CLAIMS

What is claimed is:

1. A refractory purging device (1) for blowing gas into molten metal in a metallurgical vessel, the refractory purging device comprising a refractory main body (2) which defines a gas inlet (3a) at a first longitudinal end for receiving 5 purging gas, a gas outlet (3b) at a second longitudinal end for the purging gas to enter the molten metal, and a gas passage channel (3) interconnecting the gas inlet and the gas outlet; wherein a plurality of molten metal receptacles (4) for capturing or intercepting and retaining molten metal that flows reversely from the gas outlet into the gas passage channel is distributed in the gas passage 10 channel, characterized in that,

- each molten metal receptacle comprises a pocket portion or a miniaturized reservoir (4a) to retain the molten metal that is captured or intercepted at the molten metal capture aperture,

- the receptacles are forming bridges connecting first and second opposing surfaces 15 defining the channel and

- the gas passage channel (3) defines a gas flow direction and a metal flow direction which is opposite the gas flow direction, and wherein the molten metal receptacles (4) comprise a wall portion which protrudes into the gas passage channel in a direction orthogonal or substantially to the metal flow direction to define the molten metal capture aperture and 20 the pocket portion or the miniaturized reservoir (4a).

2. A refractory purging device according to Claim 1, wherein the molten metal receptacles (4) include a molten metal capture aperture for capturing molten metal that flows reversely into the gas passage channel, the molten metal capture aperture facing the gas outlet.

3. A refractory purging device according to claim 1 or 2, wherein the molten metal receptacles (4) are distributed in the gas passage channel (3) and along the metal flow direction; and wherein a downstream molten metal receptacle is transversely offset from an

upstream molten metal receptacle such that molten metal overflowed from the upstream molten metal receptacle will be captured by the downstream molten metal receptacle.

4. A refractory purging device according to any of the preceding Claims, wherein the molten metal receptacles (4) are distributed in the gas passage channel (3) in a direction transverse to the metal flow direction, and wherein transversely adjacent molten metal receptacles are separated by a molten metal overflow path, the molten metal overflow path providing a guide to facilitate molten metal to overflow from an upstream molten metal receptacle which is more proximal to the gas outlet into a downstream molten metal receptacle which 35 is more proximal to the gas inlet.

5. A refractory purging device according to Claim 4, wherein a downstream molten metal receptacle (4) is arranged such that its molten metal capture aperture (4a) is aligned with the overflow path of an upstream molten metal capture aperture to capture molten metal overflowed from the upstream molten metal receptacle.

6. A refractory purging device according to any of the preceding Claims, wherein the molten metal receptacles are arranged in rows which are transverse to the metal flow direction; and wherein the molten metal receptacles of one row are transversely offset from molten metal receptacles of an immediately upstream row such that a molten metal receptacle in an immediately upstream row is directly facing the molten metal overflow path of an immediately upstream row to receive molten metal overflowed from that upstream row.

7. A refractory purging device according to any of Claims 3 to 6, wherein the number (N) of molten metal receptacles distributed longitudinally along the metal flow direction is $N > 3$, preferably > 5, and more preferably > 10.

8. A refractory purging device according to any of the preceding Claims, wherein the molten metal receptacles are integrally formed on the main refractory body.

9. A refractory purging device according to any of the preceding Claims, wherein the gas passage channel (3) is elongate and extends transversely to the metal flow direction in a radial, concentric, annular or surrounding manner about a longitudinal central axis of the main refractory body.

10. A refractory purging device according to any of the preceding Claims, wherein the gas passage channel (3) is defined by opposite facing internal walls on the main refractory body, the transverse separation distance, W, between the opposite facing internal walls is not more than 2.0 mm, preferably not more than 1 .5 mm, more preferably not more than 1.0 mm, most preferably not more than 0.5 mm, and most preferably between 0.25 and 0.5 mm.

11. A refractory purging device according to Claim 12, wherein the transverse length (L) of the gas passage channel in a direction orthogonal or substantially orthogonal to the metal low direction is such that L/W > 3, more preferably > 5, even more preferably > 10, and most preferably > 50.

12. A refractory purging device according to any of the preceding Claims, wherein the refractory main body (2) comprises a core portion (2a) surrounded by a peripheral portion (2b), and the gas passage channel (3) is defined by separation between opposite facing internal walls of the core portion and the peripheral portion.

13. A refractory purging device according to any of the preceding Claims, wherein the refractory main body (2) has a frusto-conical shape that tapers from the gas inlet (3a) towards the gas outlet (3b).

14. A metallurgical vessel for holding molten metal comprising a refractory purging device (1) according to any of the preceding claims, wherein the refractory purging device is to supply purging gas into molten metal contained in the metallurgical vessel.

15. A moulding tool for forming a plurality of molten metal receptacles (4) on a gas passage channel (3) of a refractory purging device (1) according 5 to any of claims 1 to 13, wherein the moulding tool comprises a moulding insert on which a plurality of apertures having a shape complementary to the molten metal receptacles are distributed.

16. A moulding tool according to Claim 15, wherein the moulding insert is such that it will be dissipated from the moulding apparatus during heat hardening of refractory materials.

17. A method of making a refractory purging device according to any of Claims 1 to 13, including:

- Putting a moulding tool according to any of Claims 15 or 16 into a moulding apparatus to define the outer shape of the refractory purging device (1) to define the gas inlet (3a), the gas outlet (3b), the gas passage channel (3) and the plurality of molten metal 20 receptacles (4),

- casting the moulding apparatus with a refractory material, and

- heat hardening the moulding apparatus casted with the refractory material until the moulding insert is eliminated to form the refractory gas purging device (1).

18. Device (1) for blowing gas into a metallurgical vessel comprising:

(a) a body (2) extending along a central axis (X1) comprising,

(b) at least one gas flow channel (3) fluidly connecting a gas inlet (3a) located at one end of said body to a gas outlet (3b), located at the opposite end along said axis, said channel (3) being in the shape of a slit defined by a first and second opposed surfaces, characterized in that,

(c) the at least one gas channel (3) comprises a series of continuous concave bridges (4) connecting the first and second opposing surfaces defining the channel, the bridges (4) having a concave side (4a) oriented towards the gas outlet (3b), wherein said concave bridges (4) are disposed in a staggered arrangement, such that any first shortest line running from the gas outlet (3b) to the gas inlet (3a) of the channel necessarily intercepts the concave side (4a) of at least one first bridge (4).

19. Process for producing a gas purging plug for blowing gas into a metallurgical vessel, comprising the following steps:

(a) providing a tool (21) which cavity (22) defines the volume of an elongated body (2) of the purging plug extending along a central longitudinal axis (X1);

(b) positioning in said tool at a location corresponding to the desired position of the channel slit (3), at least one foil (23), being removable during the heating step (d) of the process, said foil having a plurality of apertures (24) over the surface thereof, and defining between the apertures a continuous path from a first end portion (23a) thereof corresponding to the channel gas inlet (3a) to a second, opposite end portion (23b) thereof corresponding to gas outlet (3b);

(c) casting a refractory material (25) in said tool provided with said foil;

(d) heating the purging plug at a temperature sufficient to harden the refractory material and to eliminate the foil, characterized in that, the apertures (24) have a concave geometry with the concave side (24a) thereof oriented towards a first foil portion (23b) corresponding to the channel gas outlet (3b), and are disposed in a staggered arrangement, such that any shortest line running from the first foil portion (23b) to an opposed, second foil portion (23a) corresponding to the channel gas inlet (3a) of the channel necessarily intercepts the concave side (24a) of at least one aperture (24).

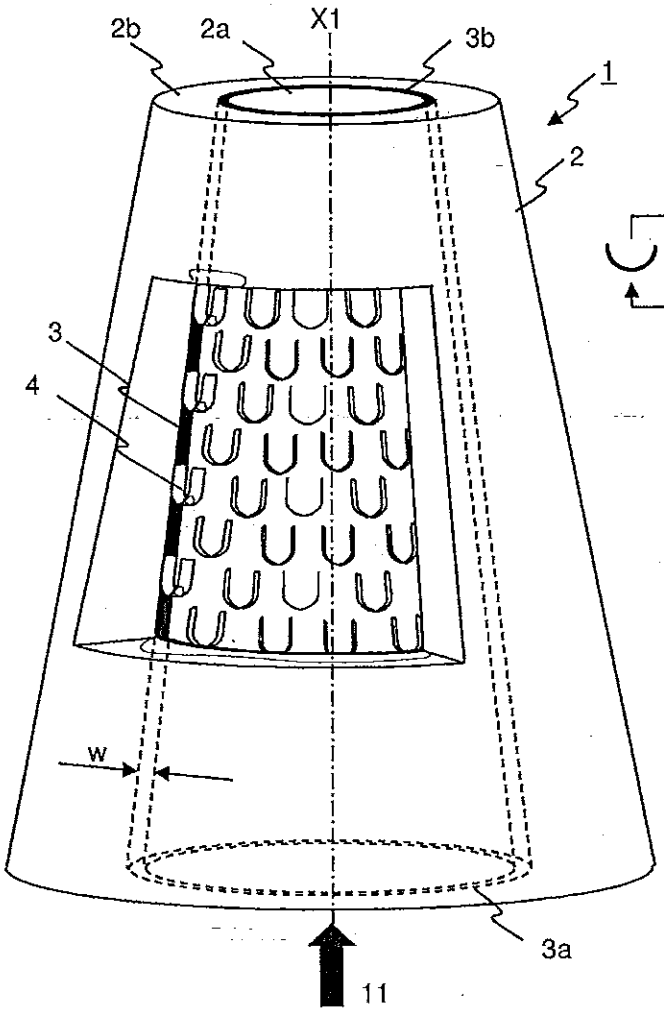


Fig. 1

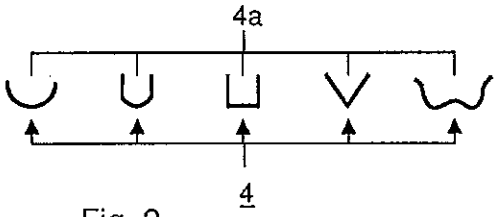


Fig. 2

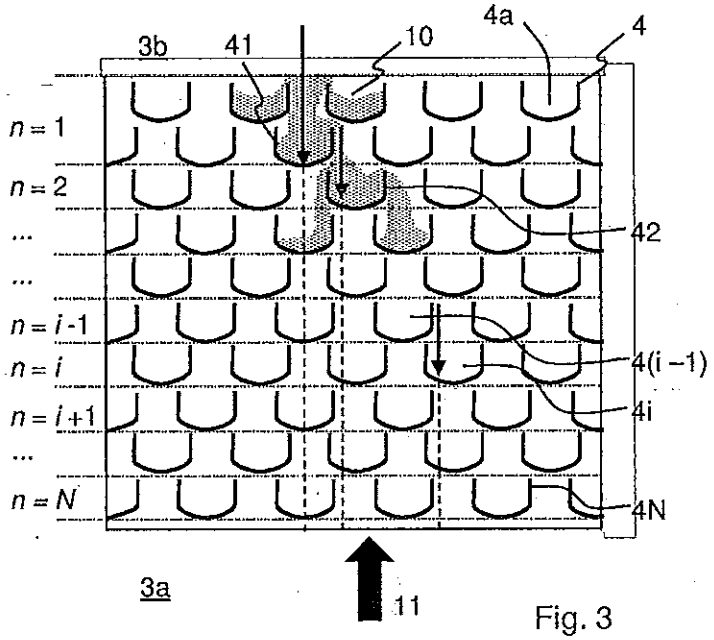


Fig. 3

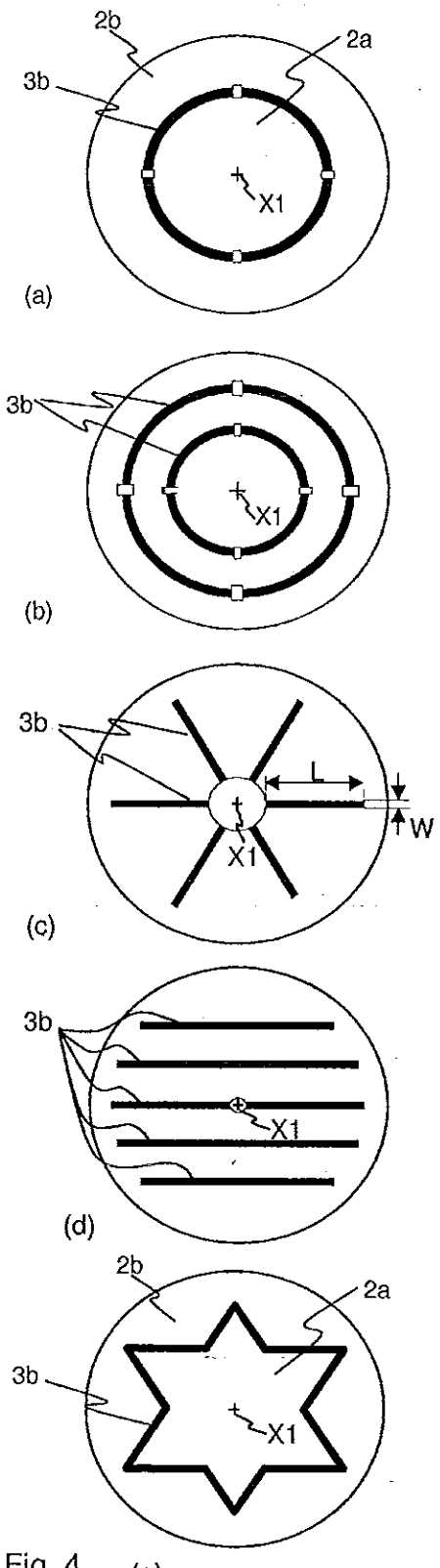


Fig. 4

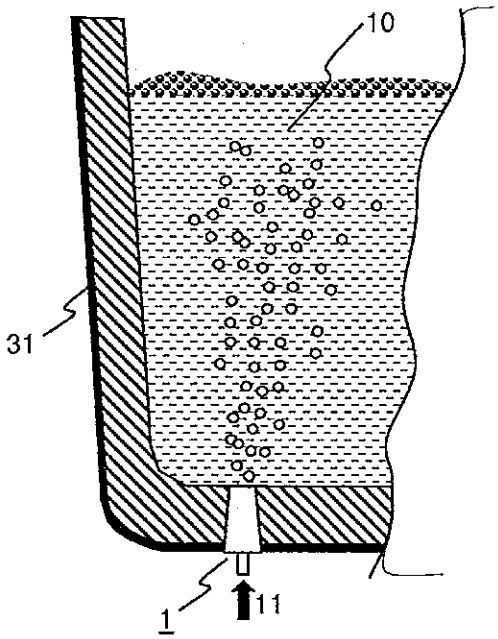
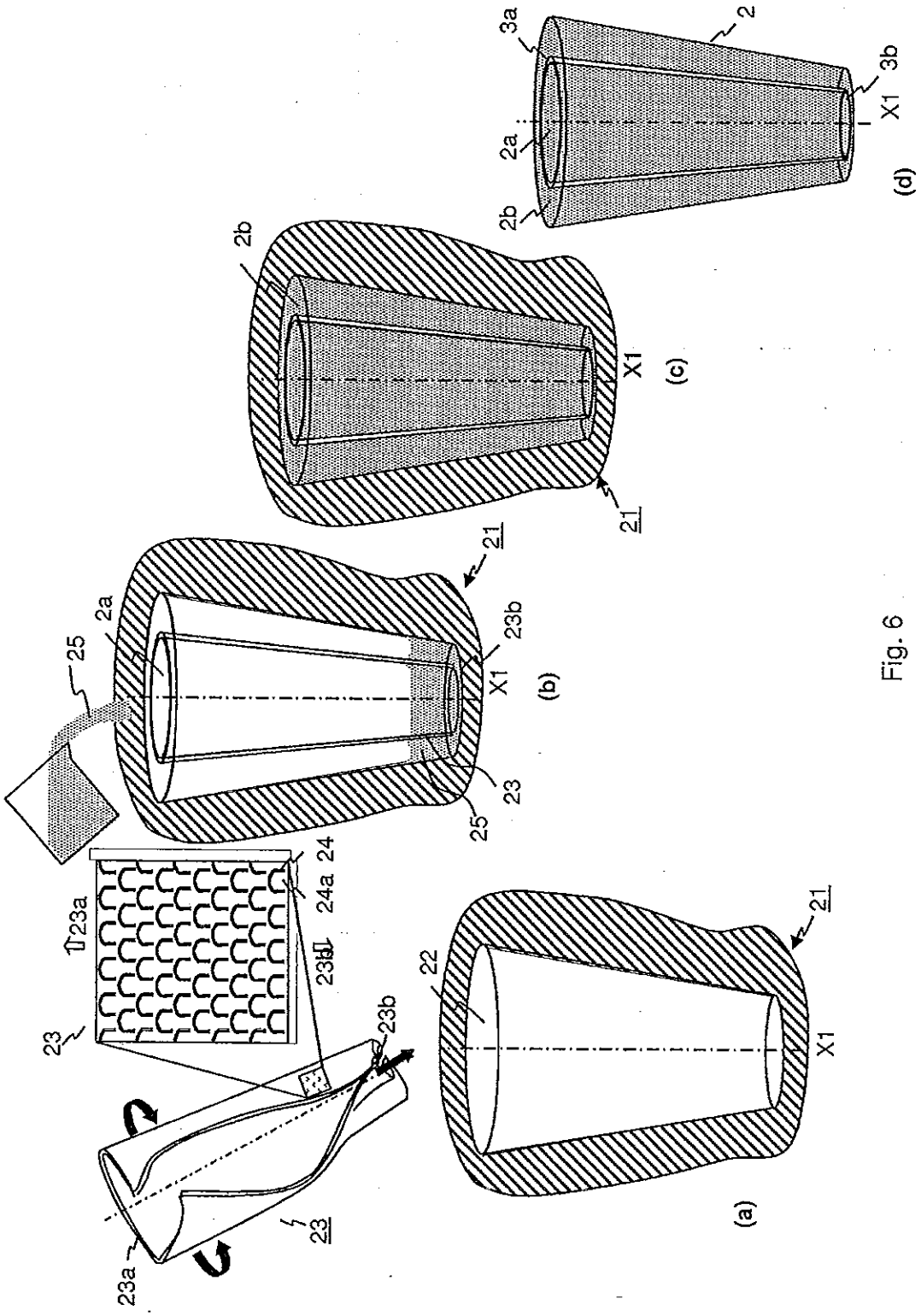


Fig. 5


3a
2
3b
X1
2a
2b
(d)
2b
X1
(c)
21
21
2a
25
23b
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21
X1
(a)
23
23a

Fig. 6

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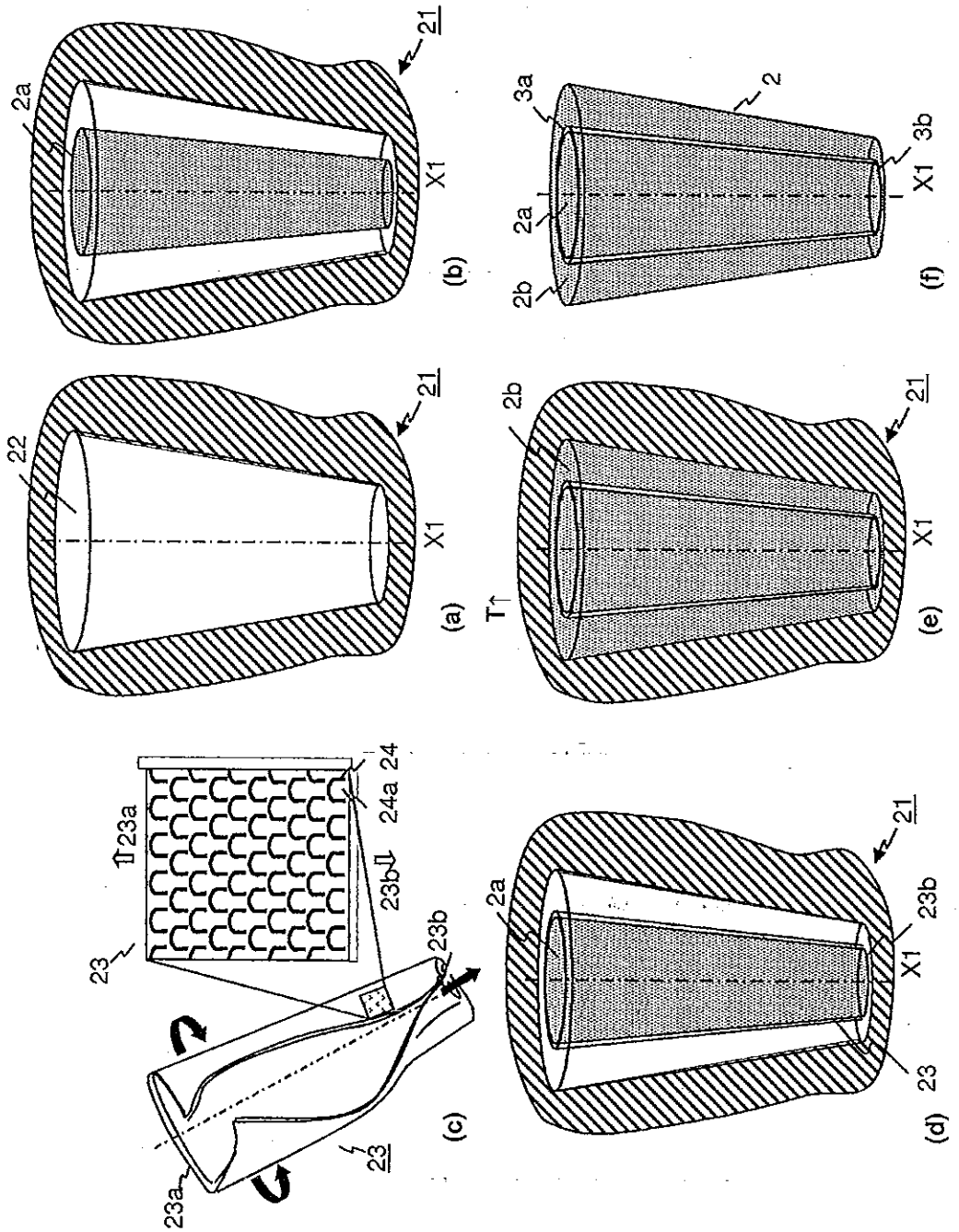
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X1
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(d)

Fig. 7

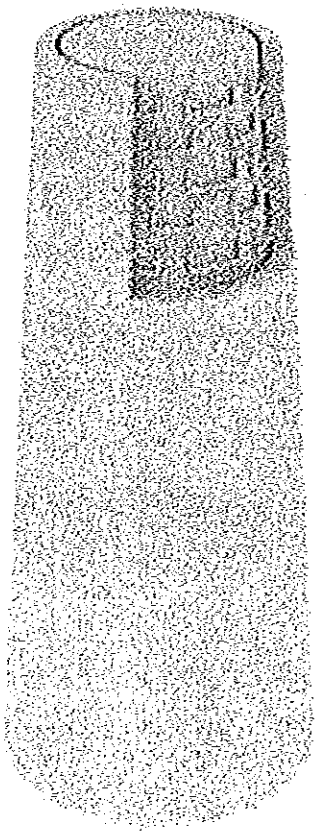

Fig. 1a

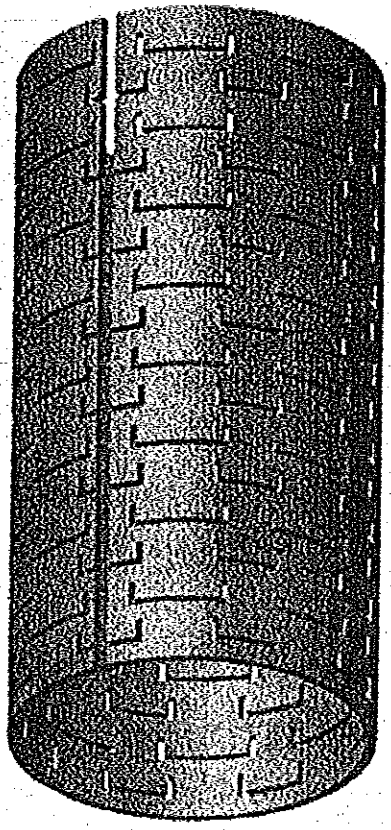

Fig. 8