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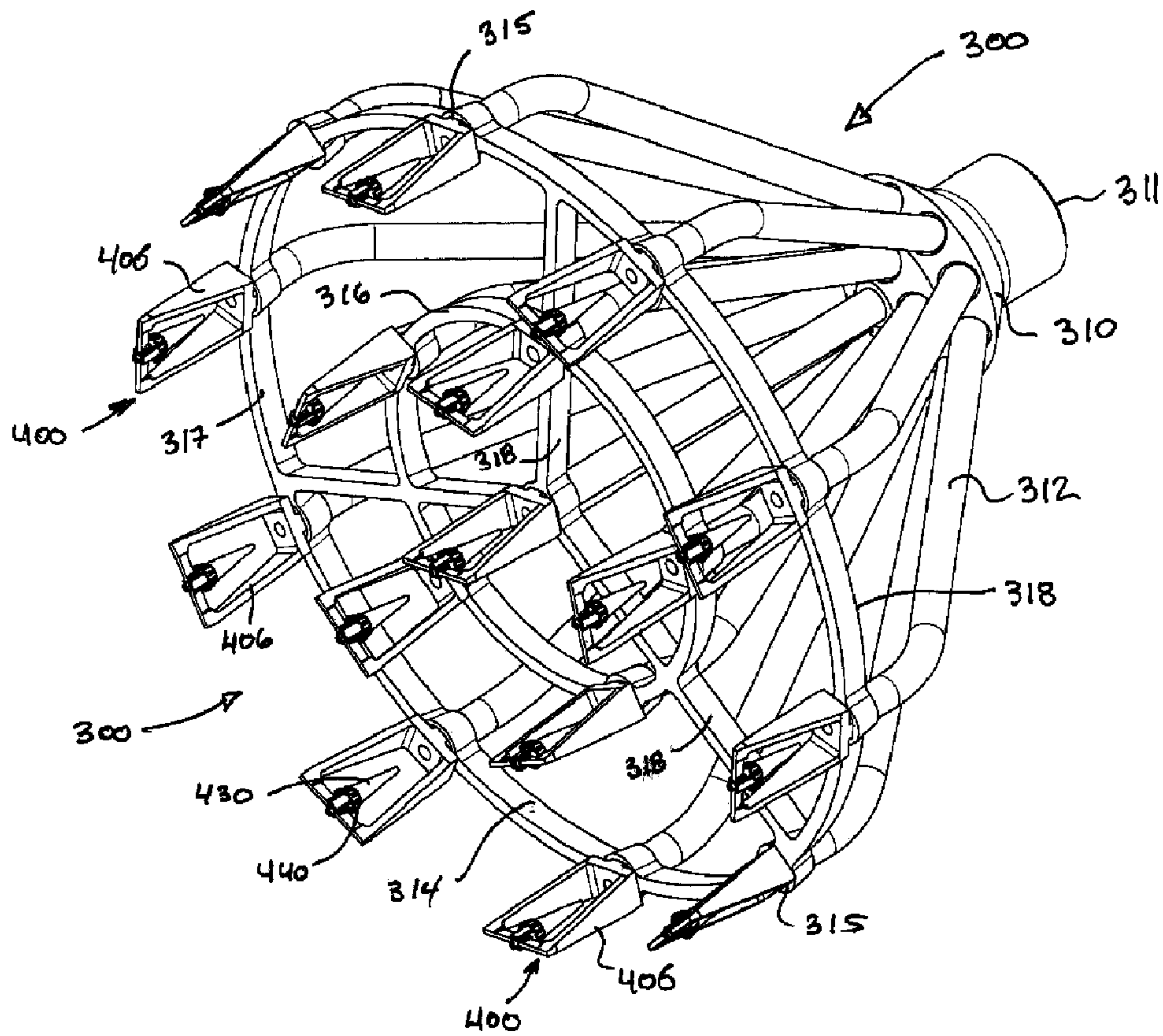
(54) **Titre : APPAREIL DE LUTTE CONTRE LES INCENDIES, TETE DE PULVERISATION ET BUSE DE PULVERISATION A LONGUE PORTEE CORRESPONDANTES**

(54) **Title: FIRE-FIGHTING APPARATUS, SPRAY HEAD AND LONG-RANGE SPRAY NOZZLE THEREFOR**



(57) **Abrégé/Abstract:**
There is provided a fire-fighting apparatus comprising a positive pressure blower generating an airstream at an outlet, and a high-flow spray head having a plurality of low-dispersion droplet generators mounted at substantially equally spaced positions proximate

(57) **Abrégé(suite)/Abstract(continued):**
to said outlet for generating and projecting water droplets within said air stream Thereby a long-range concentrated stream of droplets can be produced. There is further provided a high-flow multi-nozzle spray head and a long-range low-dispersion spray nozzle comprising a body defining an inlet bore and outlet orifice, an impingement assembly comprising an elongated conical deflector and a downstream diffuser having a plurality of forwardly oriented tabs, and at least one arm connecting a downstream end of the impingement assembly to the body.

ABSTRACT OF THE DISCLOSURE

There is provided a fire-fighting apparatus comprising a positive pressure blower generating an airstream at an outlet, and a high-flow spray head having a plurality of low-dispersion droplet generators mounted at substantially equally spaced positions proximate to said outlet for generating and projecting water droplets within said air stream Thereby a long-range concentrated stream of droplets can be produced. There is further provided a high-flow multi-nozzle spray head and a long-range low-dispersion spray nozzle comprising a body defining an inlet bore and outlet orifice, an impingement assembly comprising an elongated conical deflector and a downstream diffuser having a plurality of forwardly oriented tabs, and at least one arm connecting a downstream end of the impingement assembly to the body.

TITLE

FIRE-FIGHTING APPARATUS, SPRAY HEAD AND LONG-RANGE SPRAY NOZZLE THEREFOR

BACKGROUND

1) Field

[0001] The subject matter generally relates to fire-fighting equipment. More specifically, but not exclusively, the subject matter relates to apparatus for generating water droplets transported in a strong airflow, spray heads and spray nozzles.

2) Related art

[0002] Projecting water on burning material is a common way of lowering the temperature of the blazing mass to extinguish a fire. However, directing a heavy jet of water to the base of a fire is not a very efficient way of fighting the fire. An indication of that is the large volume of water surrounding a site after fighting a fire and causing damages to the remaining structures. Indeed, one of the most helpful properties of water for extinguishing fire is its high heat absorption capacity, especially thanks to its unmatched evaporation latent heat. Therefore, water that does not evaporate is not used efficiently on top of being a source of collateral damages.

[0003] A strategy for using water with improved efficiency and accelerating fire extinguishing for a given water flow would be to split the flow into a large number of fine droplets spread over a large area of the blazing mass, so to promote rapid evaporation of the droplets as they approach or contact the blazing material, and prevent water from running and accumulating all around. Indeed, a large flow of water directed toward a concentrated location falls rapidly and a large proportion of the volume runs over the ground without wetting and cooling burning material and without evaporating. In order to provide an effective fire fighting means, such water droplets must be projected over a sufficient range to reach the fire heat source. A long projection range is generally necessary to keep equipment and operators at the safe distance from the flames. Obstacles between the fire-fighting equipment and the brazing material may also contribute to keep equipment far from their target. Producing droplets in a proper size range to enable efficient fire fighting and projecting said droplets in large volume over a long operating range represent a highly challenging objective.

[0004] It may also be desirable to produce a mist of water spread around a fire site over a shorter range to help cooling the surrounding atmosphere and fight the elevated heat affecting any person present in the vicinity. Moreover, projecting a water mist in a directed airflow is known to help repel smoke for additional benefits such as improving visibility and dissipating hazardous vapors, gasses and aerosols.

[0005] Therefore, a mobile apparatus for generating a powerful air stream and water droplets in a combined flow can be a powerful tool for fire fighting. It would also be desirable that such an apparatus enable directing and concentrating the flow to reach the zones of interest in spite of site factors such as distance and wind. It would further be desirable to enable rapid reconfiguration of the apparatus to produce droplet of different sizes to address different needs such as fire extinguishing, air-cooling or smoke repelling.

[0006] Different types of apparatuses comprising an air blower combined with a mist-generating device for fire fighting have been provided in the prior art. However, the prior art devices fail to provide true fire extinction capability since droplet size is too small, and/or liquid flow capacity and operating range are too limited. Projecting the major part of a large flow droplet stream into a concentrated area over a distance several times the diameter of the targeted zone remain a challenge that none of the known apparatus could meet. The prior art fails to teach any spray head or spray nozzle aiming and succeeding at meeting such a challenge. Indeed, most existing spray nozzles contemplate low-range fire-fighting applications such as building sprinklers systems. They feature wide dispersion patterns and an efficient operating range of a few meters.

[0007] There is therefore a need to provide a user fire-fighting apparatus, a spray head and a spray nozzle that obviate the limitations and drawbacks of the prior art devices.

SUMMARY

[0008] It is an object of the present disclosure to provide a fire-fighting apparatus capable of producing and projecting a high flow and concentrated droplet stream of fire extinguishing fluid over a long distance thanks to a multiple-nozzle spray head and long range low dispersion spray nozzles.

[0009] According to an embodiment, there is provided a fire-fighting apparatus comprising i) a positive pressure blower mounted in a housing having an upstream air inlet and a downstream generally circular outlet defining a peripheral ring, for generating an air stream at said outlet according to a dispersion pattern; and ii) a high-flow spray head comprising a plurality of low dispersion droplet generators mounted at substantially equally spaced positions proximate to said outlet for generating and projecting water droplets within said air stream, whereby a long-range concentrated stream of droplets can be produced.

[0010] According to a further embodiment, the fire-fighting apparatus comprises a plurality of adjustable stream deflecting flaps connected to at least one controllable actuating device and having one end pivotally mounted about said outlet peripheral ring, whereby a user may control the at least one actuating device to adjust an angular position of the flaps for in turn changing the dispersion pattern.

[0011] According to another embodiment, there is provided a high flow multiple-nozzle spray head adapted for quick assembly to a fire-fighting apparatus and comprising a center spray nozzle, a first peripheral ring comprising from one to six and preferably four to five spay nozzles, and a second peripheral ring comprising from eight to ten spray nozzles, for generating a long-range low-dispersion stream of droplets.

[0012] According to yet another embodiment, there is provided a multiple nozzle spray head comprising at least two types of spray nozzles having different droplet generation and dispersion characteristics.

[0013] According to a further embodiment, there is provided a long-range low-dispersion spray nozzle comprising a body defining an inlet bore and outlet orifice, an impingement assembly comprising an elongated conical deflector and a downstream diffuser having a plurality of forwardly oriented tabs, and at least one arm connecting a downstream end of the impingement assembly to the body.

[0014] According to a still further embodiment, there is provided a long-range low-dispersion spray nozzle wherein the elongated deflector has an apex angle of less than about fifteen degrees.

[0015] According to another embodiment, there is provided a long range low-dispersion spray nozzle wherein the diffuser comprises from nine to twelve impingement tabs forwardly oriented with an angle of less than 50° with respect to the nozzle longitudinal axis.

[0016] Features and advantages of the subject matter hereof will become more apparent in light of the following detailed description of selected embodiments, as illustrated in the accompanying figures. As will be realized, the subject matter disclosed and claimed is capable of modifications in various respects, all without departing from the scope of the claims. Accordingly, the drawings and the description are to be regarded as illustrative in nature, and not as restrictive and the full scope of the subject matter is set forth in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Further features and advantages of the present disclosure will become apparent from the following detailed description, taken in combination with the appended drawings. Similar parts are identified by identical or similar numerals throughout the drawings. In the appended drawings:

[0018] Figure 1 is an illustration of an embodiment of the user configurable fire-fighting apparatus mounted on a vehicle mounted lifting platform ready for use;

[0019] Figure 2 is an isometric view of a user configurable fire-fighting apparatus according to an embodiment;

[0020] Figure 3 is an isometric view of a long-range low-dispersion multi-nozzle spray head according to an embodiment;

[0021] Figures 4a and 4b are respectively a front elevation view and a side elevation view of the spray head of Figure 3;

[0022] Figure 5 is an exploded isometric view of elevation view of the spray head of Figure 3;

[0023] Figures 6a and 6b respectively show a front elevation view and a cross-sectional view taken along line A-A of Figure 8a, of a manifold core of the spray head of Figures 3 through 5;

[0024] Figures 7a through 7e show different views of a nozzle mounting ring of the spray head of Figures 3 through 5, respectively: a side front isometric view, a front elevation view, a side elevation view, a cross sectional view taken along line B-B of Figure 7b, and a cross-sectional view taken along line A-A of Figure 7b;

[0025] Figures 8a through 8e show different views of an alternate embodiment of a nozzle mounting ring of the spray head of Figures 3 through 5, respectively: a side front isometric view, a front elevation view, a side elevation view, a cross sectional view taken along line B-B of Figure 8b, and a cross-sectional view taken along line A-A of Figure 8b;

[0026] Figure 9a is an isometric view of a long-range low-dispersion spray nozzle (droplet generator) according to an embodiment;

[0027] Figure 9b is an assembly view of the nozzle of Figure 9a, to better show a deflector cone and a diffuser thereof;

[0028] Figures 10a through 10d show different views of the deflector cone of the nozzle of Figures 9a and 9b, respectively: a front side isometric view, a side elevation view, a cross-sectional view taken along line A-A of Figure 10b, and a bottom view;

[0029] Figures 11a through 11c show different views of a diffuser of the nozzle of Figures 9a and 9b, respectively: a top view, a cross-sectional view taken along line A-A of Figure 11a, and a top plan view of the flat cut part prior to the tab bending step to form the diffuser;

[0030] Figures 12a through 12d show different views of a first alternate embodiment of the diffuser of Figures 11a through 11c, respectively: a top view, a cross-sectional view taken along line A-A of Figure 12a, and a top plan view of the cut flat piece prior to the tab bending step to form the diffuser, and a top side isometric view of the formed diffuser;

[0031] Figures 12e through 12g show different views of a second alternate embodiment of the diffuser of Figures 11a through 11c, respectively: a top view, a cross-sectional view taken along line A-A of Figure 12e, and a top plan view of the cut flat piece prior to the tab bending step to form the diffuser;

[0032] Figures 12h through 12j show different views of a third alternate embodiment of the diffuser of Figures 11a through 11c, respectively: a top view, a cross-sectional view taken along line A-A of Figure 12h, and a top plan view of the cut flat piece prior to the tab bending step to form the diffuser.

DETAILED DESCRIPTION

[0033] In the non restrictive illustrative embodiments there are disclosed a fire-fighting apparatus, a high-flow multi-nozzle spray head et a long-range low-dispersion spray nozzle for generating and projecting a concentrated stream of fire-fighting fluid droplets.

[0034] Referring now to the drawings, and more particularly to Figures 1 and 2, a first illustrative embodiment is concerned with a configurable fire-fighting apparatus **100** comprising a positive pressure blower **110,** mounted into a housing **120** having an upstream air inlet **121** and a downstream generally circular outlet **122** defining a peripheral ring **123**, for delivering a strong air stream at outlet **122**. As shown, transportation and appropriate orientation of the apparatus **100** may be provided by mounting the apparatus to a scissor lifting platform **181,** a boom or a ladder carried by a fire-fighting or recue vehicle **180**. Actuators **125** such as hydraulic or pneumatic cylinders or electric linear actuators may be mounted to the housing **120** of the apparatus **100** and to the platform **181** and connected to a control device (not shown) to enable a user to adjust the general height and stream orientation of the apparatus. A high-pressure high-flow fluid pump **182** is further carried by the vehicle **180** and supplies fluid to apparatus **100** through a supply hose **183**. The fluid may be water or a mix of grade A fire-fighting foam and water, or a similar fire-extinguishing medium.

[0035] So to provide a water containing stream as required for performing different fire-fighting tasks as stated above, the apparatus **100** further comprises a sophisticated droplet generating system incorporated into a high-flow multi-nozzle spray head **300**, provided with a plurality of long-range low-dispersion droplet generating nozzles **400**. Head **300** can be quickly mounted to or disassembled form the fire-fighting apparatus **100** to mount another head having different droplet stream characteristics, such as droplet size and/or droplet stream dispersion pattern. Thereby, apparatus **100** is suitable for addressing different fire-fighting tasks. A detailed description of the head **300** and nozzles **400** will be provided in the following, referring to Figures 3 through 12.

[0036] In order to provide adjustment of a dispersion pattern and efficient range of the air/droplet stream, the apparatus **100** may further comprise a plurality (eight shown) of adjustable partly overlapping stream deflecting flaps **130.** Flaps have a proximal end pivotally assembled at an upstream end to the peripheral ring **123** of the housing **120**, surrounding the outlet **122** thereof and can have their angular orientation adjusted by user controlled linear actuators such as electric actuators, or pneumatic or hydraulic cylinders. An adjustable converging or diverging funnel-like generally frustoconical nozzle **132,** mating with outlet **122** at an upstream end and defining a variable diameter nozzle outlet **133** at a downstream end, is thus provided.

[0037] Thereby, a user may conveniently adjust the nozzle **132** and outlet **133** to form the airflow at outlet **122** into a divergent or more focused stream pattern originating from outlet **133**. The positive pressure blower **110** is preferably driven by a variable speed motor (electric or hydraulic), whereby a user may conveniently and accurately adjust the blower RPM to produce air flows from about 1,500 to 35,000 CFM. Therefore, the apparatus **100** provides a user with control over the general strength, range and dispersion pattern of the stream projecting from the outlet **133**.

[0038] Referring now principally to figures 3 through 5, a general description of the spray head **300** will now be provided.

[0039] The high-flow multi-nozzle spray head **300** is designed to fit in the center of the outlet **122** of the apparatus **100** having a nominal diameter of 32 in (adjustable from 26 to 32 in at outlet **133**). It may fit smaller diameters down to about 24 in, or larger diameters with slight modifications or no modifications. The head **300** first comprises a fluid supply manifold comprising a core **310** (see details at Figure 6) and flow distribution tubes **312** connecting the core to a nozzle mounting ring **314**. The core **310** has ingress **311** defining a standard 2.5 in diameter Torz mounting fluid connection for quick detachable assembly to a mating tubular outlet centered in a throat of the apparatus **100** near outlet **122**. With distribution tubes **312** made to at least 0.55 in inside diameter the manifold provides the capability to supply up to 500 GPM flow to the nozzles with minimal pressure drop. The head **300** and droplet generating nozzles **400** are designed to handle operating pressures ranging from 175 to 250 PSI as provided by the onboard pump **182**.

[0040] The nozzle mounting ring **314** (details at Figure 7) is adapted to threadedly receive a plurality of long-range low-dispersion nozzles having a k-factor in the range of 2 to 4, in a generally equally spaced pattern to provide uniform flow distribution with minimal interaction between individual nozzle jets. This range of k-factor is necessary to meet the required long range of stream projection at the targeted operating pressures with the preferred impingement section design. Therefore, from nine to sixteen nozzles are to be provided so to handle the rated flow. In the head embodiment illustrated at Figures 3-5, a total of sixteen nozzles are provided. Figures 7a-7e illustrate details of the sixteen nozzle ring and Figures 8a-8e illustrate details of a fourteen nozzle ring **314'**. Nozzles are not required to be all similar. Actually, although barely noticeable, the example embodiment has one type of nozzles at the center and at the inner ring and another type having slightly different flow and dispersion characteristics mounted on the outer ring. This has been found desirable to achieve a given range of droplet sizes and optimal stream projection pattern. The basic structure and different possible variations of the specifications of nozzles **400** will be discussed in the following, referring to Figures 9 to 12.

[0041] Referring to Figure 7a-e, the sixteen nozzle mounting ring **314** comprises sixteen treaded cavities **315** each adapted to receive the threaded base (or body) **403** of a nozzle **400** (see Figure 9). All cavities have the same diameter of 0,87 (7/8) in and all usable nozzles have a common base **403** that matches this specification for interchangeability, although flow characteristics such as inlet diameter and impingement section design may be made slightly variable from a nozzle to another.

[0042] The mounting ring **314** of Figure 7 comprises a center nozzle mounting cavity, a 10 in diameter inner ring **316** having five equidistant cavities **315**, and a 20 in nominal diameter outer ring holding ten equidistant nozzle positions **315**, for a total of sixteen substantially equidistant nozzle positions. The fourteen cavity nozzle mounting ring **314'** of Figure 8 also has a 10 in inner ring **316'** that is rather provided with four cavities **315** and a 20 in external ring **317'** holding nine cavities. In both of these embodiments, rings are interconnected by lean members **318** having a frusto-conical cross-section with a narrower side facing the source of airflow **110** to minimize aerodynamic interferences. Similar members constitute the rings **316**, **317** themselves to interconnect nozzle mounting positions **315**. The manifold **310** and the rings **314** and **314'** are made from a high strength corrosion proof material such as stainless steel.

[0043] Turning now to Figures 9 through 12, the long range low-dispersion spray nozzles **400** will be described in detail. The nozzles **400** are devised to generate droplet having an average diameter ranging from 600 to 1000 microns (preferred 800) and to project 90% of the generated stream within a 15 ft diameter target zone at a distance of about 100 ft with the assistance of the airflow.

[0044] Such design specifications obviously deviate from those of conventional nozzles mostly developed for application in building sprinkler systems. Therefore, as stated above, a k-factor between 2 and 4 and preferably of about 3 is adopted, meaning that outlet orifices diameter are selected between 0.312 and 0.375 in, with a diameters of 0.343 (at center and inner ring) and 0.375 (at outer ring) being used in the exemplary sixteen nozzle ring configuration.

[0045] Referring to Figures 9a and 9b, the general structure of the nozzle **400** is as follows: The nozzle comprises an outwardly threaded base **403** for screwing into mating threaded cavities **315**, the base **403** having an internal bore terminated into an outlet at orifice **404** conditioning an outlet fluid jet from the fluid source supplied through the manifold **310-312** and the ring **314**. Tapering arms **406** project axially from the base **403** to support a lean cross-member **408** provided with an axially drilled seat portion **410**. An impingement section is comprised of an elongated conical deflector **430** and a diffuser **440**. The deflector **430** has an internally threaded tubular stem **431** adapted for fit insertion in the circular aperture **441** at the center of diffuser **440** (see Figures 11a-c) and insertion into the drilled hole **411** in the mounting seat **410**. A screw **412** and a washer **413** are used to fasten the deflector and diffuser assembly to the side of the seat **410** that faces the outlet orifice **404**. The impingement assembly is thereby mounted upstream of the seat **410** and cross member **408**, thus minimizing hydrodynamic interference caused by these elements.

[0046] Referring to Figures 10a-10d the conical deflector **430** has a small apex radius (0.63 in to prevent gathering debris with a sharp spike) facing the fluid jet projecting from outlet **404** and an acute apex angle **θ** of preferably less than 15° for the long range nozzle **400**. Optimal projection and diffusion performance has been experienced with an apex angle of 10° for a mean droplet size of about 800 microns. The circular base **436** having a diameter of about 0.5 is adapted to sit on the flat circular center portion **442** of the diffuser **440** (Figures 11a-c). Thereby, the conical portion of the deflector **430** has a length that is about three to six times its base diameter. The deflector **430** and diffuser **440** are preferably made from a material that is resistant to abrasion and corrosion such as stainless steel.

[0047] Figures 9a and 9b respectively illustrate a top view and an axial cross sectional view of the diffuser 440. Figure 9c shows a flat part prior to the folding operation and best illustrates the quasi-rectangular elongated shape of the tabs **443**. Ten to eleven elongated tabs **443** (eleven shown) project from the generally circular center portion **442** and are equally distributed about the periphery of the diffuser **440** with a spacing of 32.7° while their width is about 8.4°. The tabs **443** are folded with an exceptionally small acute angle **α** of 10° to 15° (preferred 15° shown) with respect the center axis of the circular mounting aperture **441**. Figures 12a-j illustrate three alternate embodiments of the diffuser **440**, wherein the tab bending angle and the number of tabs are respectively (10° - 11), (10° - 10) and (15° - 10). The overall diameter of the diffuser **440** is only slightly (typically less than 50%) larger than the deflector base **436** diameter. Different configurations provide slightly different droplet size distribution and projecting range to meet dispersion pattern objectives.

[0048] The best mode of carrying out the subject matter, according to the contemplated projection range and dispersion pattern performance for long range fire extinction applications, was experienced using nozzles **400** with 10° deflector cone apex angle **θ**, and eleven tabs **443** with a 15° bending angle **α** on the diffuser **440**, but with an outlet orifice **404** diameter of 0.343 in for the six center nozzles and 0.375 in for the ten peripheral nozzles of a sixteen nozzle spray head **300**. Good performance was also obtained with a fourteen nozzle head **430'** having five center nozzles (0.343) and nine peripheral nozzles (0.375) **400**, and with a nine nozzle head (not shown).

[0049] Referring back to the nozzle assembly of Figures 9a-9b, it should be noted that the diffuser **440** is assembled with its tabs **443** bent in the downstream direction that is away from the outlet orifice **404**, with an acute angle with respect to the longitudinal axis. This particular arrangement is characteristic of the applications contemplated by the apparatus **100**. In cooperation with the small angle of diffusion (diffuser apex angle), elongated diffusion cone and the narrow span of the diffuser **440**, this contributes to minimizing interference and kinetic energy neutralization between individual streams produced by adjacent nozzles **400** in head **300** and meeting the low-dispersion long-range specifications of apparatus **100**.

[0050] In use, the pump **182** supplies fluid at high-pressure and high-flow through the hose **183** to a fluid inlet in apparatus **100**, in turn supplying the manifold core **310** through ingress **311** with the fluid that is equally distributed though the feed tubes **312** up to the inlets of the nozzles **400**. A fluid jet projects from the outlet **404** of each nozzle and hits the impingement assembly. The jet is split by the elongated deflection cone **430** to form a thin conical fluid stream that hits the tabs **443** of the diffuser **440**. The stream is thereby into droplets forwardly projected with high velocity thanks to their kinetic energy provided by the high supplied pressure and the high-velocity airflow produced by the blower **110**. The airflow provides some further splitting of the droplets to achieve the desired size range, dispersion and projection range. Flaps **130** may be adjusted, in addition to fluid pressure and flow control, to further control the range and direction of the droplet stream at the apparatus' outlet **133**, to take into account factors such as wind effects, obstacles and distance to the target.

[0051] It can thus be easily appreciated that the above-described non-restrictive illustrative embodiments of the configurable fire-fighting apparatus, spray head and long range low-dispersion nozzles according to disclosed matter obviate the above-discussed limitations and drawbacks of the prior art apparatuses, systems and devices.

[0052] While preferred embodiments have been described above and illustrated in the accompanying drawings, it will be evident to those skilled in the art that modifications may be made without departing from this disclosure. Such modifications are considered as possible variants comprised in the scope of the disclosure.

WHAT IS CLAIMED IS:

1. A fire-fighting apparatus comprising i) a positive pressure blower mounted in a housing having an upstream air inlet and a downstream outlet, for generating an air stream at said outlet according to a dispersion pattern; and ii) a high-flow spray head comprising a plurality of low-dispersion droplet generators mounted at substantially equally spaced positions proximate to said outlet for generating and projecting water droplets within said air stream, whereby a long range concentrated stream of droplets can be produced.

2. A high-flow multiple-nozzle spray head adapted for quick assembly to a fire-fighting apparatus and comprising a center spray nozzle, a first peripheral ring comprising from one to six and preferably four to five spay nozzles, and a second peripheral ring comprising from eight to ten spray nozzles, for generating a long-range low-dispersion stream of droplets.

3. A long-range low-dispersion spray nozzle comprising a body defining an inlet bore and outlet orifice, an impingement assembly comprising an elongated conical deflector and a downstream diffuser having a plurality of forwardly oriented tabs, and at least one arm connecting a downstream end of the impingement assembly to the body.

Application number / numéro de demande: 2810080

Figures: 1, 2

Pages:

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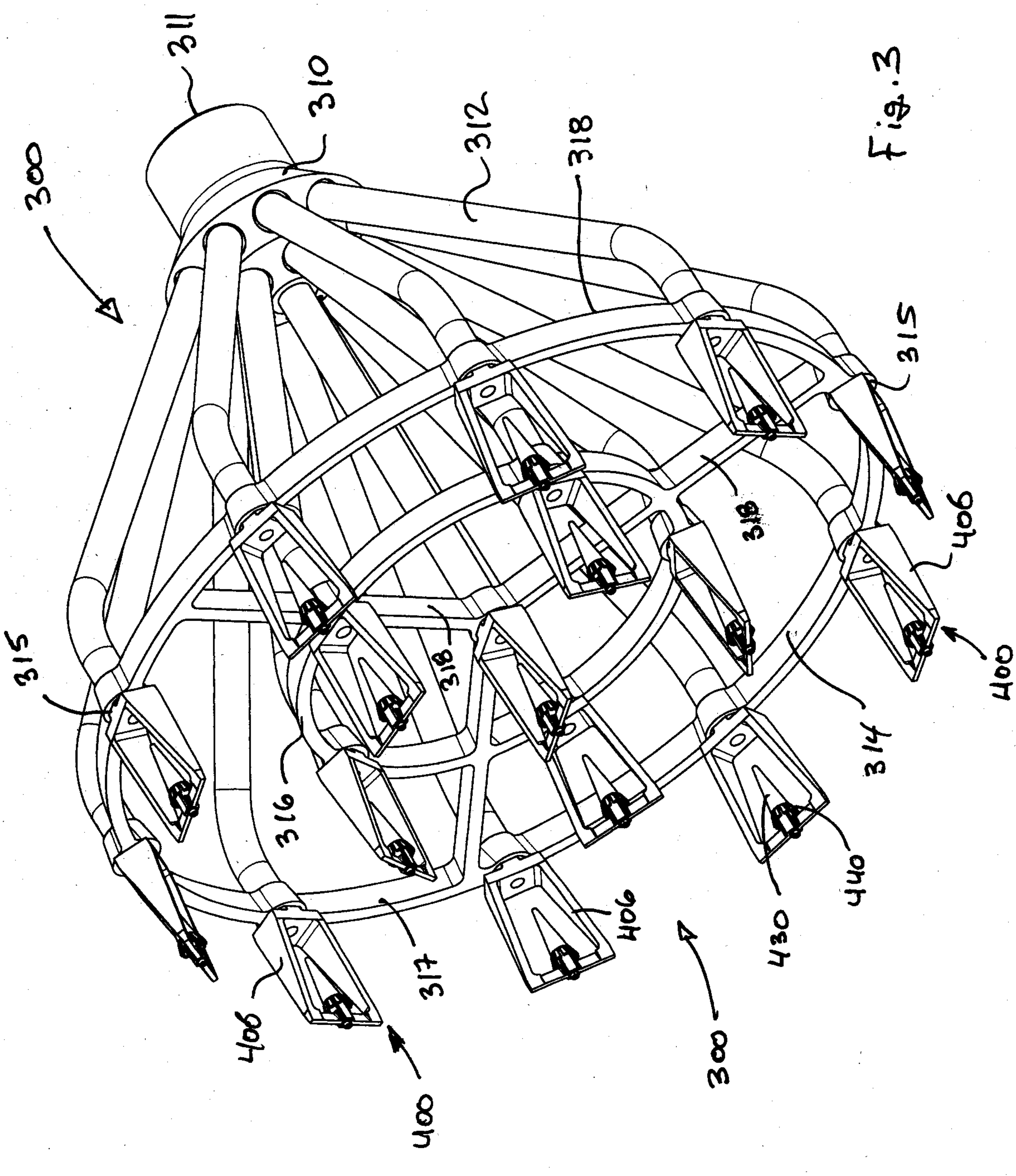
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Fig. 3

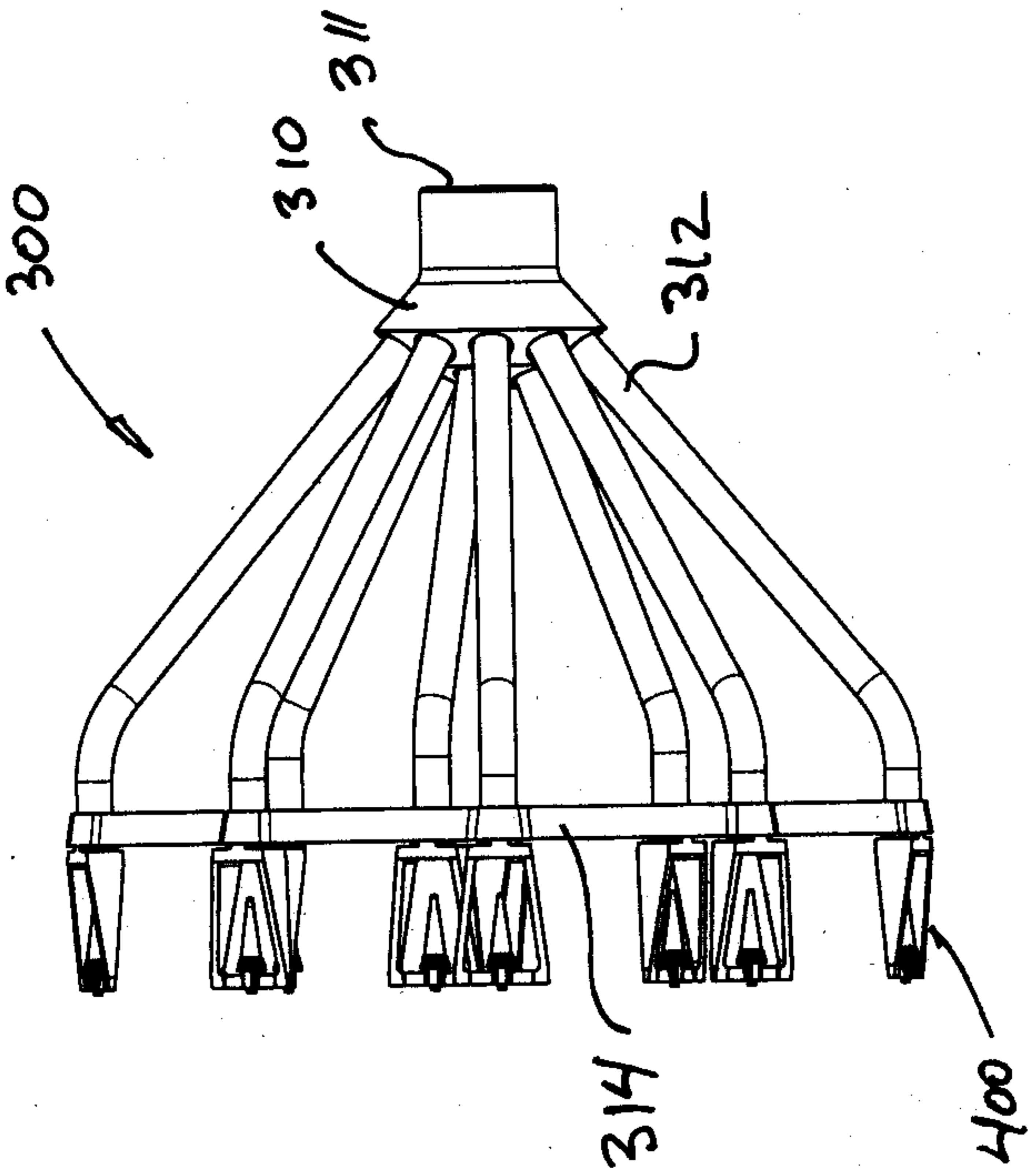
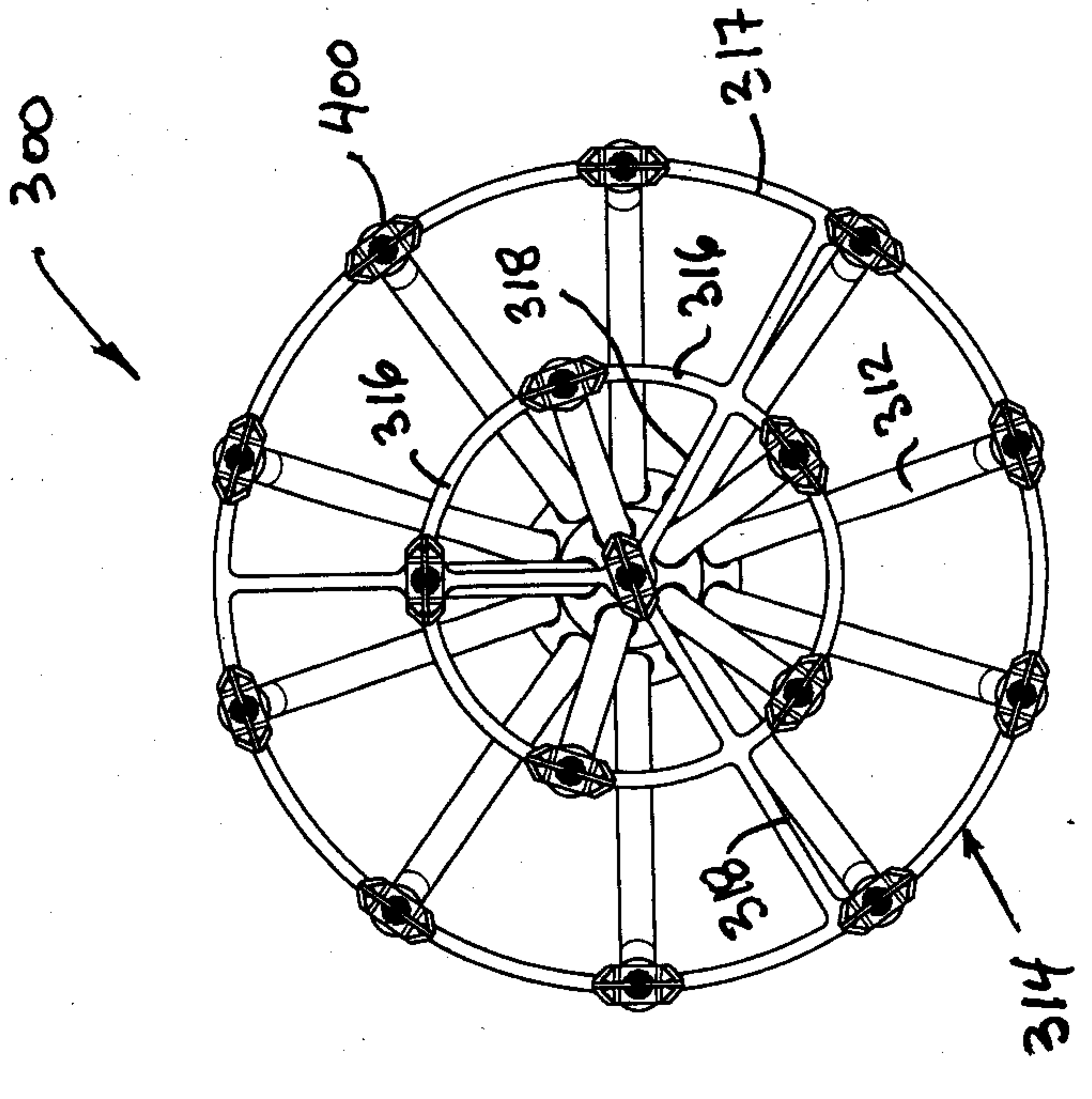


Fig. A



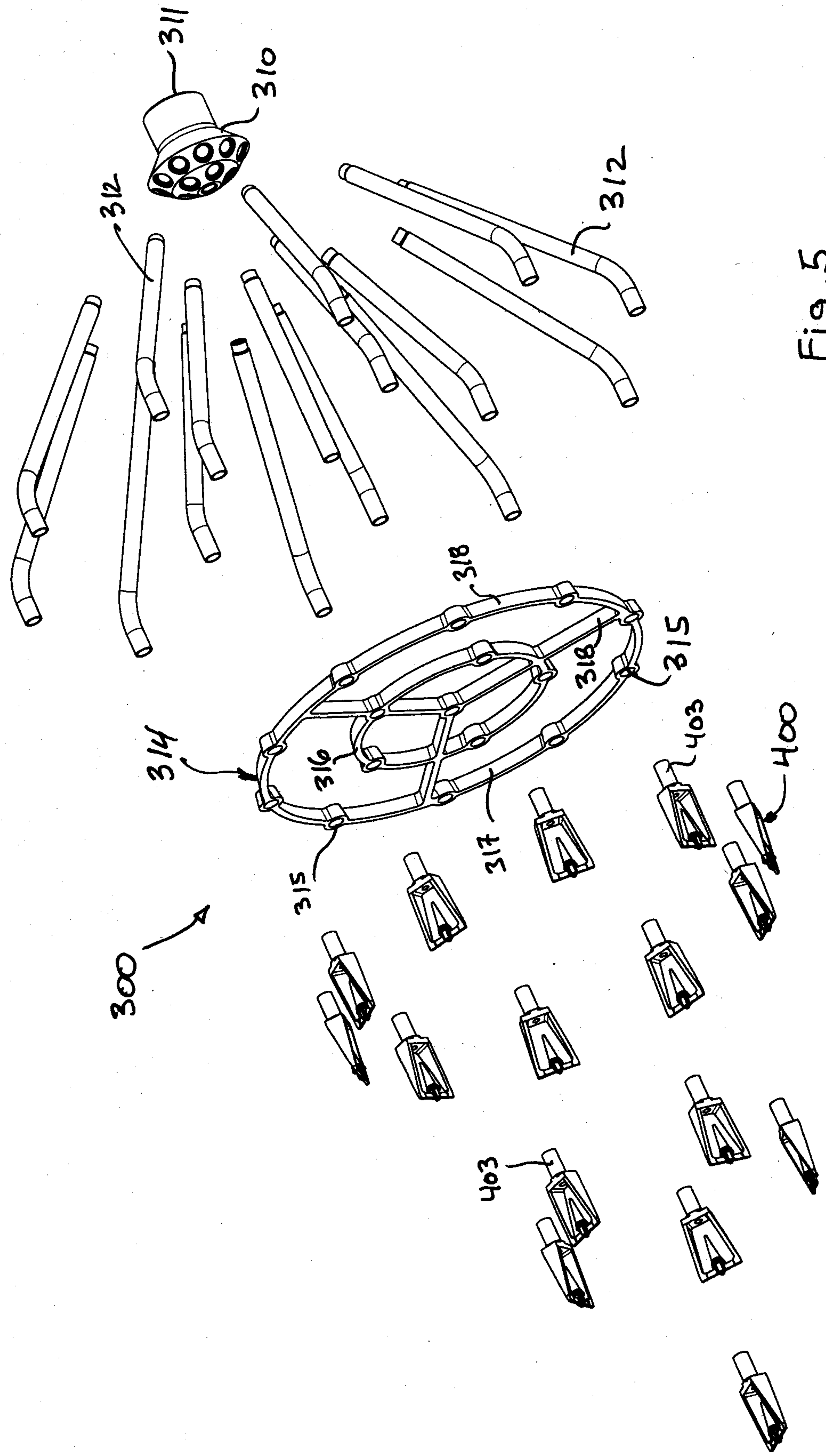


Fig.5

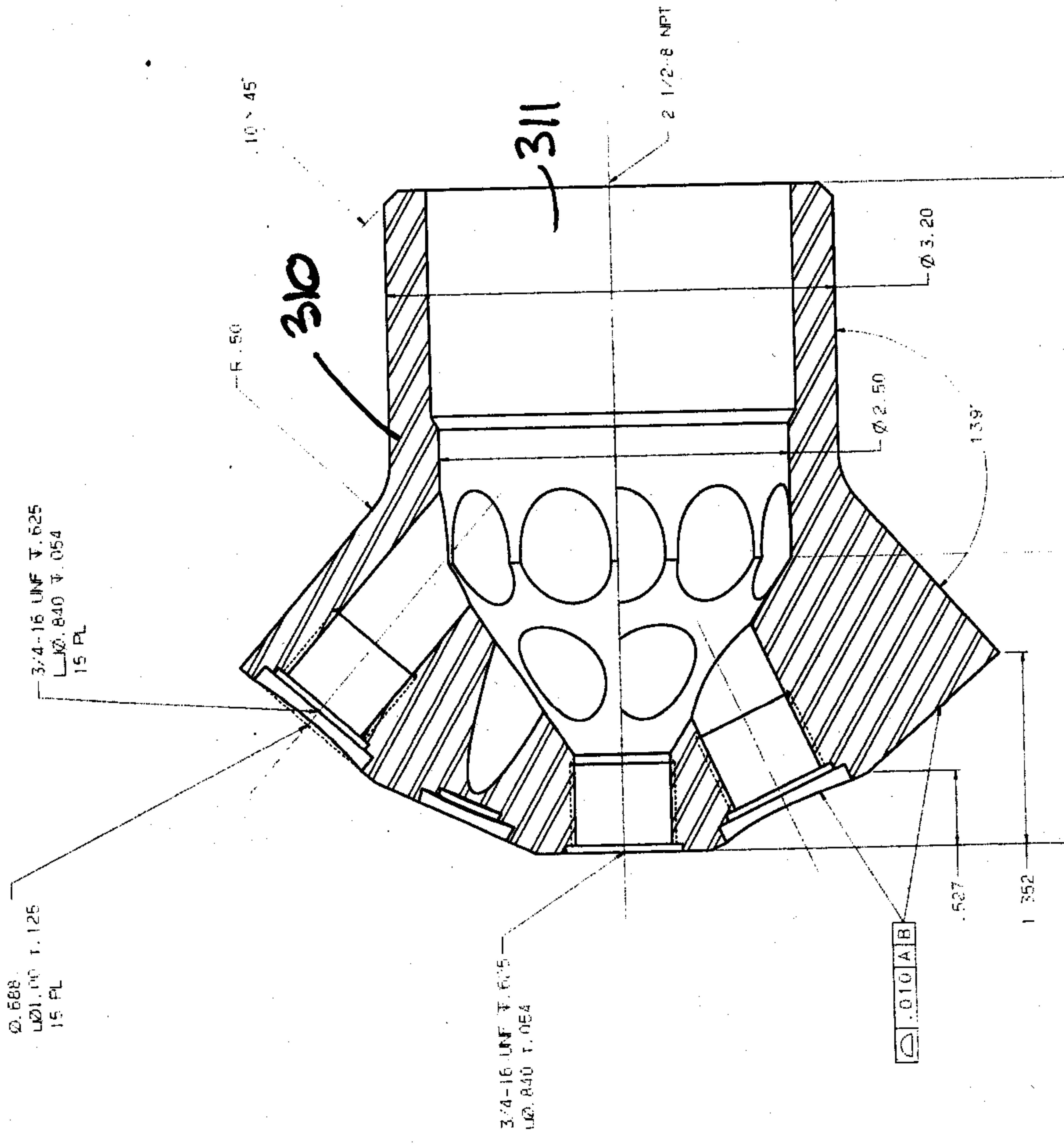


Fig. 6b

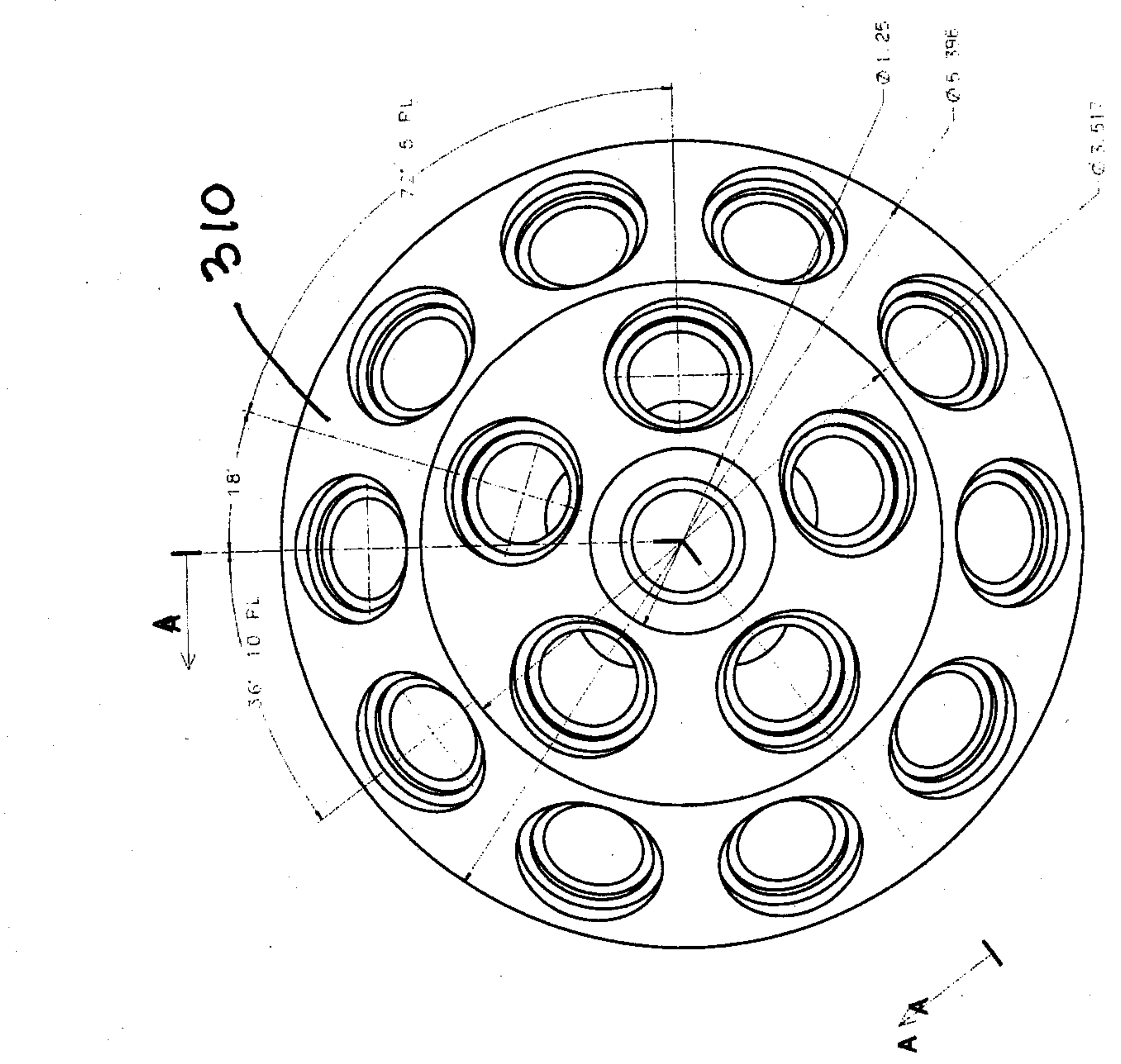


Fig. 6a

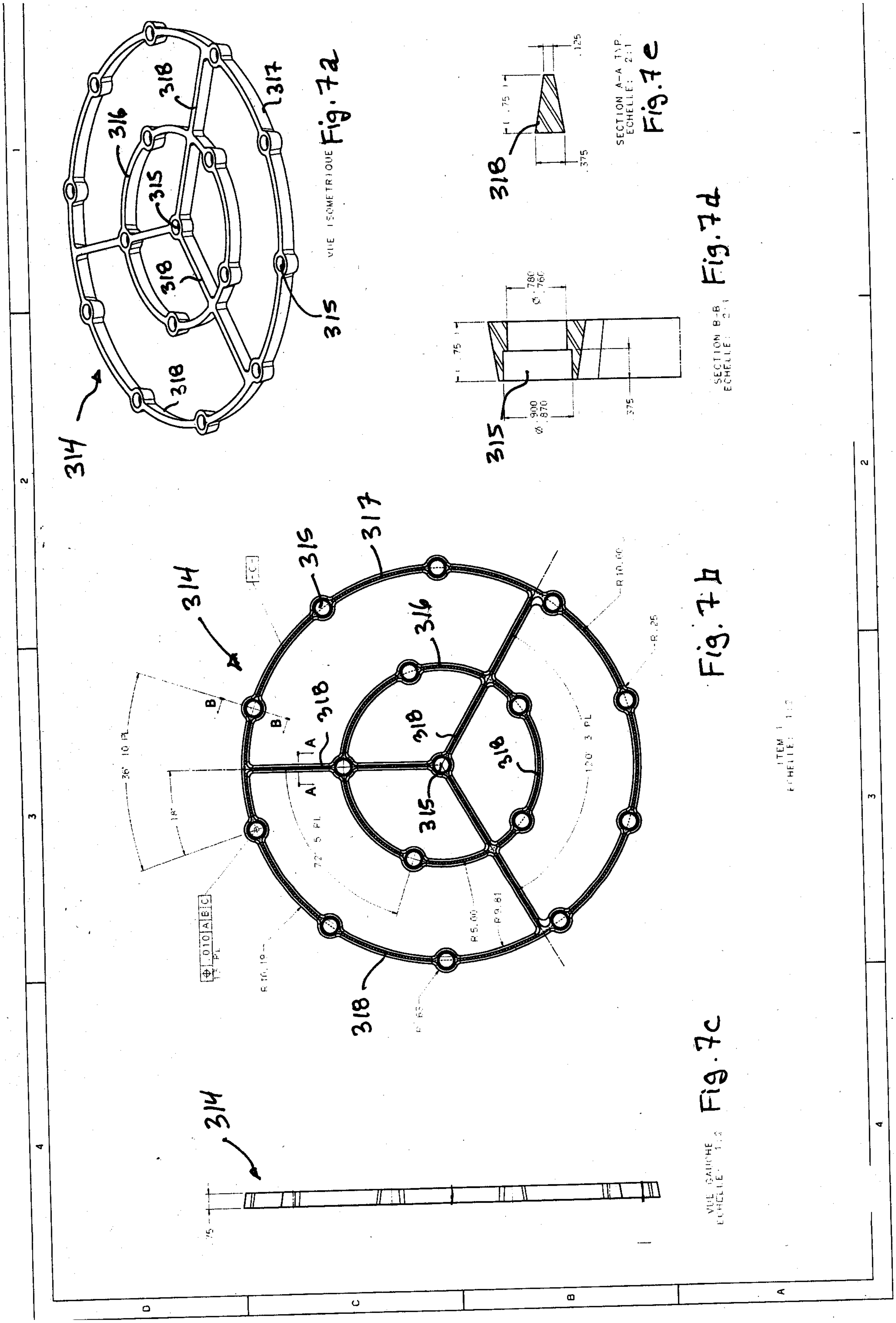


Fig. 7a
VUE ISOMETRIQUE
Fig. 7b
Fig. 7c
Fig. 7d
Fig. 7e
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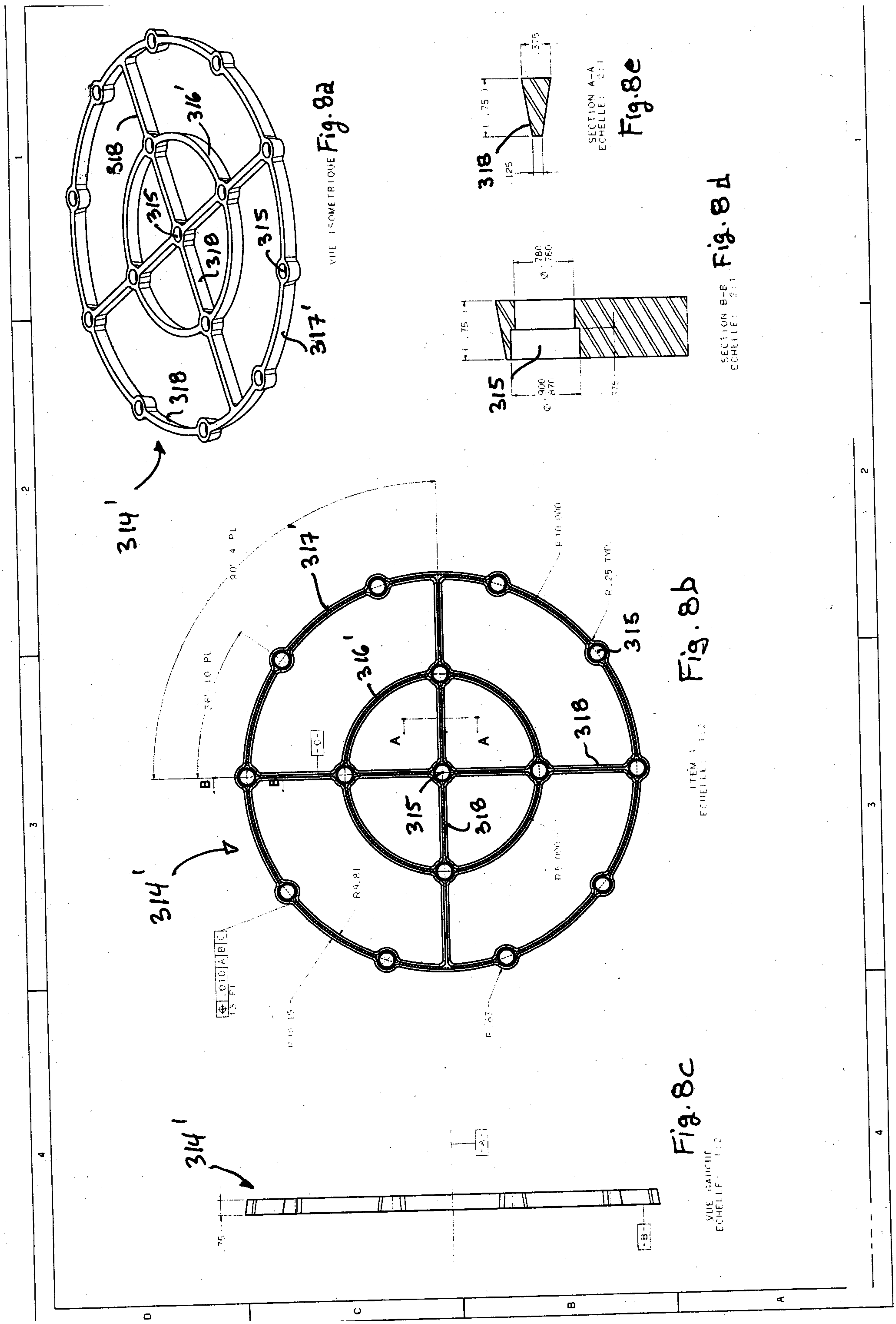
Fig. 8a
VUE ISOMETRIQUE
Fig. 8b
Fig. 8c
VUE GAUCHE
Fig. 8d
SECTION B-B
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Fig. 8e
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ITEM 1

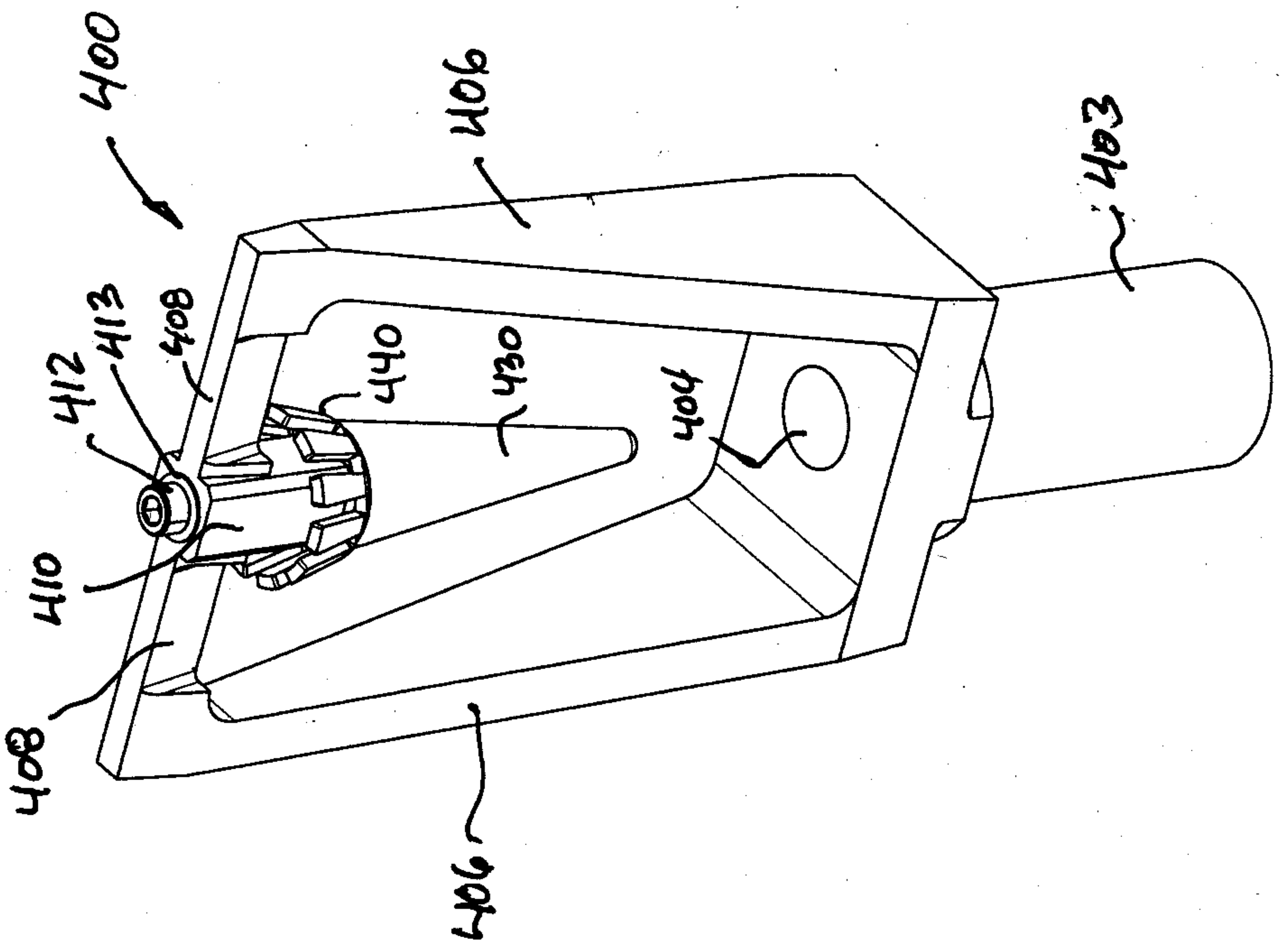
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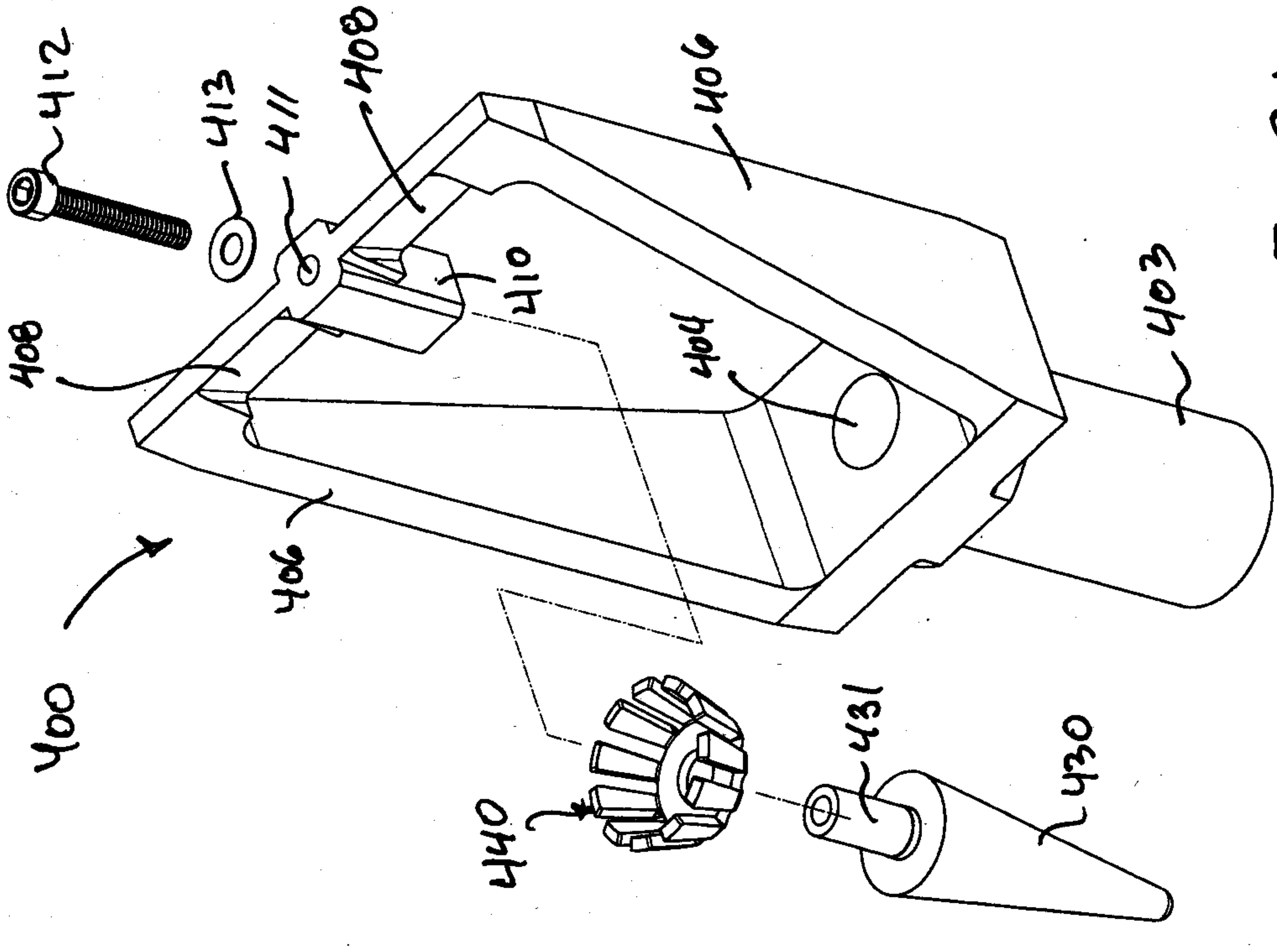
Fig. 9a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430

Fig. 9b

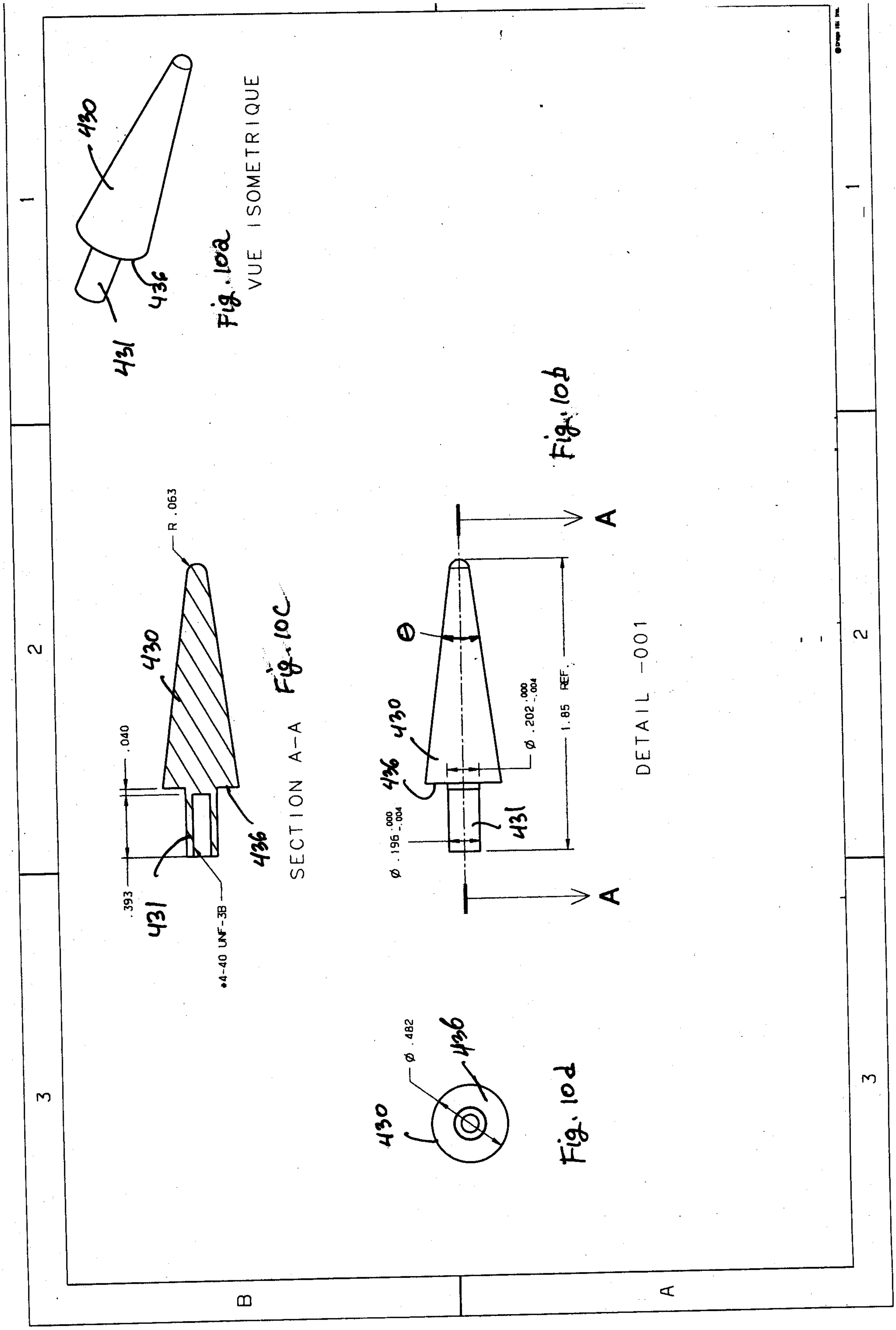


Fig. 10a
VUE ISOMETRIQUE
430
431
436
Fig. 10b
DETAIL -001
A
A
θ
ø .202 +.000 -.004
1.85 REF.
ø .196 +.000 -.004
Fig. 10c
SECTION A-A
R .063
.040
.393
#4-40 UNF-3B
Fig. 10d
ø .482
1
2
3
A
B

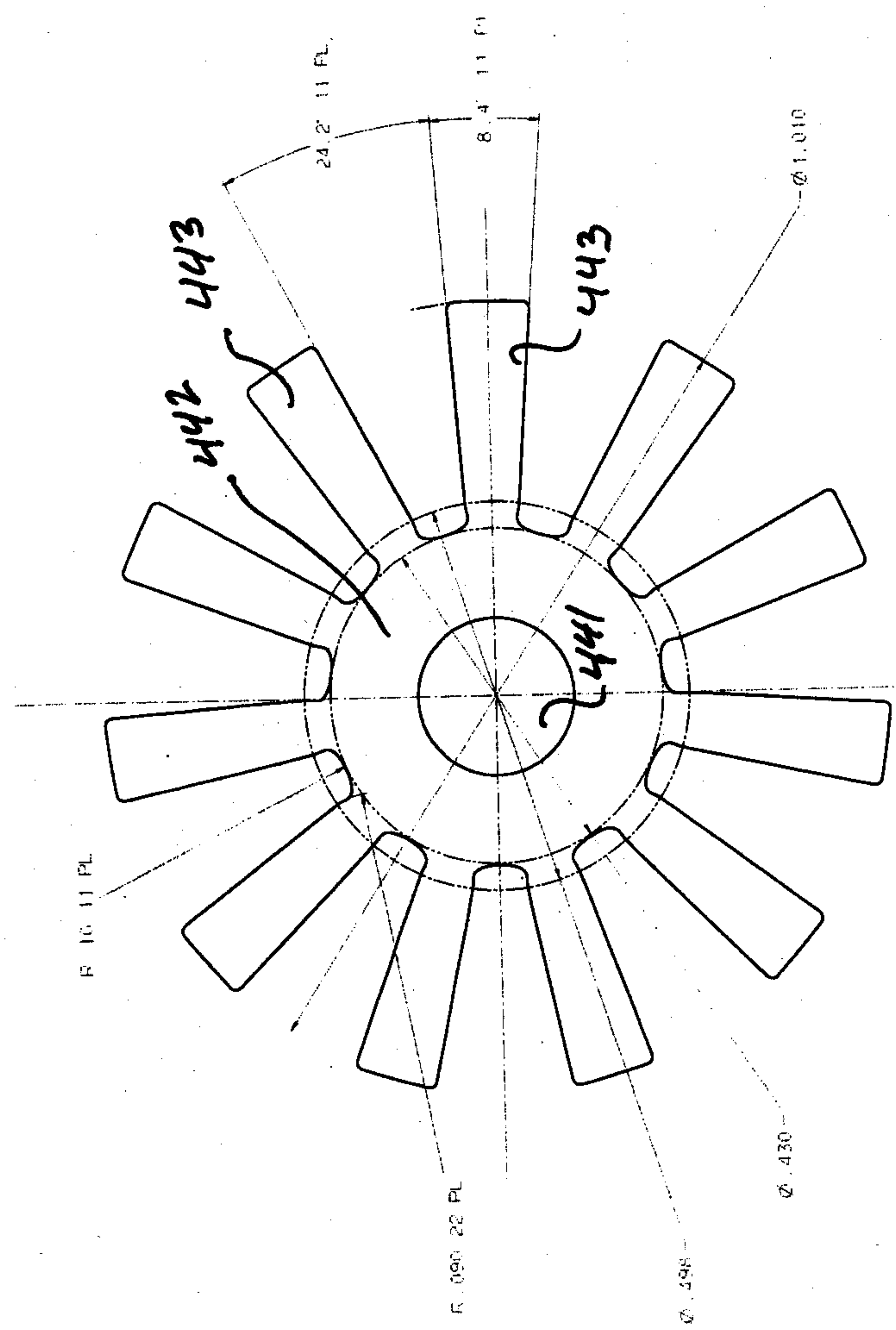


Fig. 11c

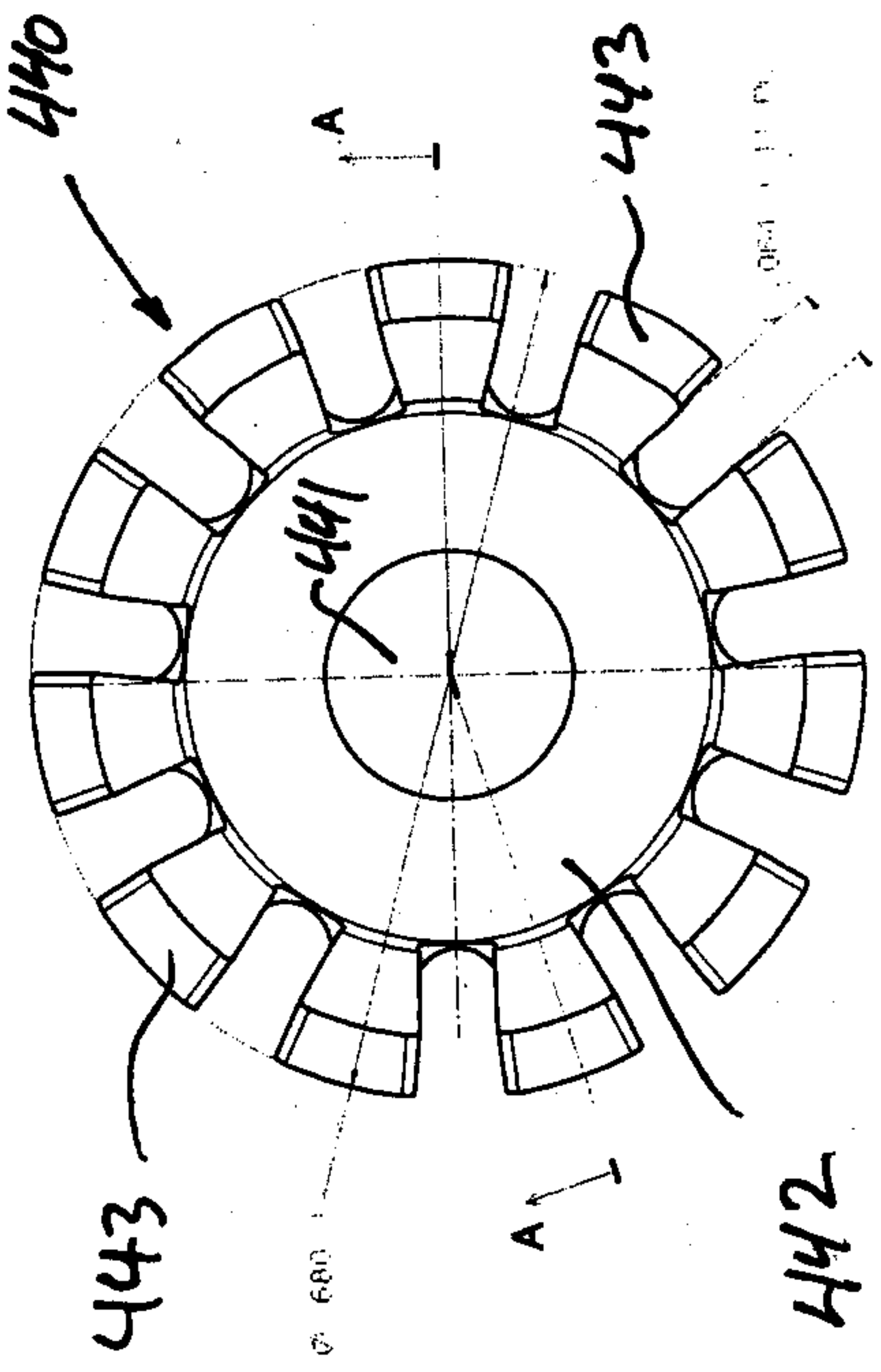


Fig. 11a

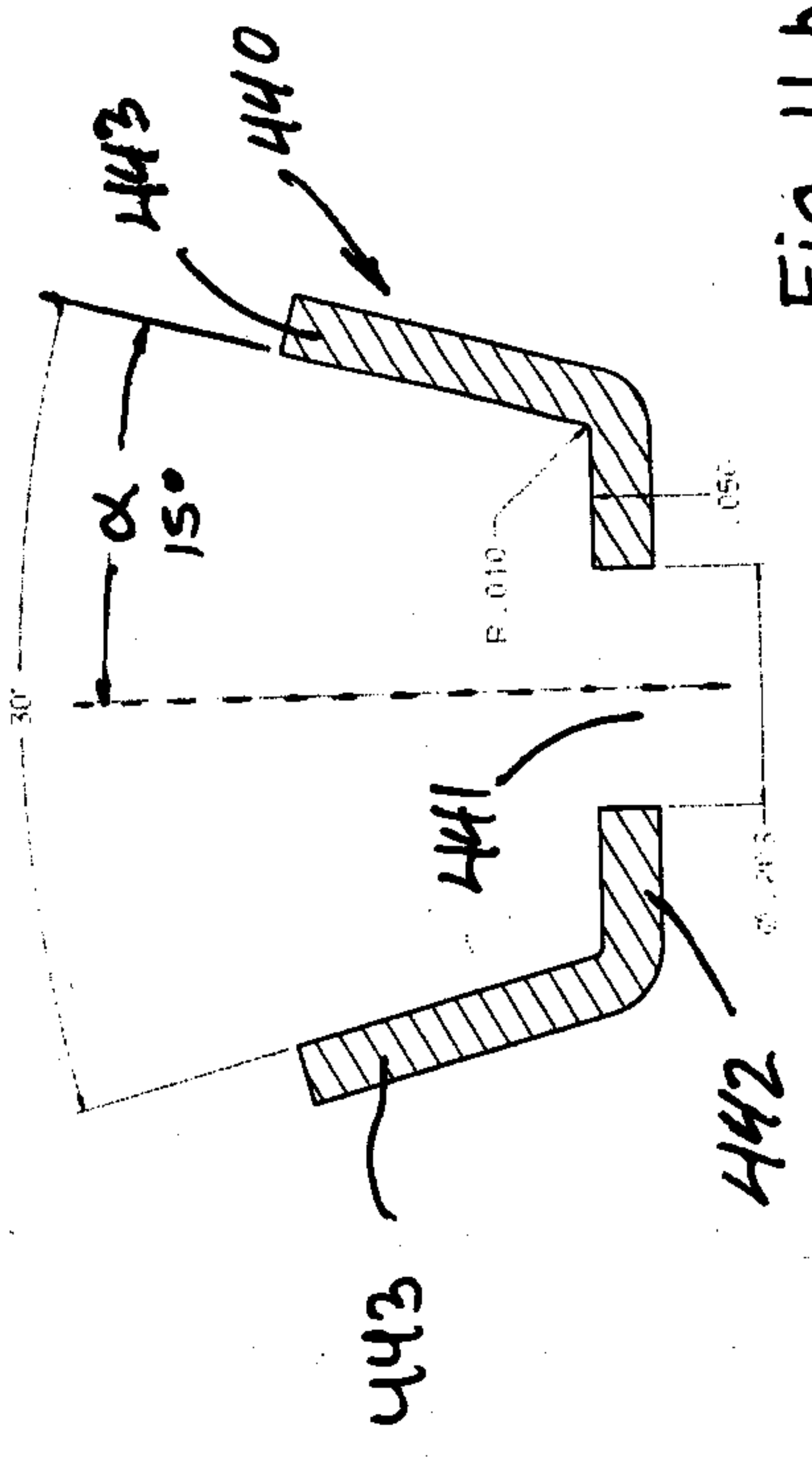
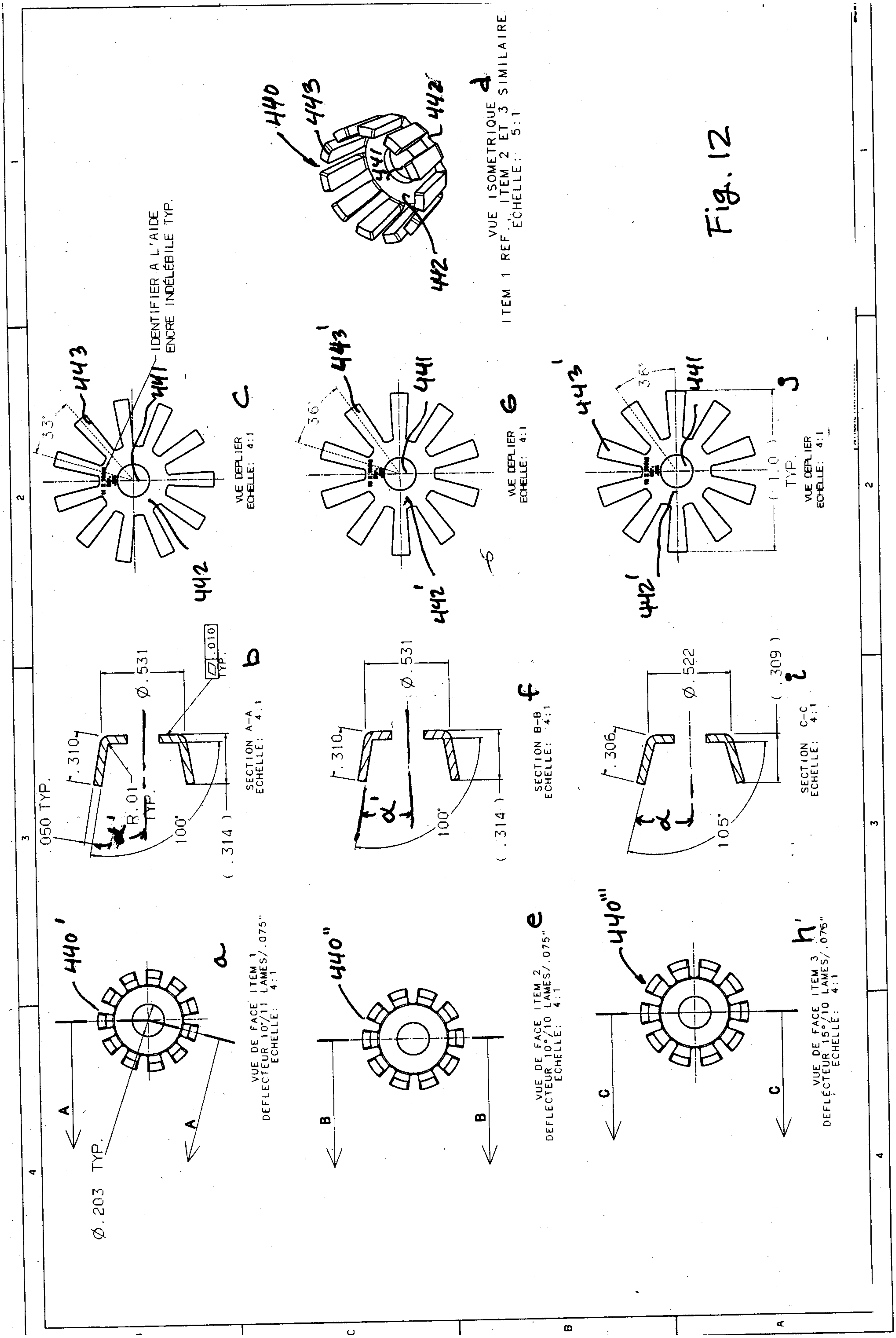
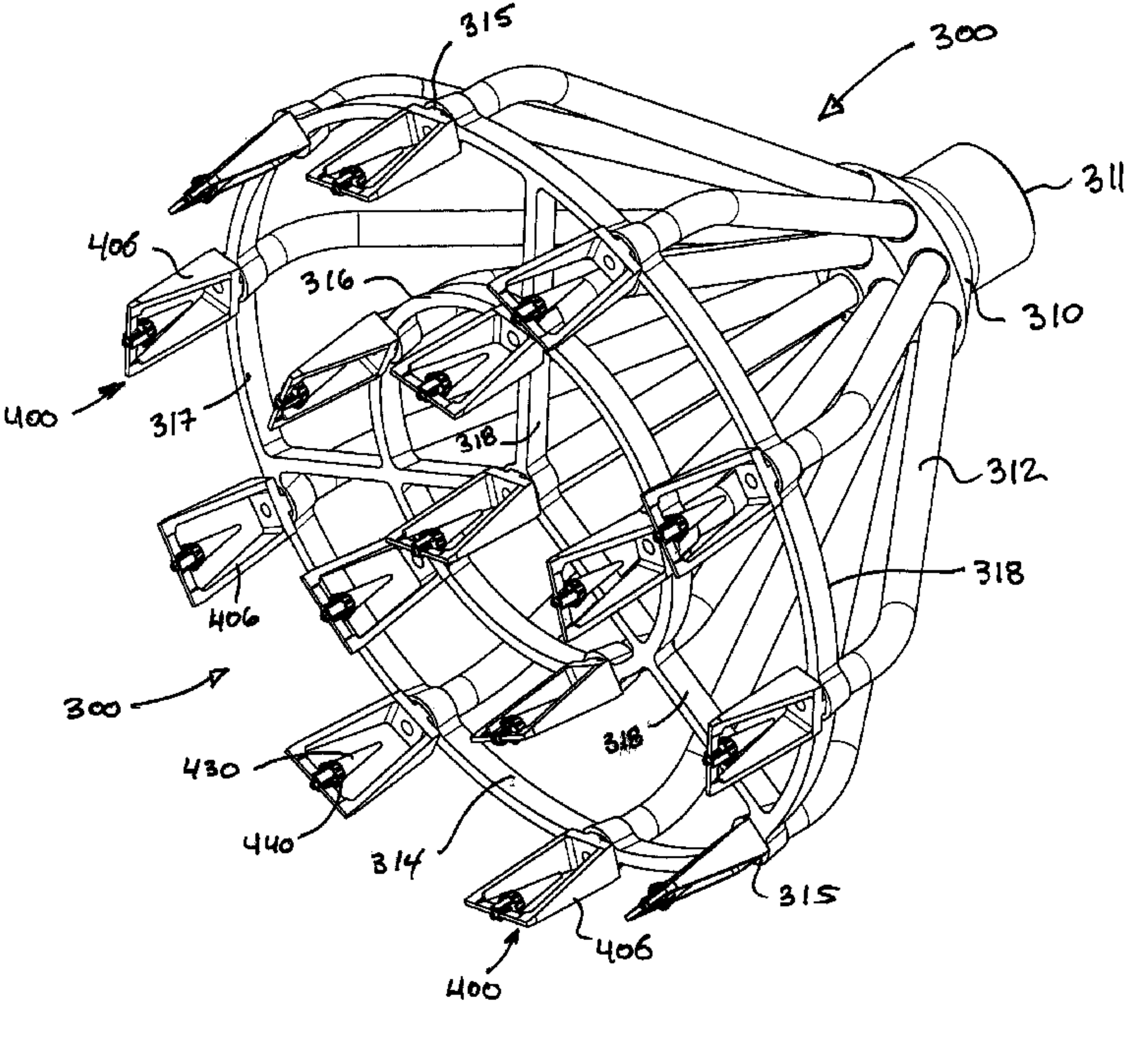


Fig. 11b



VUE DE FACE ITEM 1
DEFLECTEUR 10°/11 LAMES/.075"
ECHELLE: 4:1
VUE DE FACE ITEM 2
DEFLECTEUR 10°/10 LAMES/.075"
ECHELLE: 4:1
VUE DE FACE ITEM 3
DEFLECTEUR 15°/10 LAMES/.075"
ECHELLE: 4:1
SECTION A-A
ECHELLE: 4:1
SECTION B-B
ECHELLE: 4:1
SECTION C-C
ECHELLE: 4:1
VUE DEPLIER
ECHELLE: 4:1
IDENTIFIER A L'AIDE
ENCRE INDÉLÉBILE TYP.
VUE ISOMETRIQUE
ITEM 1 REF, ITEM 2 ET 3 SIMILAIRE
ECHELLE: 5:1
Ø.203 TYP.
.050 TYP.
R.01 TYP.
.310
.306
Ø.531
Ø.522
.010 TYP.
100°
105°
(.314)
(.309)
33°
36°
(1.0) TYP.
440'
440"
440'''
441
442
442'
443
443'
440
a
b
c
d
e
f
G
h'
i
J
A
B
C

Fig. 12



315
300
311
406
316
310
400
317
318
312
318
406
300
318
430
440
314
315
406
400