented Reality (AR) integrations when scanned by a mobile device.

**14. Integrated Micro-Electronic Timepiece and Utilitarian Billboard**

In a further utilitarian embodiment, the top-facing indicia-bearing surface (the "billboard") encapsulates a functional micro-electronic digital module, such as a liquid crystal display (LCD) timepiece. This module is powered by a micro-battery and embedded securely within the polymer housing of the closure or the hinged over-cap. This configuration transforms the disposable packaging into a retained, functional consumer good, creating continuous, long-term brand exposure for the advertiser every time the consumer checks the time.

**15. Cryptographic Anti-Counterfeiting & Supply Chain Provenance**

The Concept: We patent the use of the embedded NFC/RFID chip not just for consumer engagement, but as an immutable supply-chain tracker.

The Patent Claim: Before the product ever reaches the consumer, the closure acts as a cryptographic node. Distributors and retailers scan the cap to verify product authenticity, preventing counterfeit goods (massive for high-end liquor, pharmaceuticals, and cosmetics). Once purchased, the consumer scans it, transferring digital ownership into their APE-X wallet and permanently "burning" the retail state of the chip so the bottle cannot be refilled and resold as authentic.

**16. Thermochromic and Integrity Indication**

The Concept: Integrating smart materials with the physical hardware to act as a visual safety mechanism.

**17. The Augmented Reality (AR) Novelty Series**

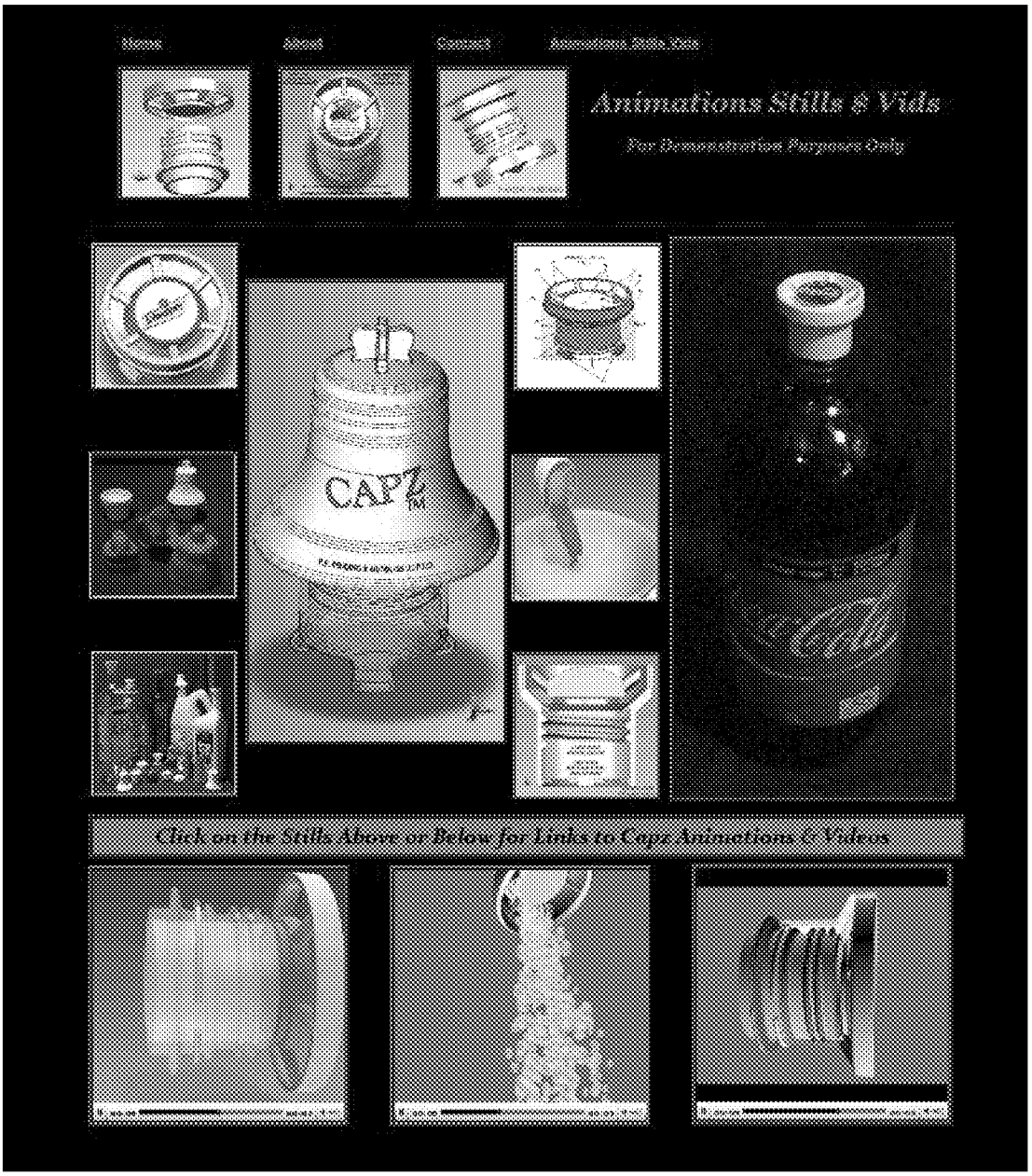
Retro space, racing, and alien, watch a spin top designs. These are not just physical toys, they are **AR Triggers**. The physical shape of the cap acts as a fiducial marker for the phone's camera, launching 3D interactive graphics (like a racecar driving off the bottle) directly on the consumer's screen.

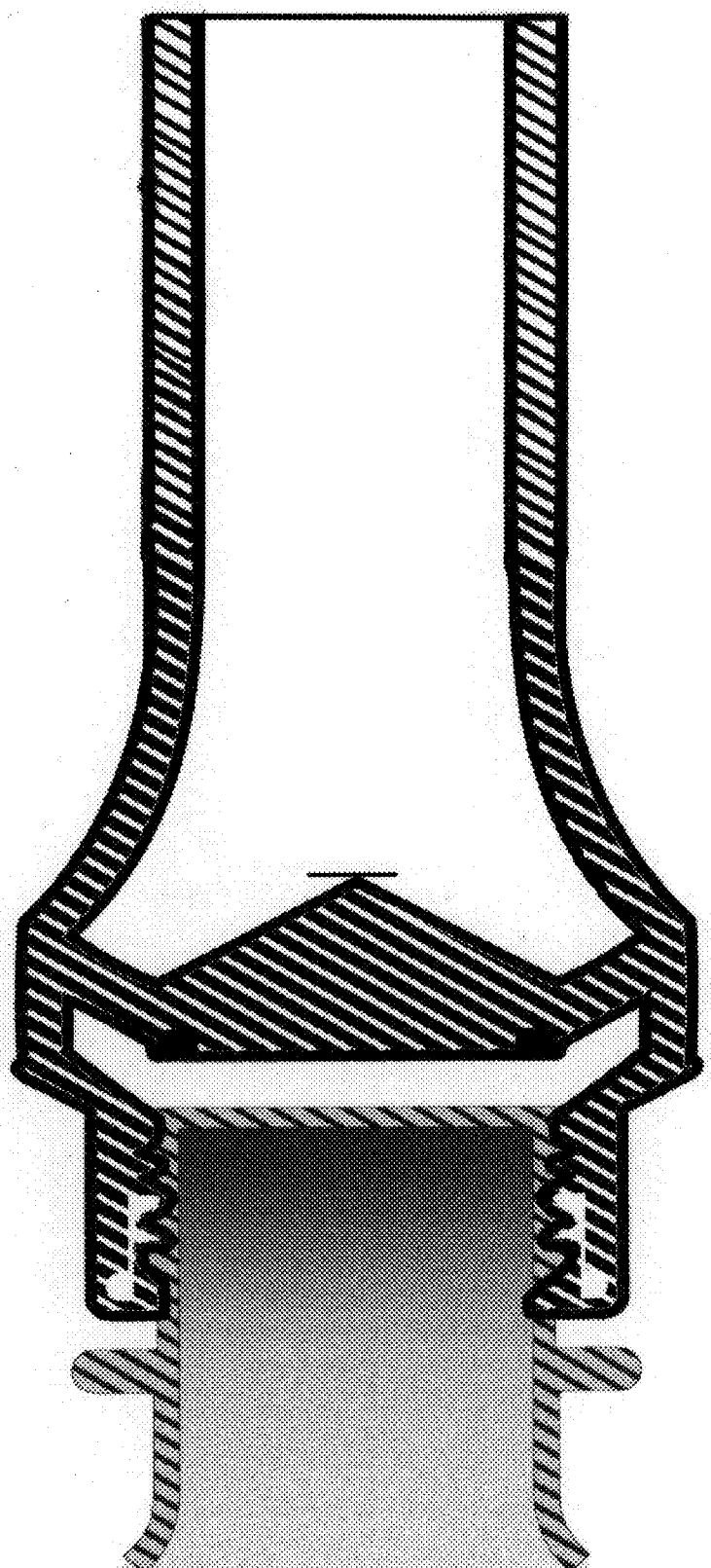
The Patent Claim: The primary closure or the articulating environmental shield incorporates thermochromic polymers that change color based on the internal temperature of the fluid (e.g., turning blue when cold, red when dangerously hot). Furthermore, the dynamic wiper lip can be engineered to permanently alter its physical state or color if the primary hermetic seal is breached before purchase, acting as a visual and tactile tamper-evident alarm.

**18. Accessibility and Audio-Spatial Ingredient Routing**

*The Concept:* Turning the cap into a medical and accessibility device for visually impaired consumers.

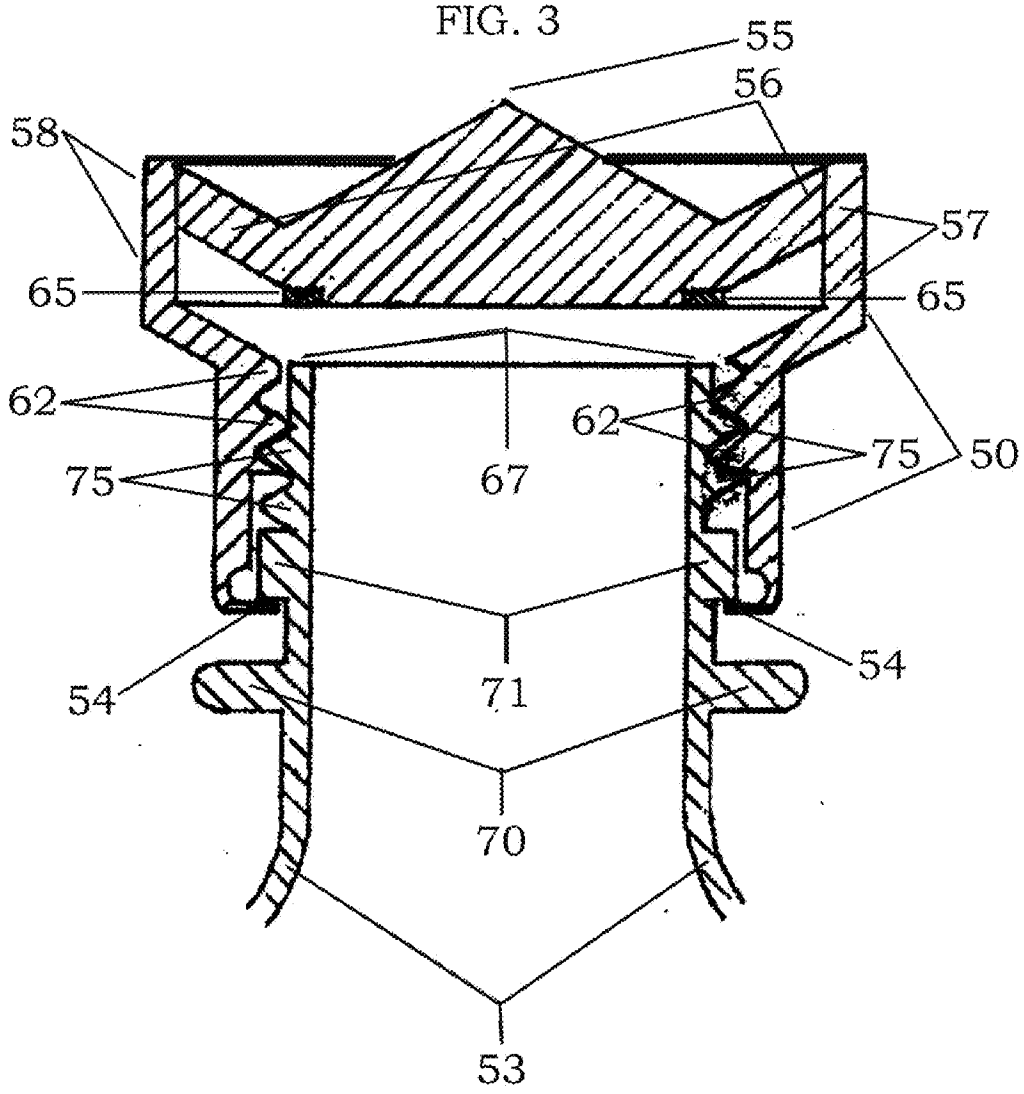
The Patent Claim: When the NFC node is scanned by a mobile device, it can be configured to bypass visual engagement and immediately execute an audio-spatial readout. This dictates exact dosage, allergen warnings, or expiration dates directly to the user's audio device. It transforms the physical cap into an ADA-compliant accessibility tool, which is a massive selling point for pharmaceutical and government packaging contracts.

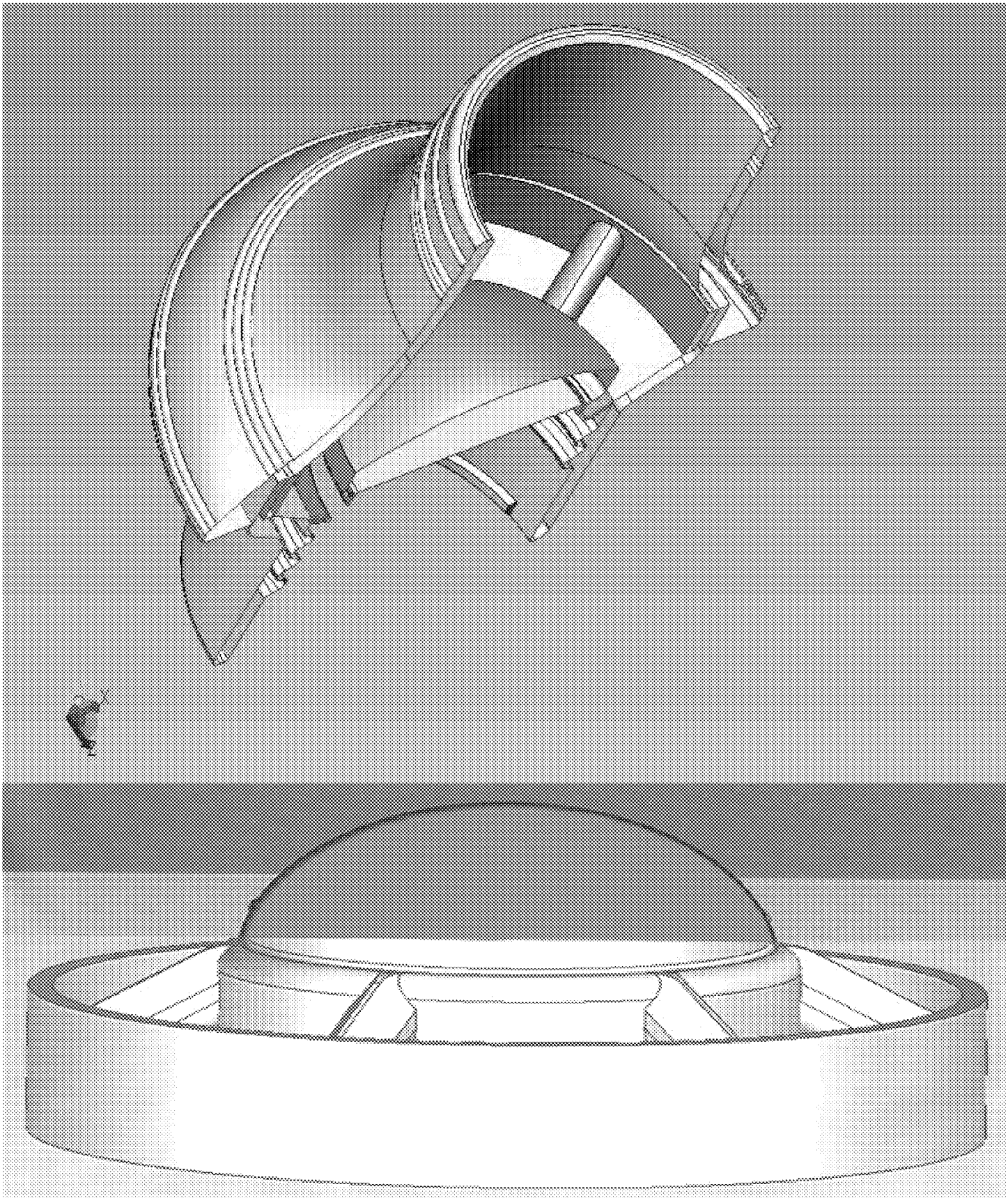




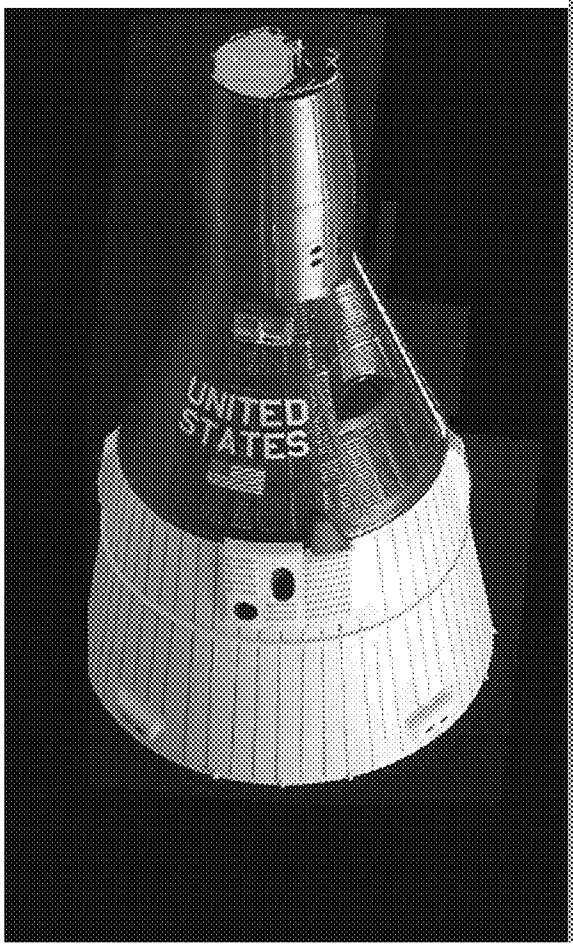
Side Elevation
Open Position

FIG. 3





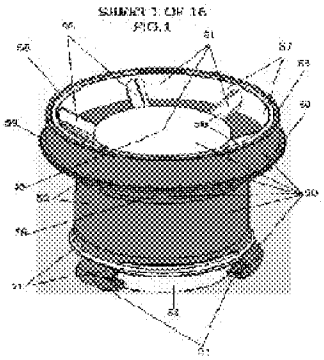
**The rounded bottom shape is expected to deflect fluid and product more effectively past the Spider Disc section**

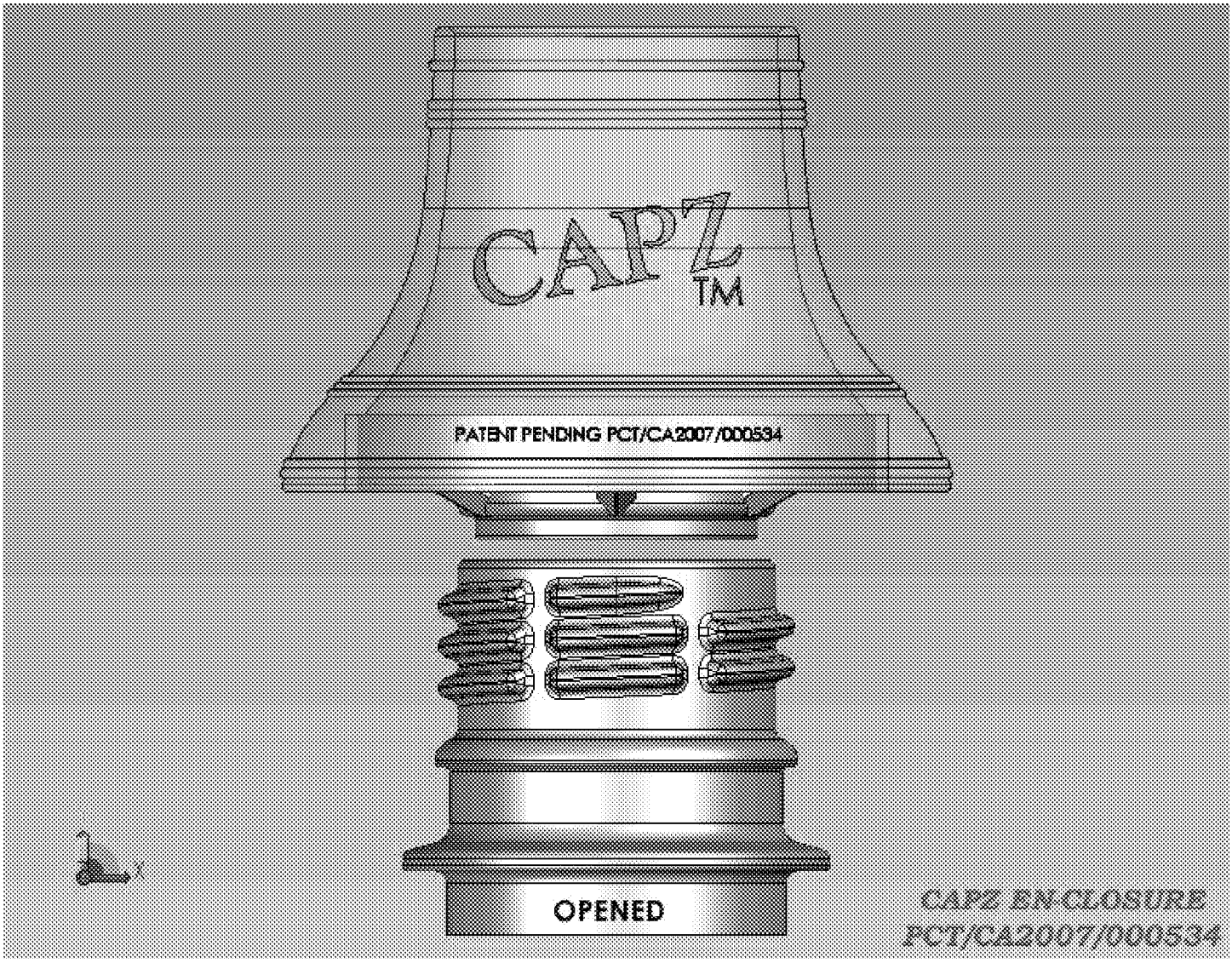

UNITED
STATES


CAPZ
TM
P.P. PENDING # 60/788,126 U.S.P.T.O.



SHEET 1 OF 16
FIG. 1




CAPZ
TM
PATENT PENDING PCT/CA2007/000534
OPENED
CAPZ ENCLOSURE
PCT/CA2007/000534

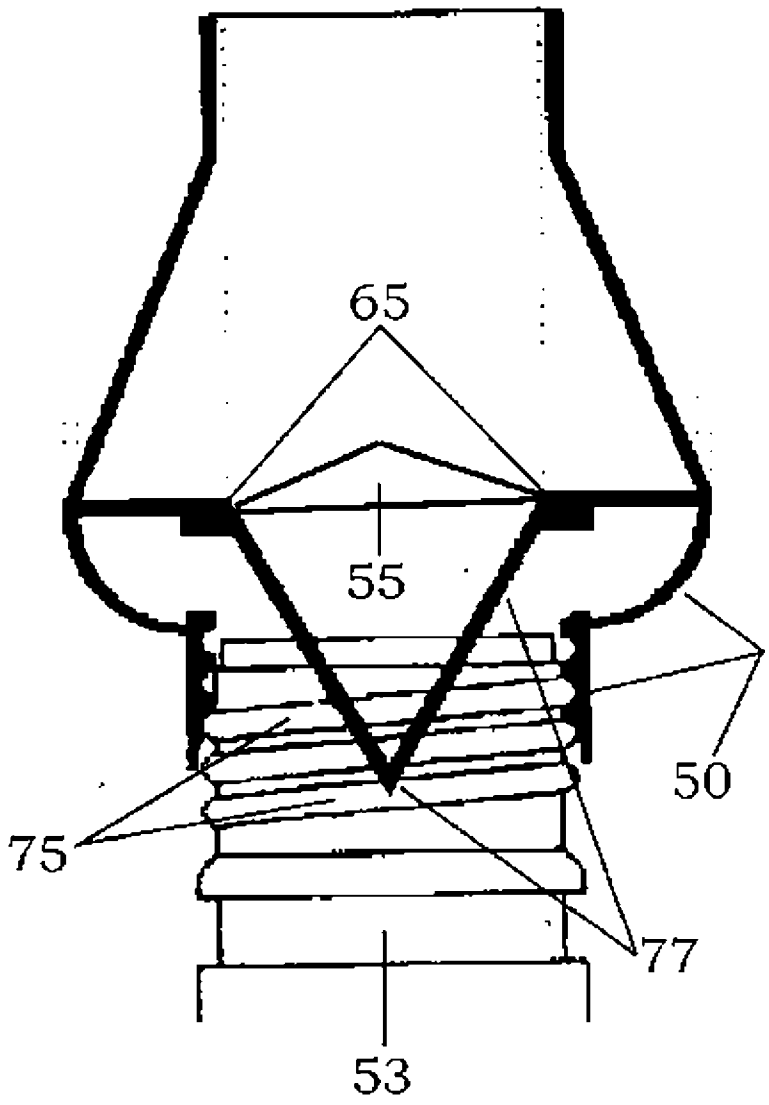
STUBBY CAPZ
ENGINEERED FOR
THE BEVERAGE INDUSTRY

ULTRA SMOOTH FLOW -
AIR GETS IN AS
PRODUCT GETS OUT!

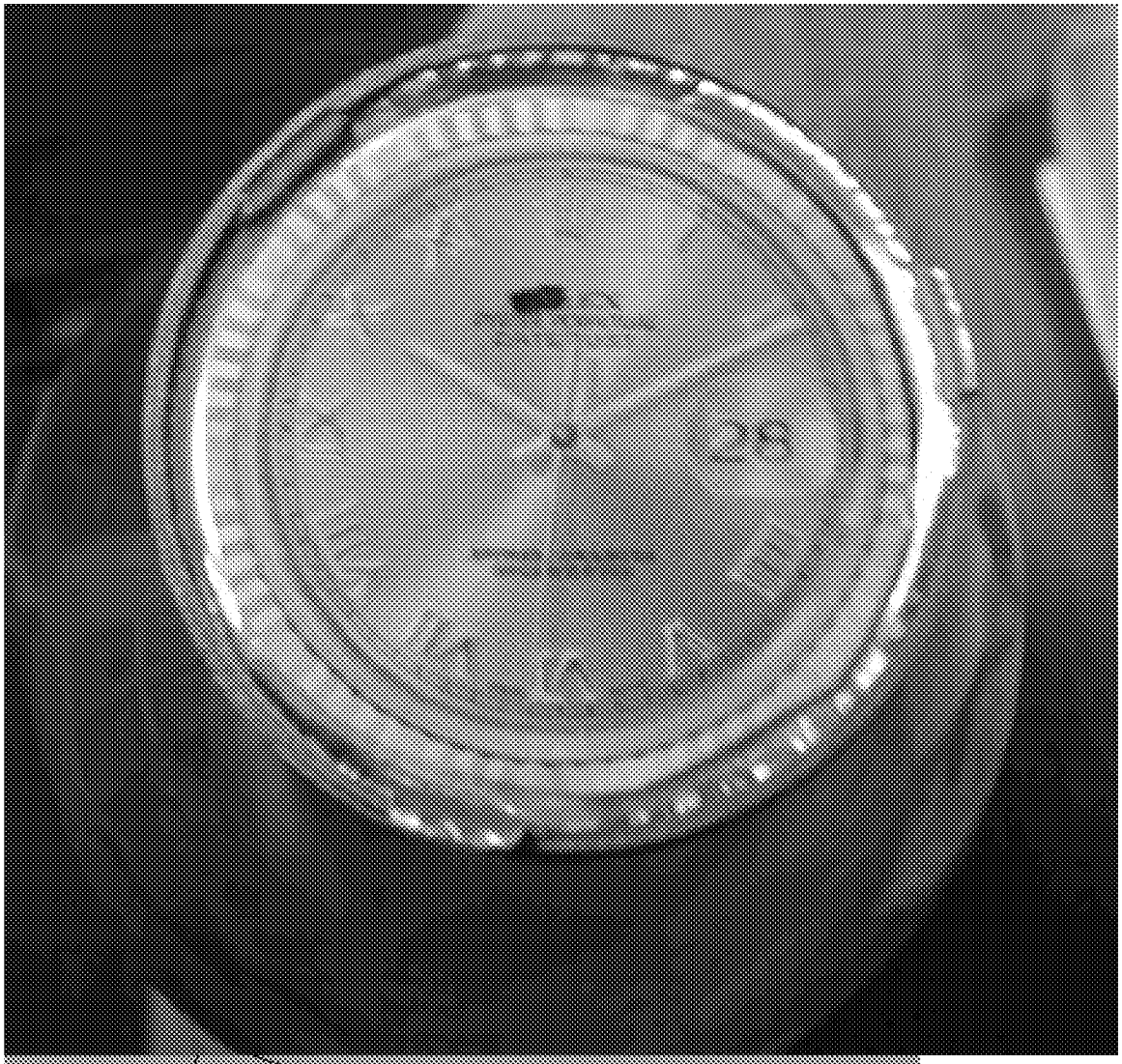

ALL 22 CAPZ DESIGNS HERMETICALLY RE-SEAL USE AFTER USE!

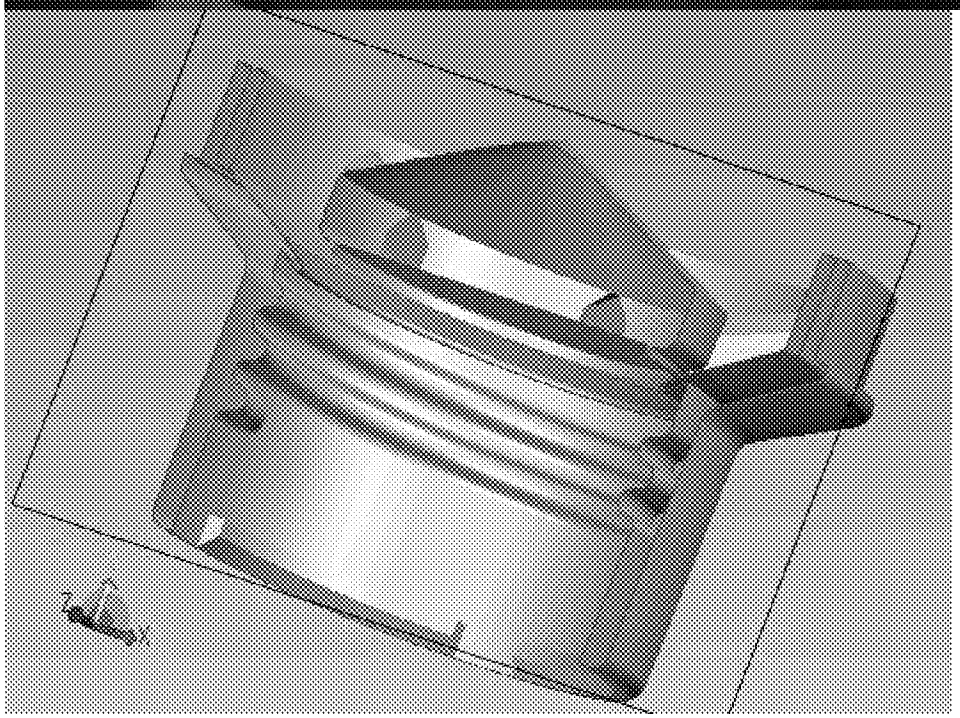
YOUR MESSAGE DELIVERED EVERYTIME SOMEONE TAKES A DRINK!

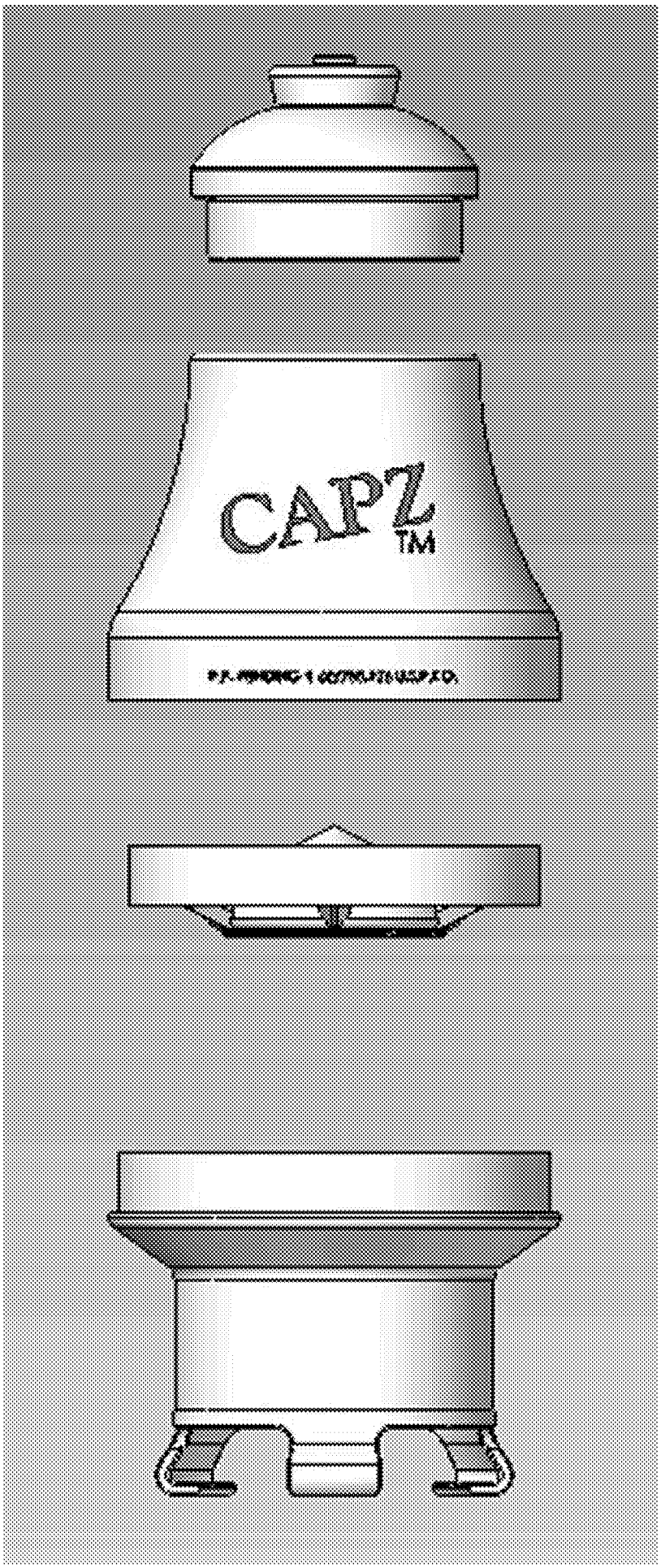
FIG. 10




Coca-Cola



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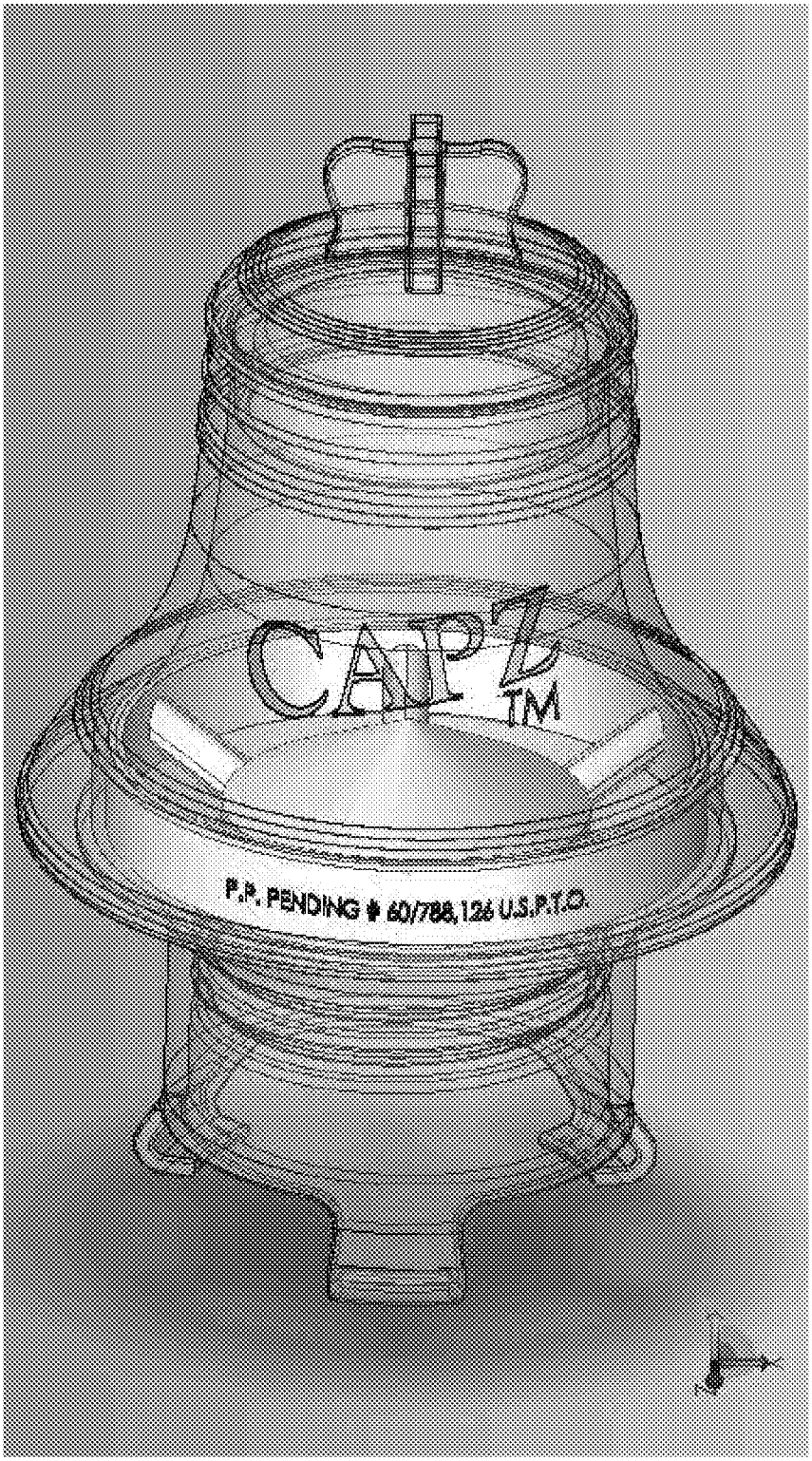
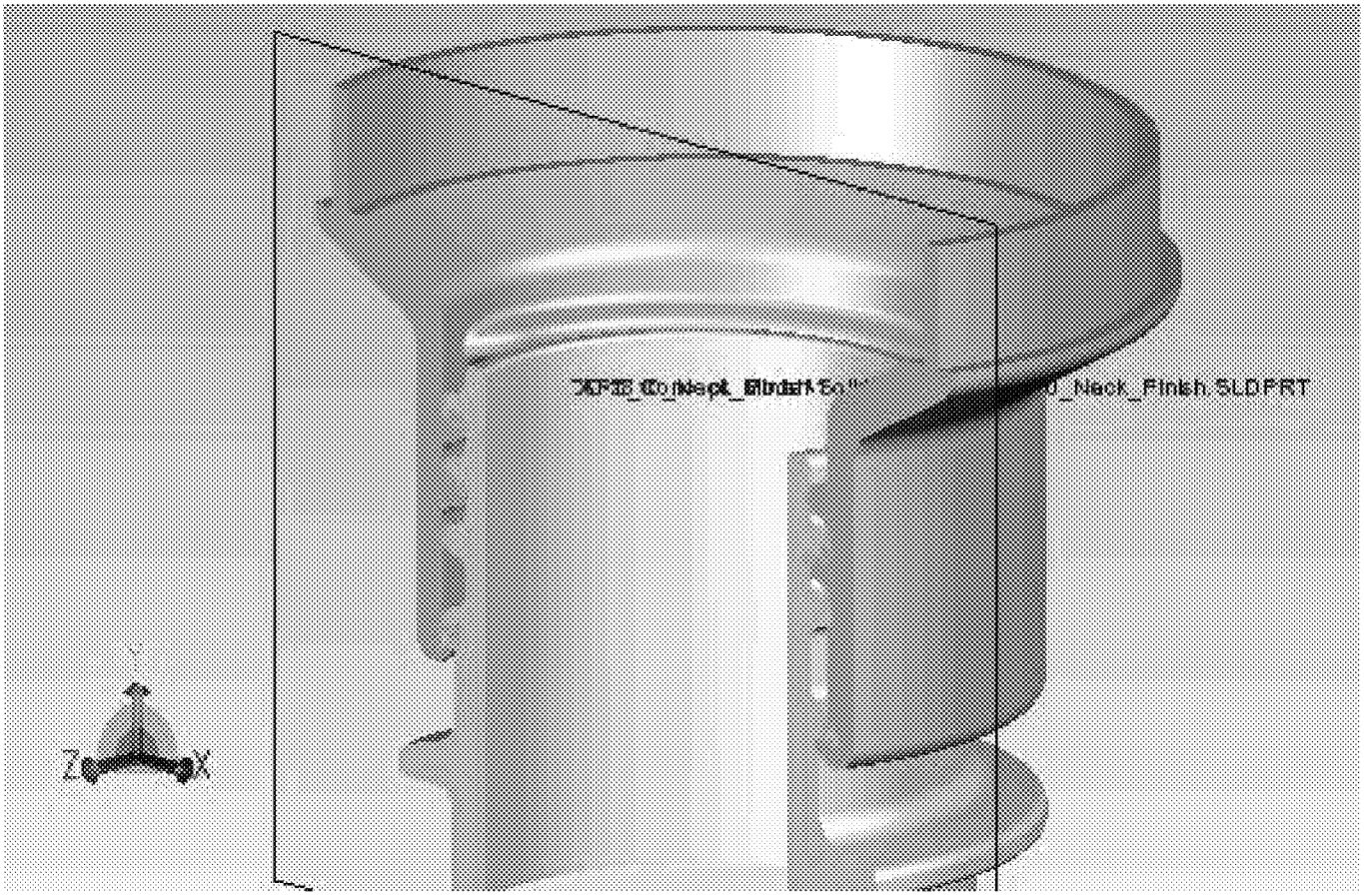

CAP-Z
TM
P.P. PENDING # 60/788,126 U.S.P.T.O.

*Cage™ Closure, Novelty & Toy Design*
*Mock-Up*
*for*
*Duncan Toys – Flambeau Inc.*

*I.S.P.I. November 13, 2006*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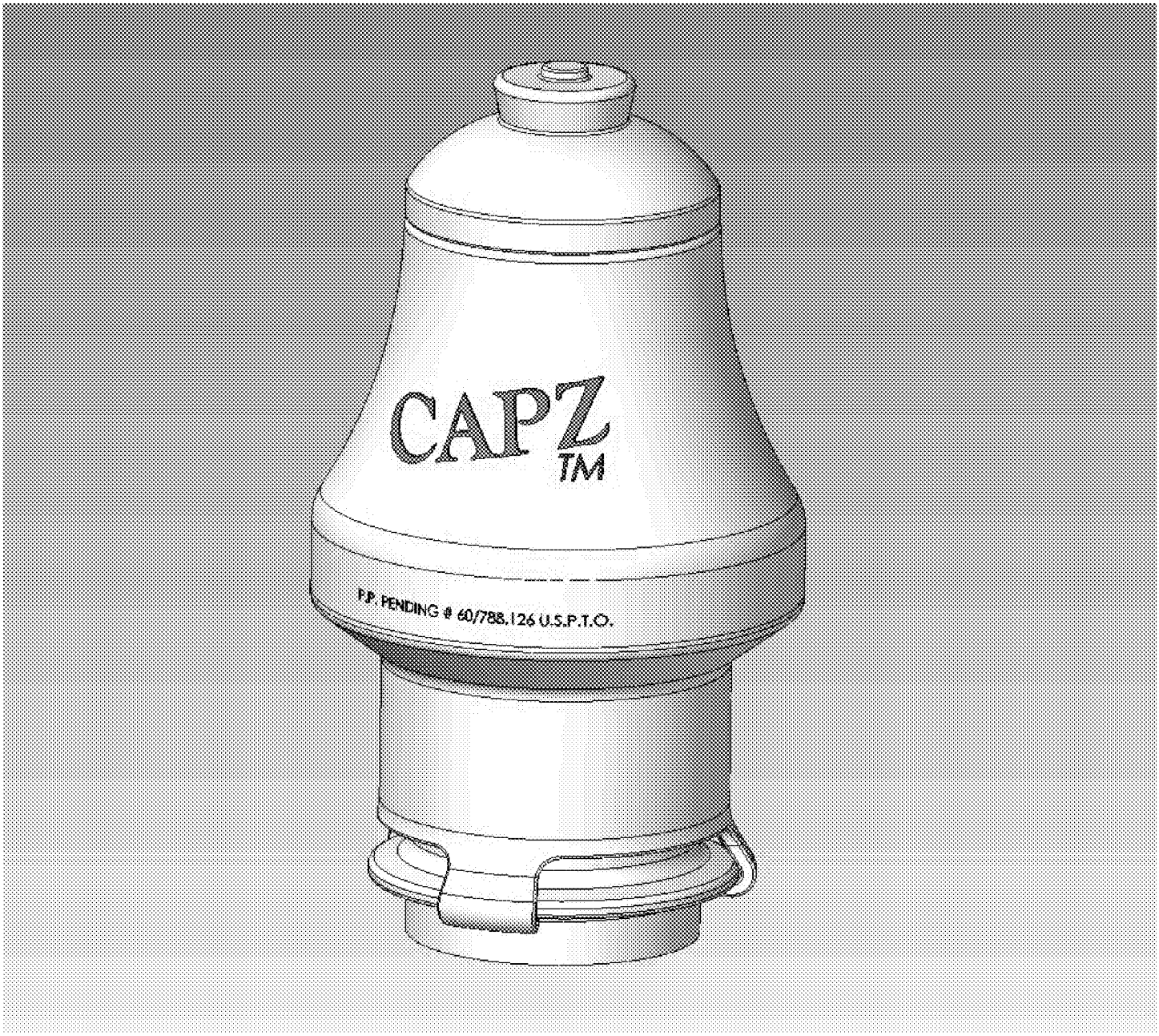
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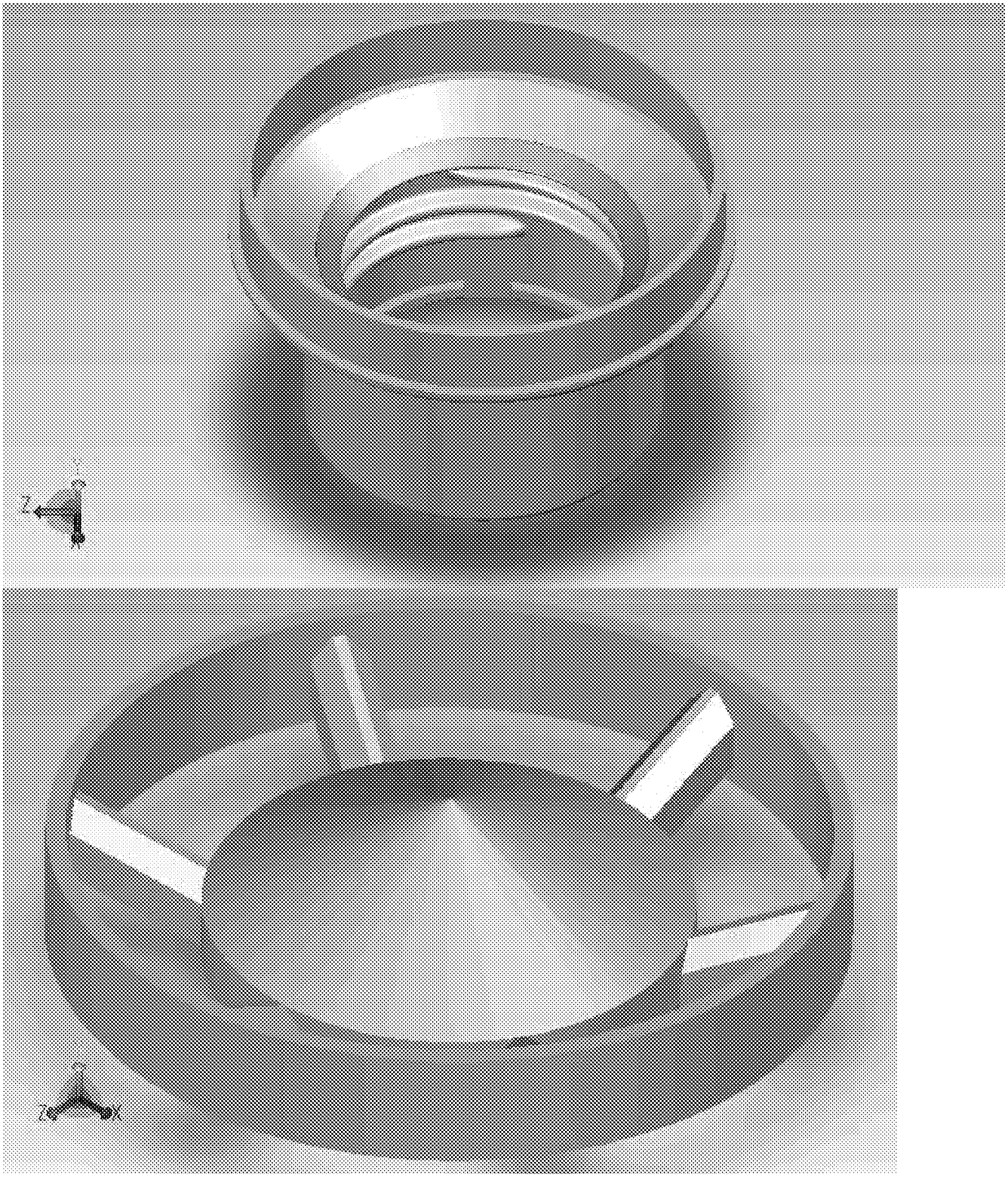
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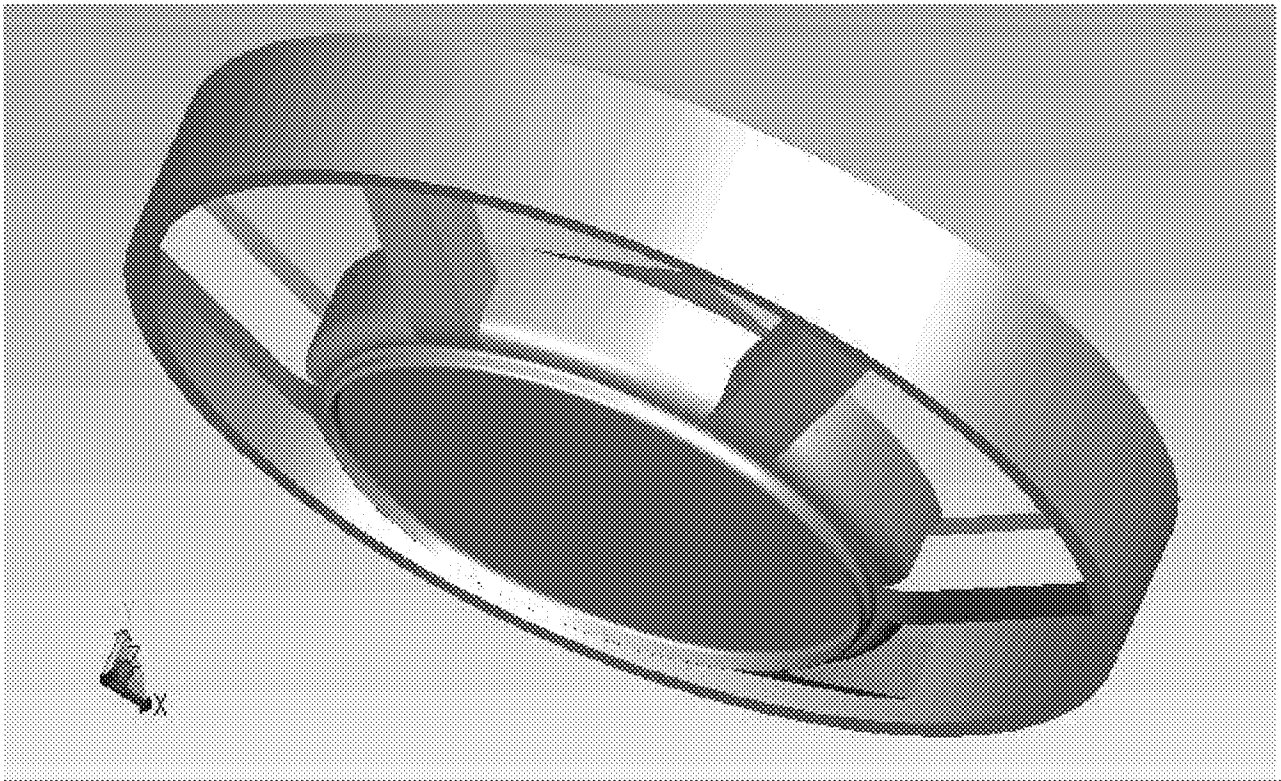
Y
Z
X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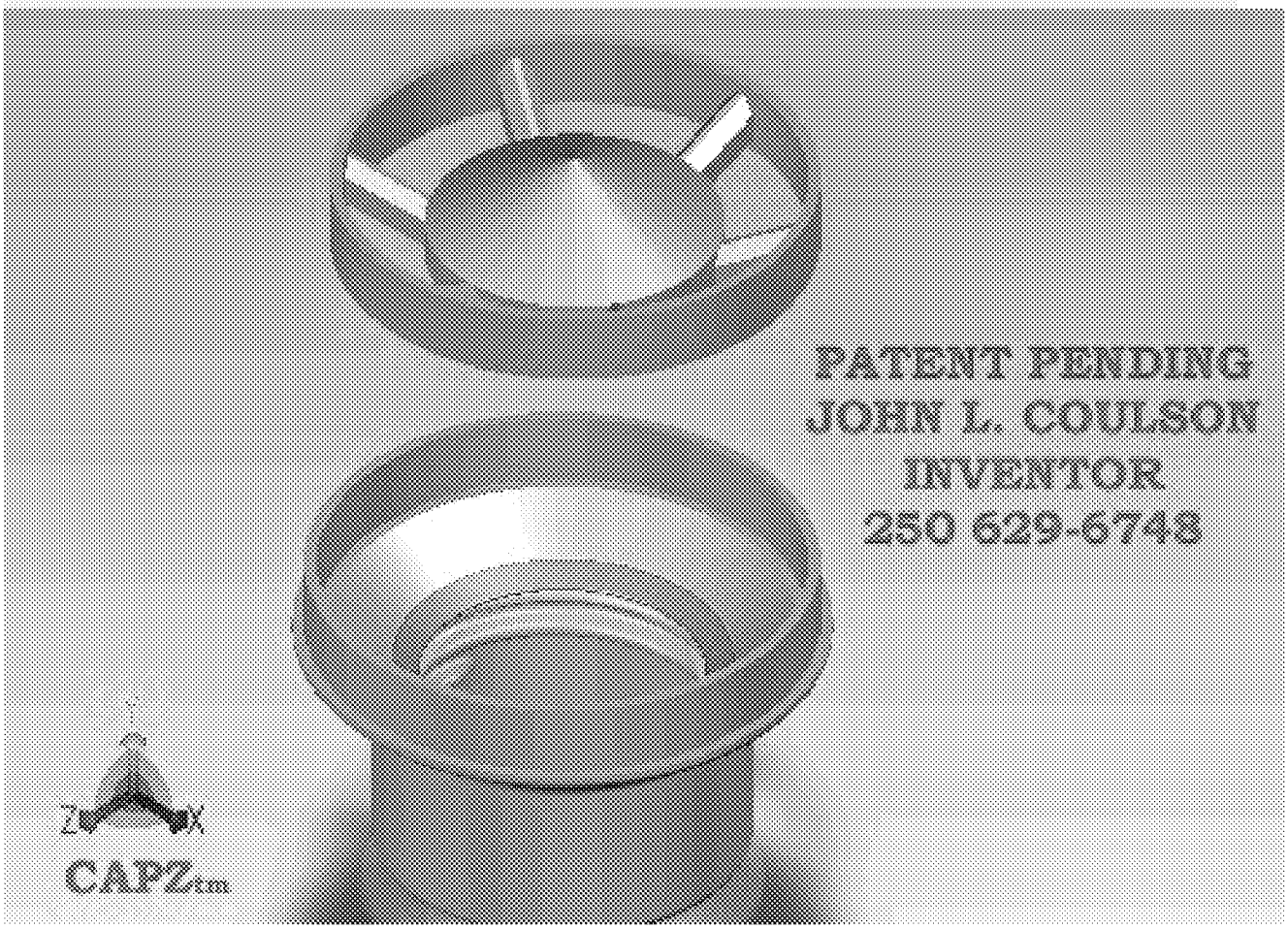
PATENT PENDING
JOHN L. COULSON
INVENTOR
250 629-6743
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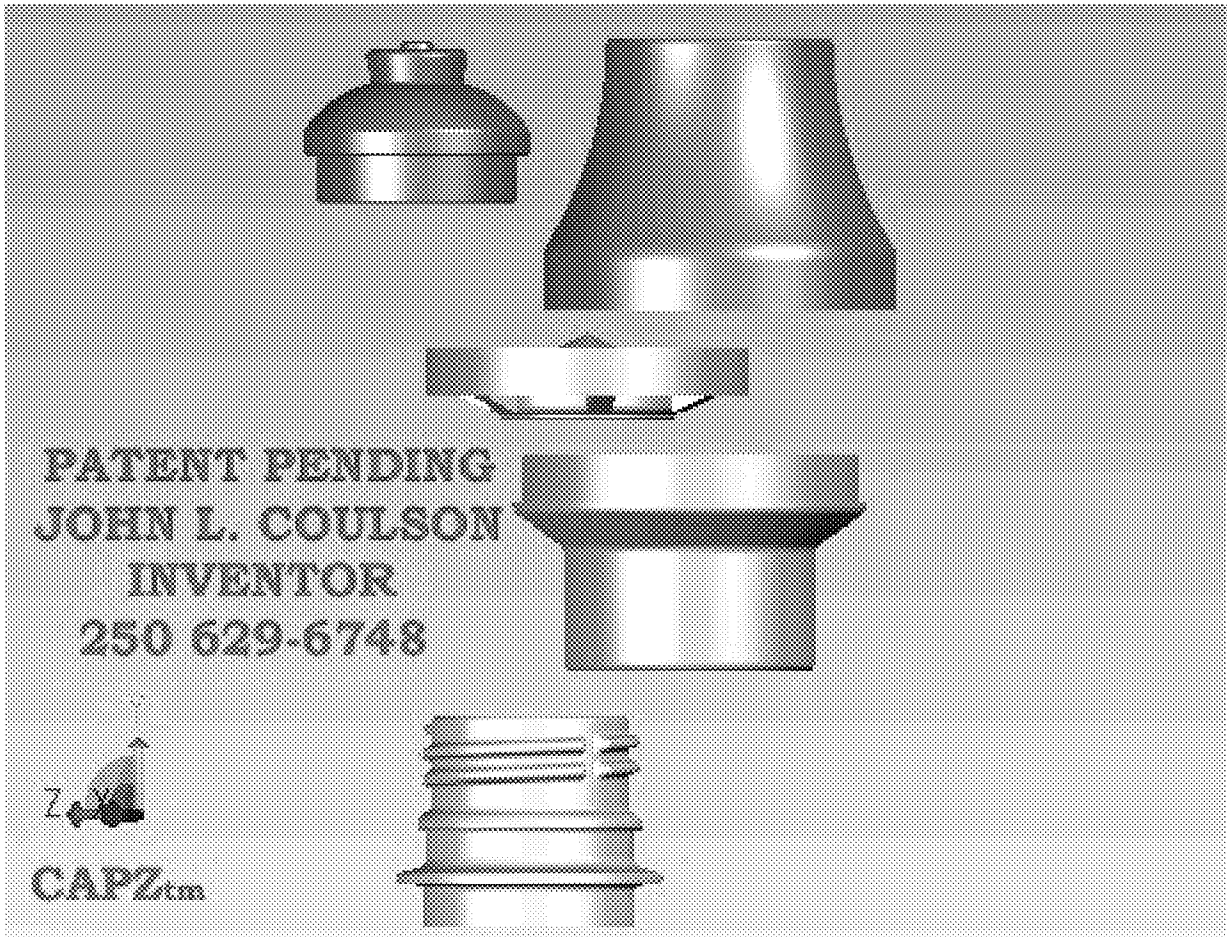
CAPZtm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JOHN L. COULSON
INVENTOR
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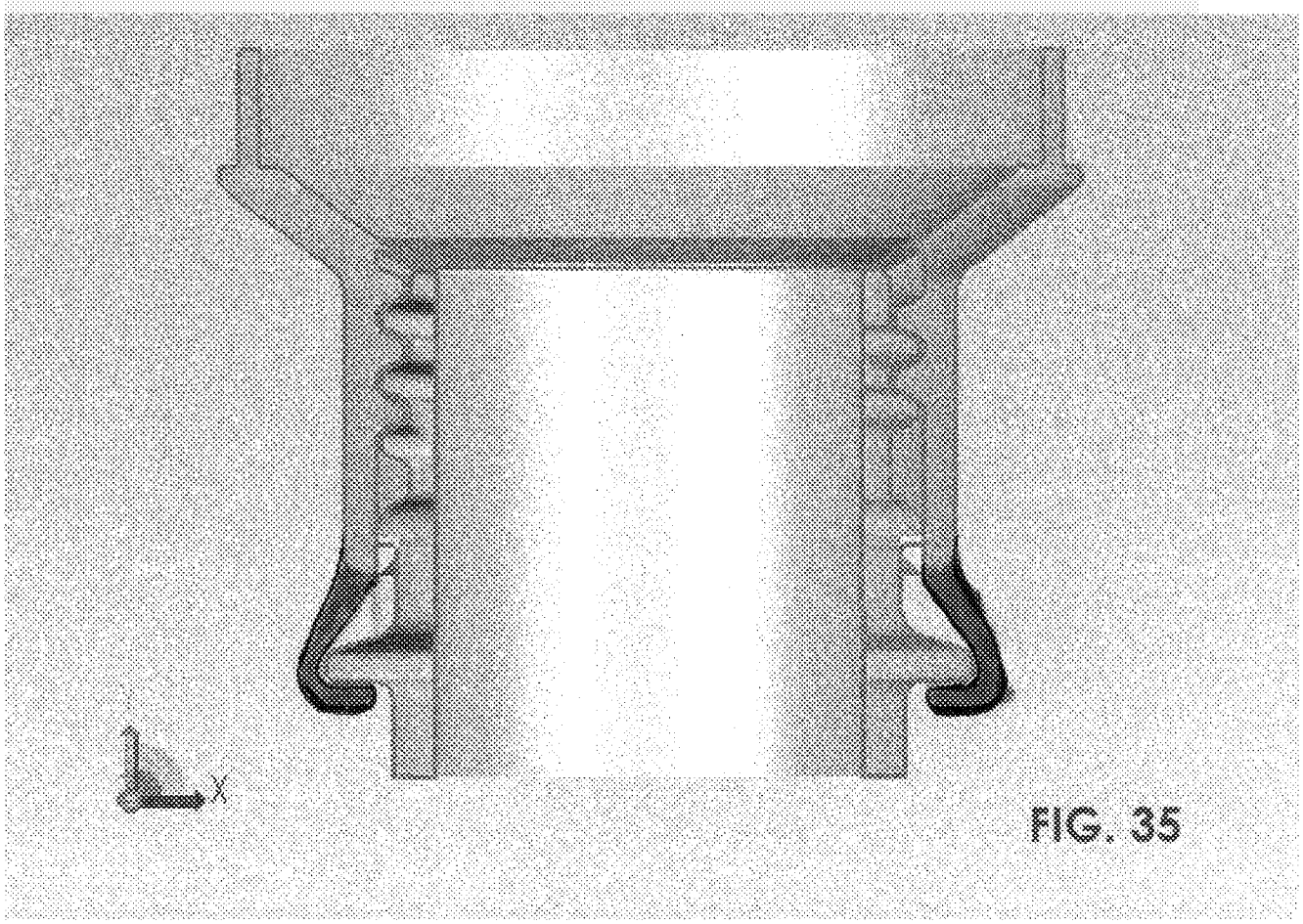
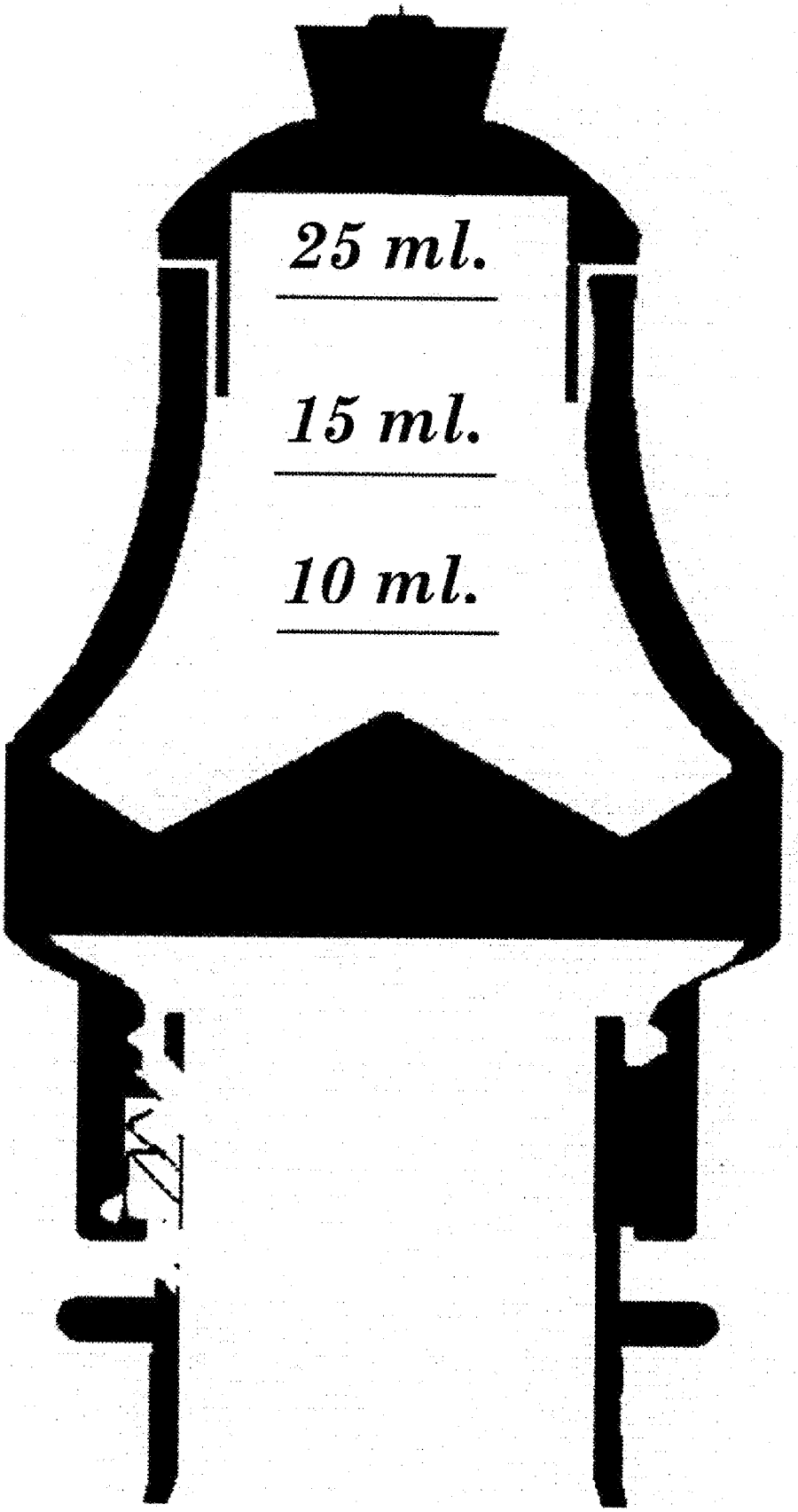

X

FIG. 35

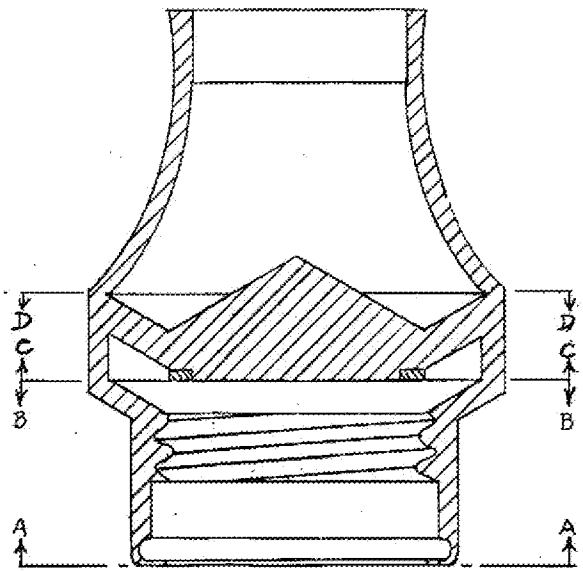
Productions Inc.
An Innovative Product
Development Corporation

CONFIDENTIAL
&
PROPRIETARY

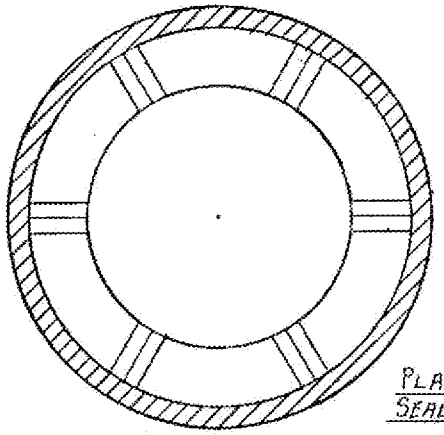
*3722 Rum Rd.*
*Pender Island B.C., V0N 2M2*
*Phone: 250 629-6748*
*Cell: 250 216-6758*
*E-mail: isphere@direct.ca*


25 ml.
15 ml.
10 ml.

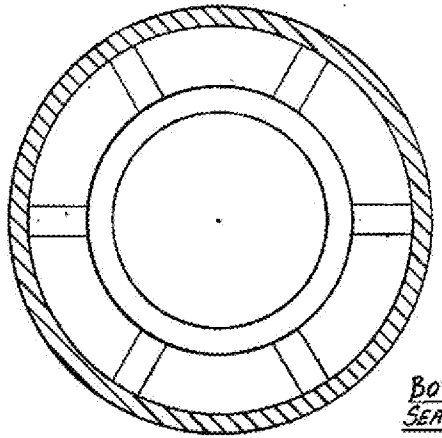
Drawn by Mr C.W. Mason and invented by Mr. John Saurence Coulson Aug 23/1993




SIDE ELEVATION



PLAN VIEW OF SEALER DISC.

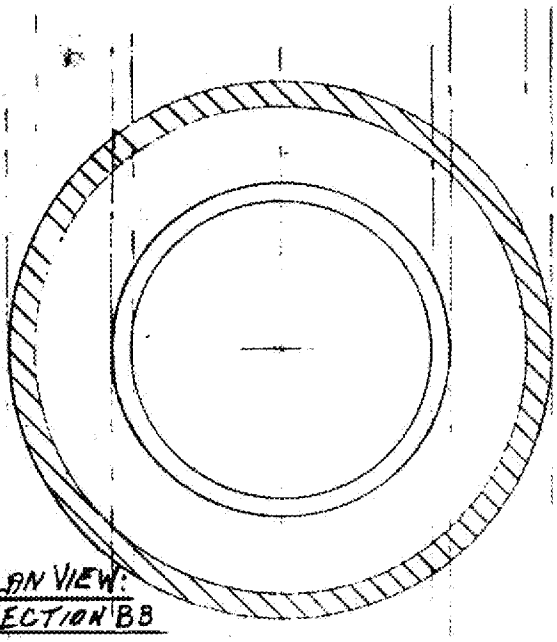


SPOKE: CROSS-SECTION

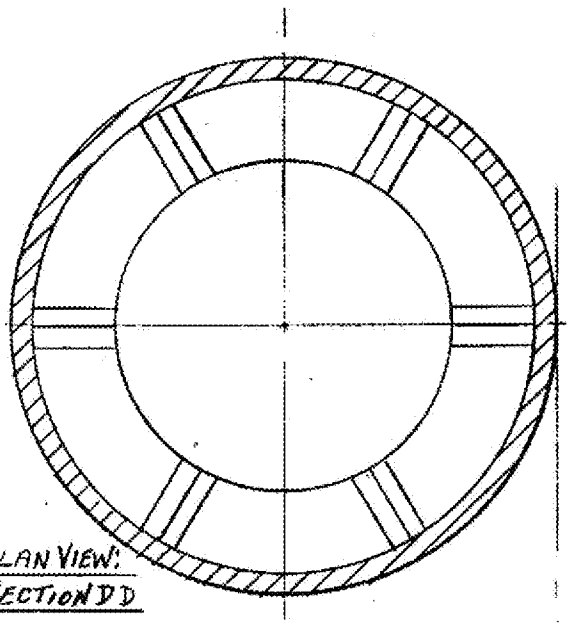
BOTTOM VIEW OF SEALER DISC

SCALE 2:1

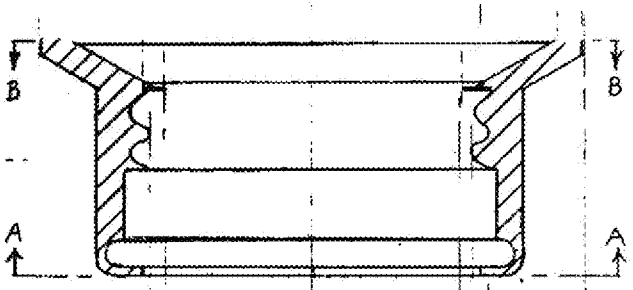
CONTAINER CAP:



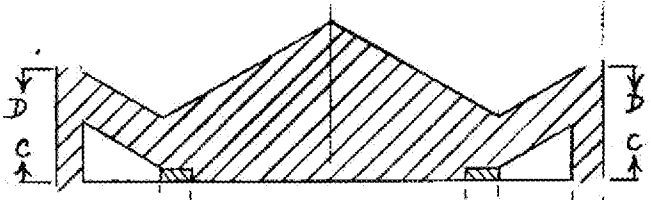
PLAN VIEW:
SECTION BB



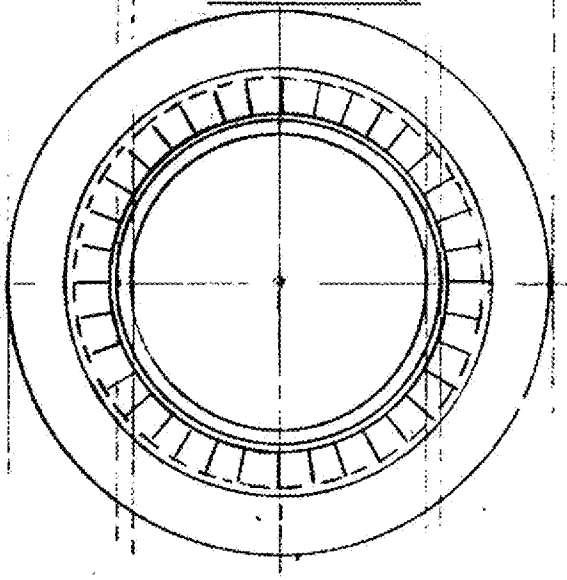
PLAN VIEW:
SECTION DD



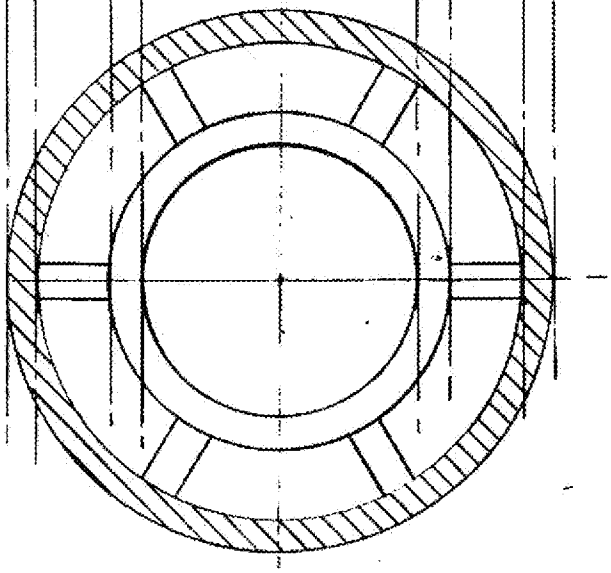

SIDE ELEVATION:
SECTION AA-BB



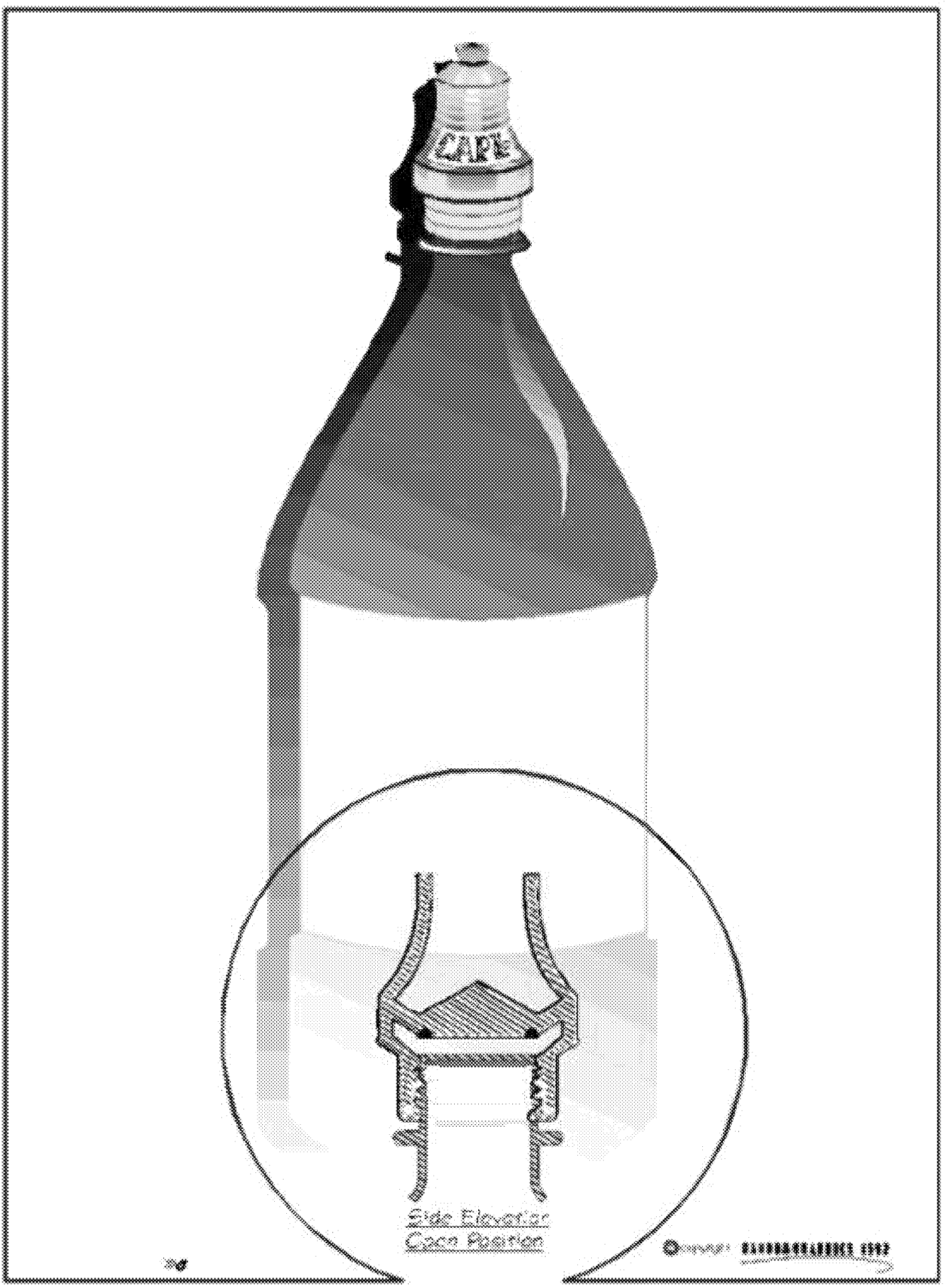

SIDE ELEVATION:
SECTION CC-DD



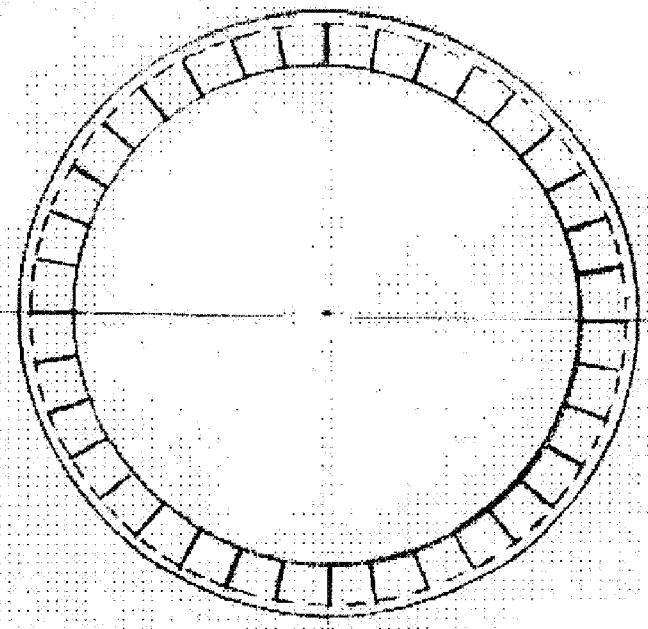
BOTTOM VIEW:
SECTION AA



BOTTOM VIEW:
SECTION CC


CAP
Side Elevation
Cam Portion

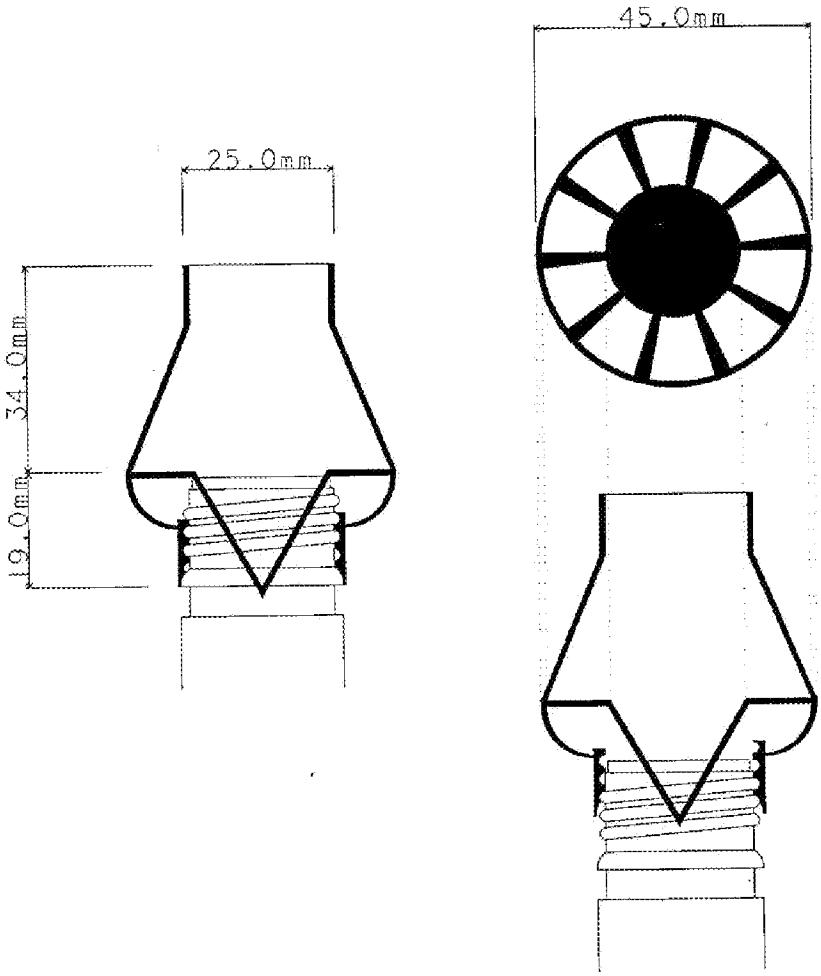
SIDE ELEVATION.



BOTTOM VIEW

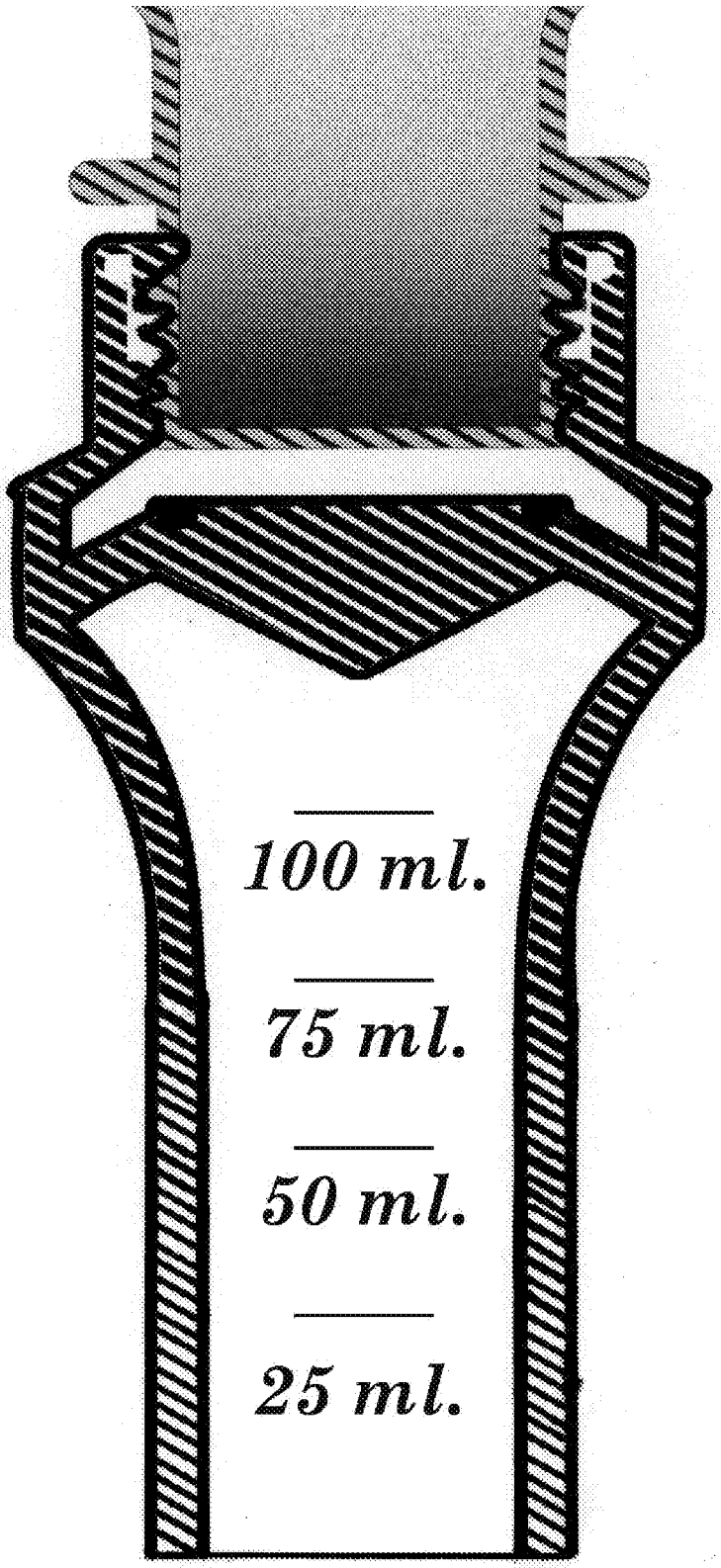
SCALE: 2:1

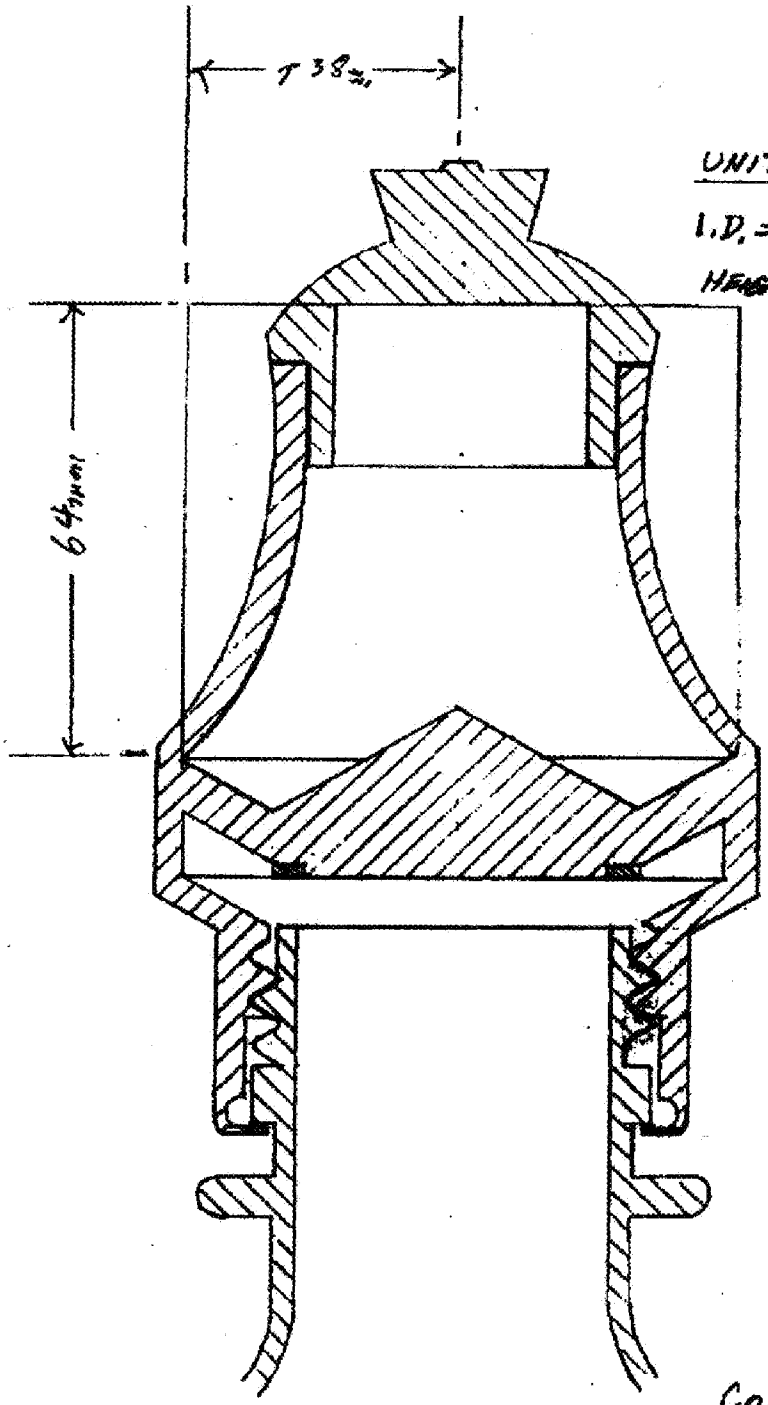
DETAIL;
FLEXIBLE STOP FLANGE
ON CONTAINER SEALER/
SPOUT ASSEMBLY.




| | |
|---|---|
| Scale: 1:1 | Client: Inter-Sphere Prod. Inc |
| Dwg By: MGX | Project: Oil Bottle Cap |
| Date: Aug. 23, 1993 | |

Side Elevation
Open Position






UNIT MADE CYLINDRICAL:

I.D. = 38 mm DIA (RADIUS 19 mm)

HEIGHT ABOVE SEAL WITH CAP ON AVERAGE 32 mm.

VOL. = $\pi 19^2 \times 32$

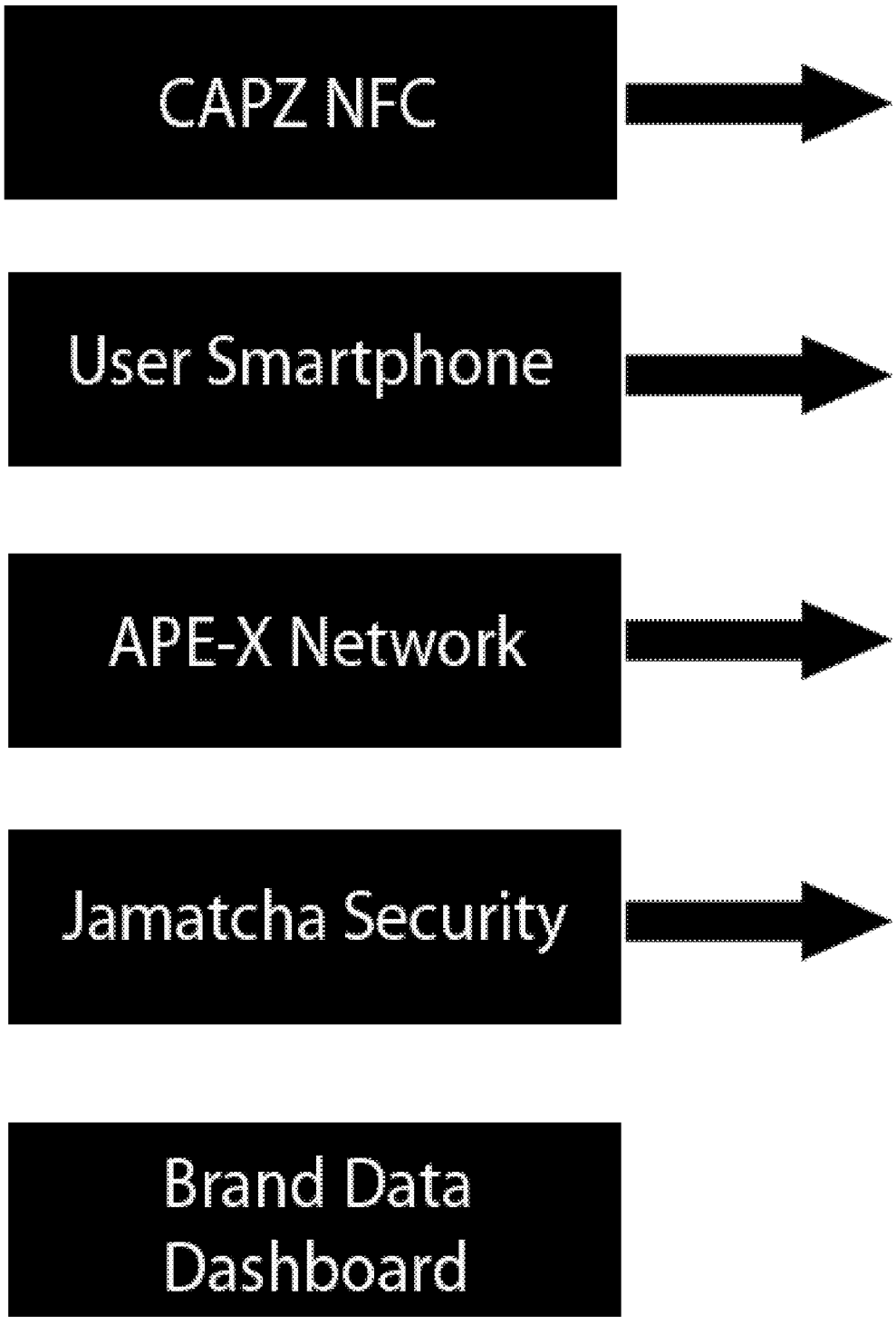
$\Rightarrow$ = 36 $cm^3$

OR = 2 $in^3$

SCALE: 2:1

SIDE ELEVATION:
OPEN POSITION.

CONTAINER CAP ASSEMBLY
INSTALLED ON PLASTIC BOTTLE.


CAPZ NFC
User Smartphone
APE-X Network
Jamatcha Security
Brand Data Dashboard