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CA 2029661 C 2001/10/09

(11)(21) 2 029 661

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1990/11/09

(41) Mise à la disp. pub./Open to Public Insp.: 1991/05/12

(45) Date de délivrance/Issue Date: 2001/10/09

(30) Priorité/Priority: 1989/11/11 (P 39 37 609.5) DE

(51) Cl.Int.^{5}/Int.Cl.^{5} B04B 5/00

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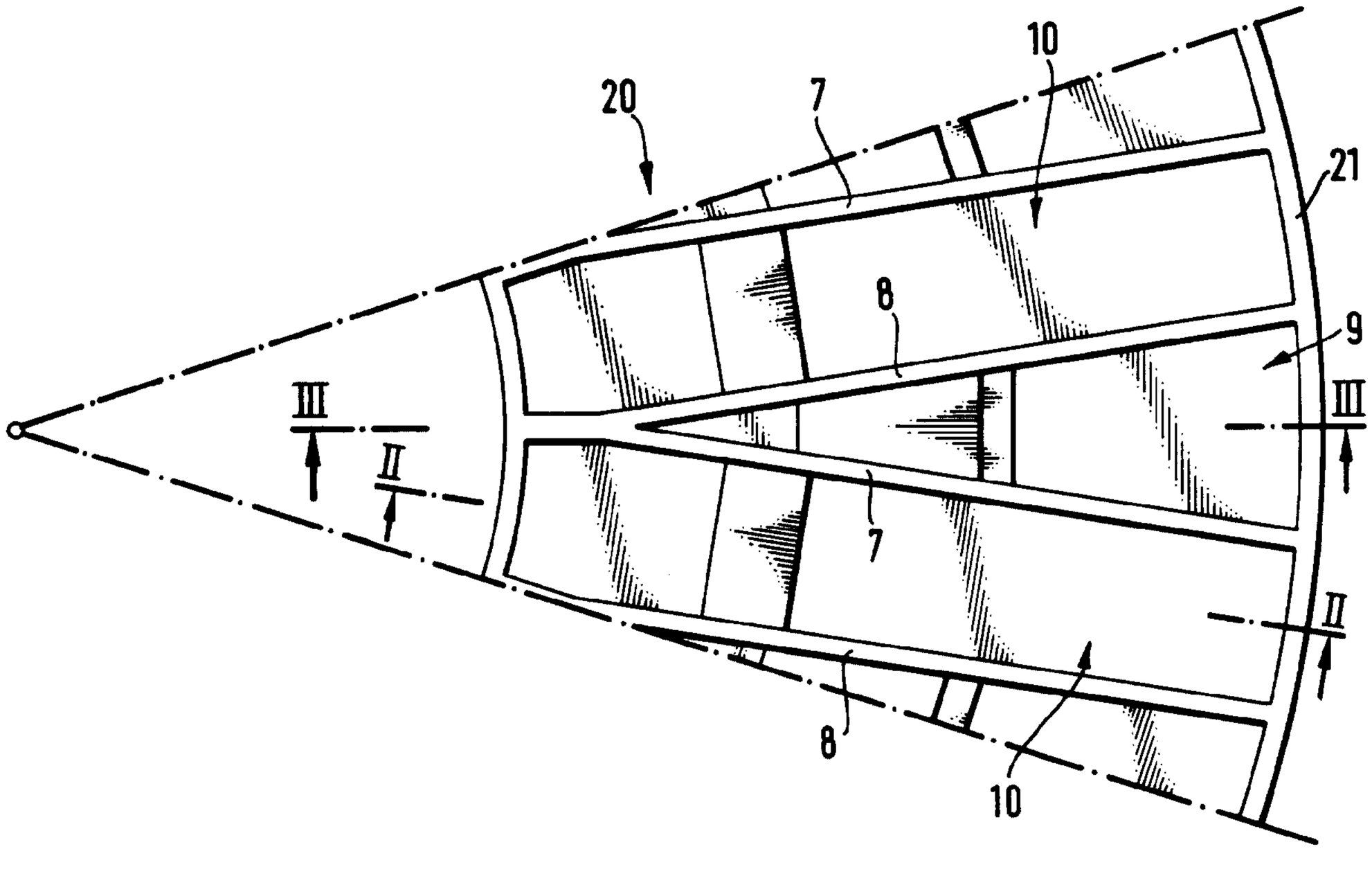
(54) Titre : ROTOR DE CUVETTE
(54) Title: CUVETTE ROTOR



(57) Abrégé/Abstract:
In the cuvette rotor (20) having circularly arranged and radially extending individual cuvettes (10) which are closed on all sides, each of the cuvettes (10) has two chambers (1, 2) which are separated from one another by a barrier (11). Each chamber (1, 2) is provided with an orifice (3, 4) for filling. Vessels (9) which are closed on all sides are arranged between the individual cuvettes (10), the bottom part (15) of each vessel having a barrier (13) which divides the vessel into two chambers (5, 6), and the upper part (14) being provided with an orifice (22) in the area of the chamber (5) arranged close to the axis of rotation and with a guard (12), which protrudes into the peripherally arranged chamber (6), in the area of the peripherally arranged chamber (6).

Abstract

HOE 89/B 040

Cuvette rotor

In the cuvette rotor (20) having circularly arranged and radially extending individual cuvettes (10) which are closed on all sides, each of the cuvettes (10) has two chambers (1, 2) which are separated from one another by a barrier (11). Each chamber (1, 2) is provided with an orifice (3, 4) for filling. Vessels (9) which are closed on all sides are arranged between the individual cuvettes (10), the bottom part (15) of each vessel having a barrier (13) which divides the vessel into two chambers (5, 6), and the upper part (14) being provided with an orifice (22) in the area of the chamber (5) arranged close to the axis of rotation and with a guard (12), which protrudes into the peripherally arranged chamber (6), in the area of the peripherally arranged chamber (6).

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Description

Cuvette rotor

The invention relates to a cuvette rotor having individual, radially arranged cuvettes, as can be used in automatically operating analytical centrifuge systems for testing biological fluids, such as, for example, blood, blood plasma or blood serum.

The biological fluids are centrifuged before the analysis, if necessary, and mixed with specific reagents, as are, for example, required for PT, aPTT, fibrinogen and factor II to XII tests, in order to determine certain properties or substances contained therein, and the result of the reaction is recorded optically.

A cuvette rotor for analyses of this type is disclosed in European Patent Application 0,163,038. The individual, circularly arranged cuvettes extend radially and are closed on all sides. Each of them has two chambers which are separated from one another by a barrier and are provided with an orifice for filling. One chamber is charged with biological fluid and the other with specific reagent which mixes and reacts with the biological fluid as soon as the two liquids reach the peripherally arranged chamber due to the effect of the centrifugal forces. Optical measurement is carried out at right angles to the plane of the rotor through the peripherally arranged chamber with a fixed path length through the fluid to be analyzed.

The invention has the object of providing a cuvette rotor of the type mentioned on which further vessels for centrifuging samples are arranged, which vessels are independent of the individual cuvettes.

The object is achieved by a cuvette rotor wherein vessels which are closed on all sides are arranged between the individual cuvettes, the bottom part of each vessels having a barrier which divides the vessel into two chambers, and the upper part of which being provided with orifices in the area of the axially arranged chambers and with guards, which protrude into the peripherally arranged chambers, in the area of the peripherally arranged chambers.

In a preferred embodiment, the invention provides a cuvette rotor comprising a plurality of alternating cuvettes and vessels, circularly arranged about a central axis of rotation and radially extending therefrom wherein:

(a) the cuvettes are closed on all sides, each cuvette having two chambers which are separated from one another by a barrier, each chamber having an orifice for filling the chamber; and

(b) the vessels which are closed on all sides, having a bottom and an upper part, the bottom part of each vessel having a barrier which divides the vessel into two radially spaced chambers, the upper part of each vessel having an orifice in the area of the chamber arranged closest to the central axis of rotation and with guards which protrude into the peripherally arranged chambers, in the area of the peripherally arranged chambers.

In a further embodiment, the cuvettes and vessels of the rotor are angularly disposed in a circle about the central axis.

In another embodiment, the cuvettes can be used to mix a biological fluid with a reagent during rotation about the central axis and the vessels can be used to centrifuge samples during rotation about the central axis.

In an embodiment of the invention, the cuvettes and vessels have common sidewalls.

In another embodiment, the guard prevents centrifuged material from remixing within the vessel. In yet another embodiment, the guard is aligned with the peripheral chamber of the vessel.

In a preferred embodiment, the cuvette barrier, the vessel barrier and the guard in cross-section have a radially extending surface, rising and falling outwardly from the central axis, the rising surfaces being disposed closer to the central axis than the falling surfaces.

In another embodiment, the absolute value of the slope of the falling surfaces is greater than the absolute value of the slope of the rising surfaces.

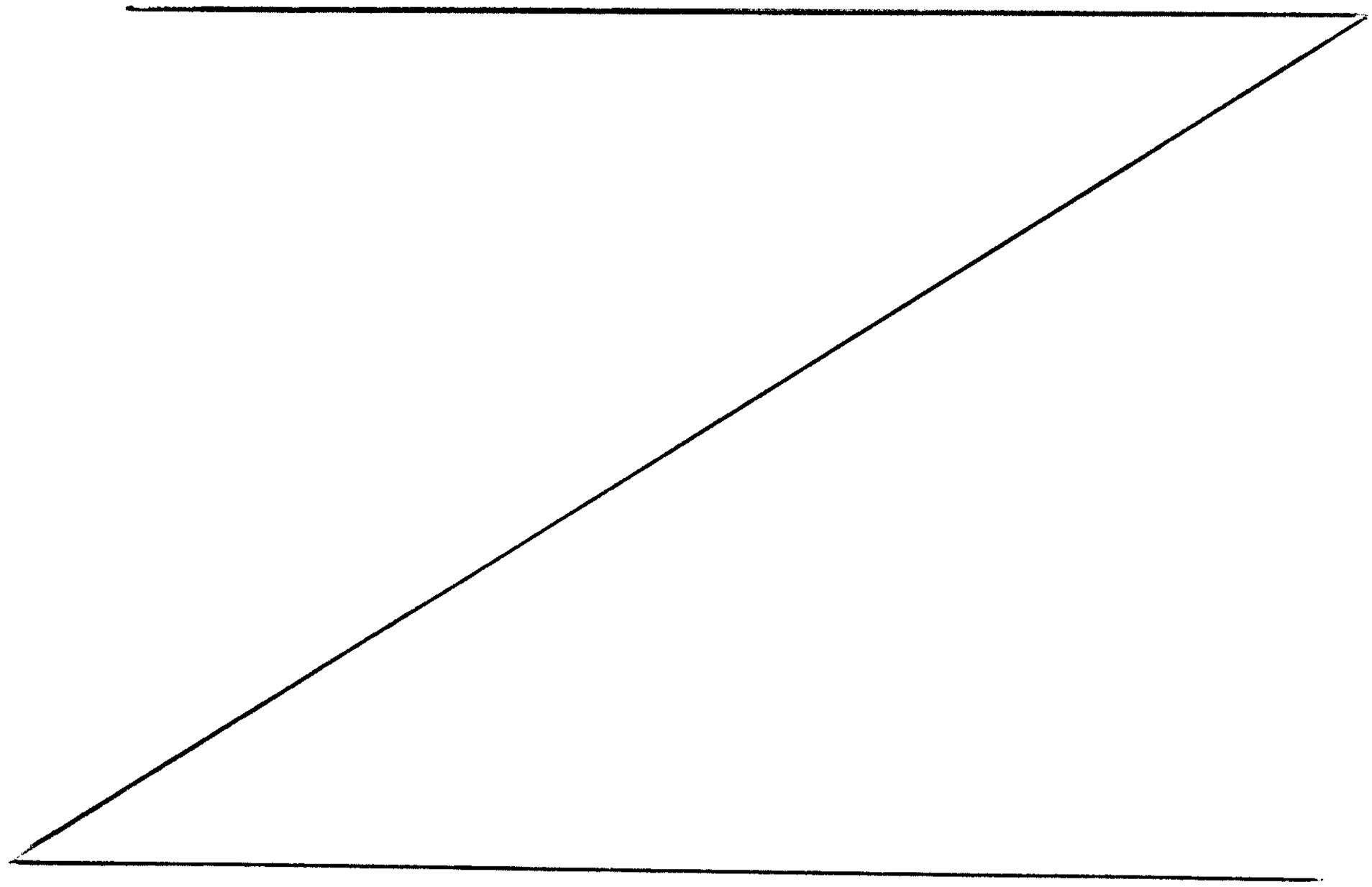
In another embodiment, the barriers can have rising and falling surfaces which extend in the radial direction of the rotor, the rising surfaces being less steep than the falling surfaces

The advantage of the invention is primarily that additional separation vessels for centrifuging samples are arranged between the cuvettes in a space-saving way, thus considerably extending the possible applications of the cuvette rotor.

In the following, the cuvette rotor is illustrated in more detail by means of drawings representing merely one embodiment, in which:

Figure 1 shows a plan view of a section of the cuvette rotor without the upper part,
Figure 2 shows the section II-II of Figure 1 with the upper part, and
Figure 3 shows the section III-III of Figure 1 with the upper part.

The cuvette rotor (20) comprises cuvettes (10) which are closed on all sides and are delimited by side walls (7, 8), an upper part (14), a bottom part (15) and a front wall (21). The individual cuvettes (10) have chambers (1) and (2) which are separated from one other by a barrier (11). The barrier (11) is arranged on the bottom part (15). The barrier (11) is designed in such a way that, at the required volume of the chamber and with the



rotor stationary, there can be no overflow into the adjacent chamber. The upper part (14) is provided with orifices (3 and 4) through which the inside of the chambers (1 and 2) can be reached.

The interspaces between the individual cuvettes (10) are designed as closed vessels (9) for centrifuging samples. The vessels (9) are delimited by the side walls (7 and 8), the upper part (14), the bottom part (15) and the front wall (21). The vessels (9) are divided into the chambers (5 and 6) by barriers (13), which are arranged on the bottom part (15). The inside of the vessels can be reached via orifices (22) which are arranged in the upper part, namely above the chamber (5) close to the axis of rotation. Guards (12) extending from the upper part (14) protrude into the peripherally arranged chambers (6). The barriers (13) and the guards (12) are delimited at the sides by the walls (7 and 8) and have rising and falling plane or curved surfaces (16, 17, 18 and 19) which extend in the radial direction of the rotor (20). The rising surfaces (16 and 17) are less steep than the falling surfaces (18 and 19).

During centrifuging, the solid constituents present in the sample move radially in the direction of the front wall (21) of the vessel (9). Once centrifuging is completed and before the rotational motion of the cuvette rotor is braked, all solid constituents of the sample are in the peripheral chamber (6), namely between the front wall (21) and the guard (12) which is attached to the upper part (14), i.e. the interface between the solid constituents and the liquid is vertically behind the guard (12) in the peripheral chamber (6). During braking the rotational motion of the guard (12) ensures that the solid constituents remain in the peripheral chamber (6) behind the barrier (13). Part of the liquid flows without solid constituents, back over the barrier (13) into the chamber (5) close to the axis where it can then be removed through the orifice (22) in the upper part

(14) with the aid of a syringe or pipette tip and, if desired, transferred into the cuvette (10).

1. A cuvette rotor comprising a plurality of alternating cuvettes and vessels, circularly arranged about a central axis of rotation and radially extending therefrom wherein:

(a) the cuvettes are closed on all sides, each cuvette having two chambers which are separated from one another by a barrier, each chamber having an orifice for filling the chamber; and

(b) the vessels which are closed on all sides, having a bottom and an upper part, the bottom part of each vessel having a barrier which divides the vessel into two radially spaced chambers, the upper part of each vessel having an orifice in the area of the chamber arranged closest to the central axis of rotation and with guards which protrude into the peripherally arranged chambers, in the area of the peripherally arranged chambers.

2. The cuvette rotor of claim 1, wherein the cuvettes and vessels are angularly disposed in a circle about the central axis.

3. The cuvette rotor of claim 1 wherein the cuvettes can be used to mix a biological fluid with a reagent during rotation about the central axis.

4. The cuvette rotor of claim 1 wherein the vessels can be used to centrifuge samples during rotation about the central axis.

5. The cuvette rotor of claim 1 wherein the cuvettes and vessels have common sidewalls.

6. The cuvette rotor of claim 1 wherein the guard prevents centrifuged material from remixing within the vessel.

7. The cuvette rotor of claim 1 wherein the guard is aligned with the peripheral chamber of the vessel.

8. The cuvette rotor of claim 1 wherein the cuvette barrier, the vessel barrier and the guard in cross-section have a radially extending surface, rising and falling outwardly from the central axis, the rising surfaces being disposed closer to the central axis than the falling surfaces.

9. The cuvette rotor of claim 8 wherein the absolute value of the slope of the falling surfaces is greater than the absolute value of the slope of the rising surfaces.

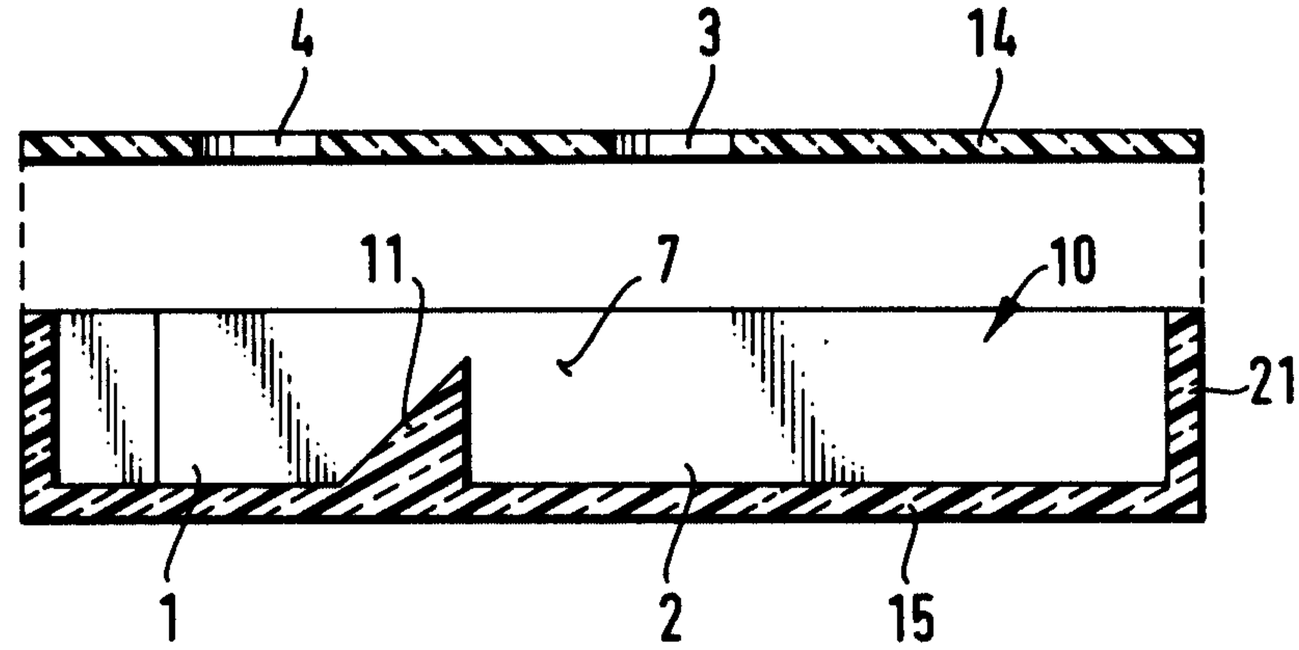


Fig. 2

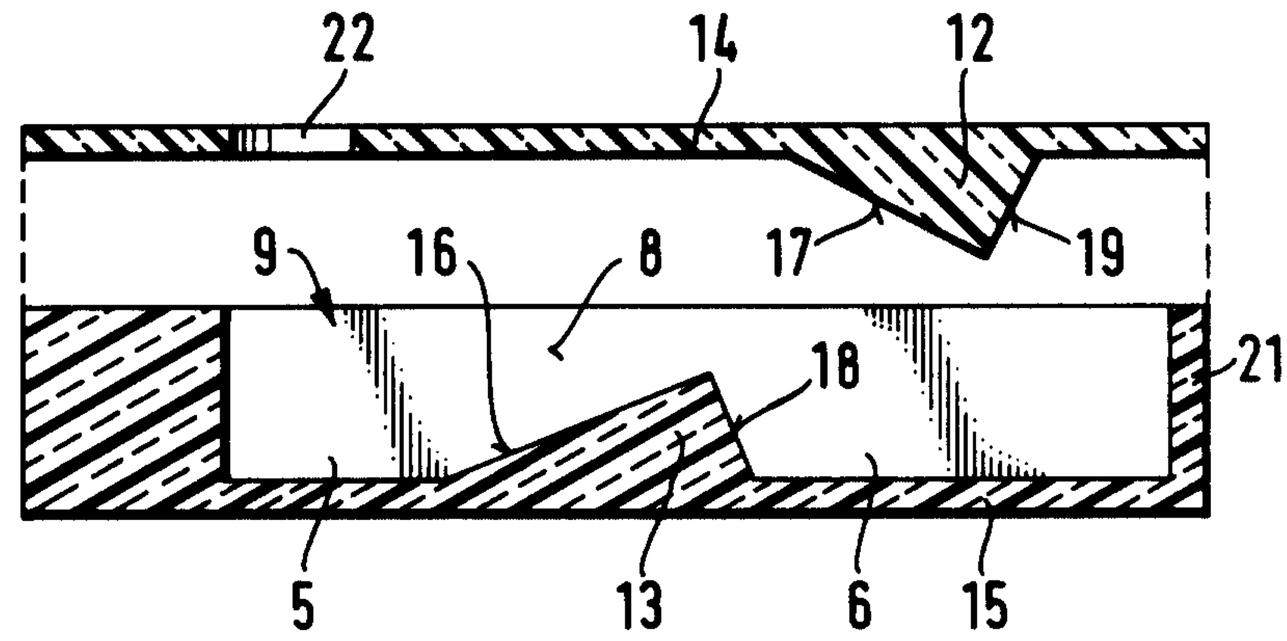


Fig. 3

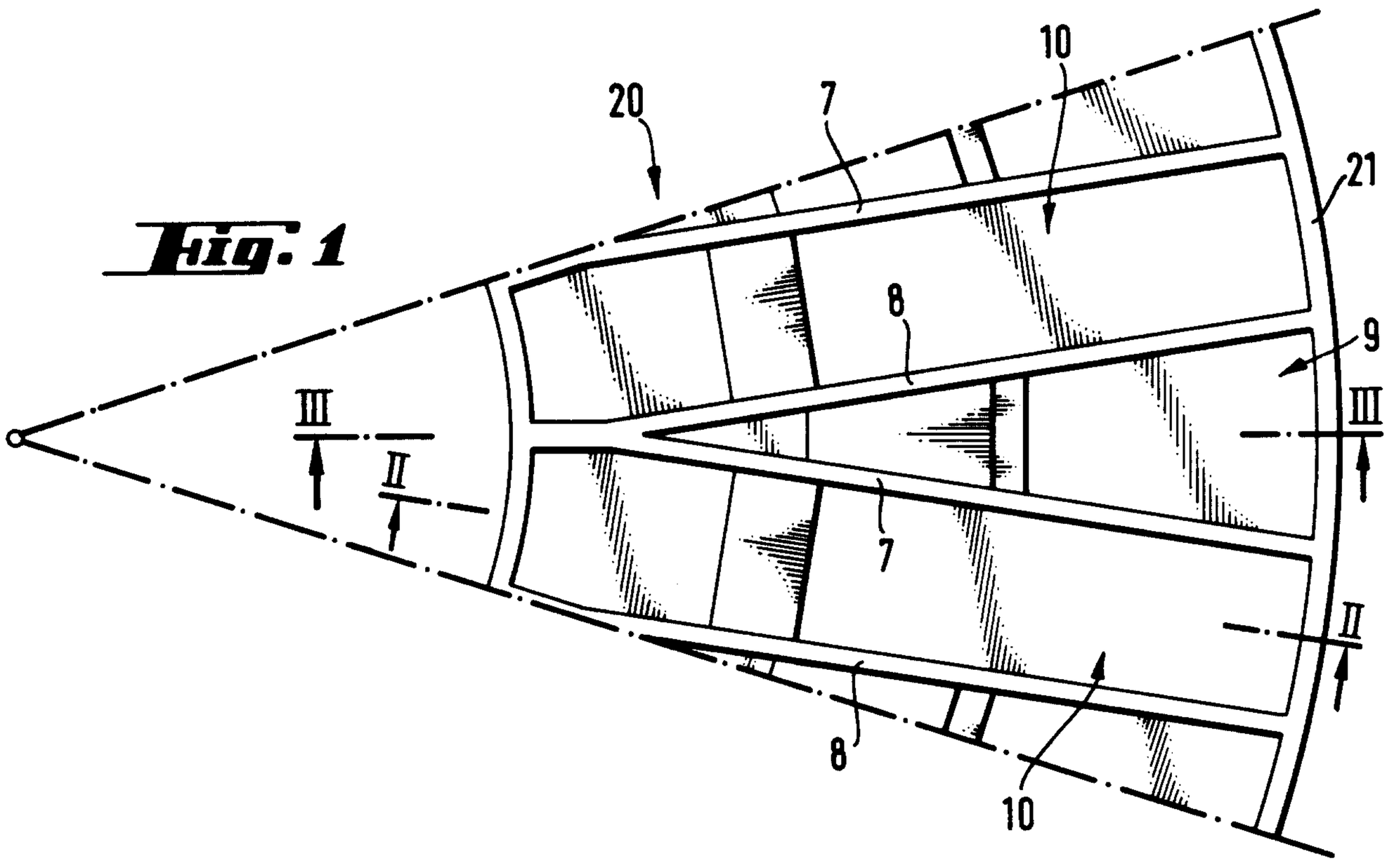


Fig. 1

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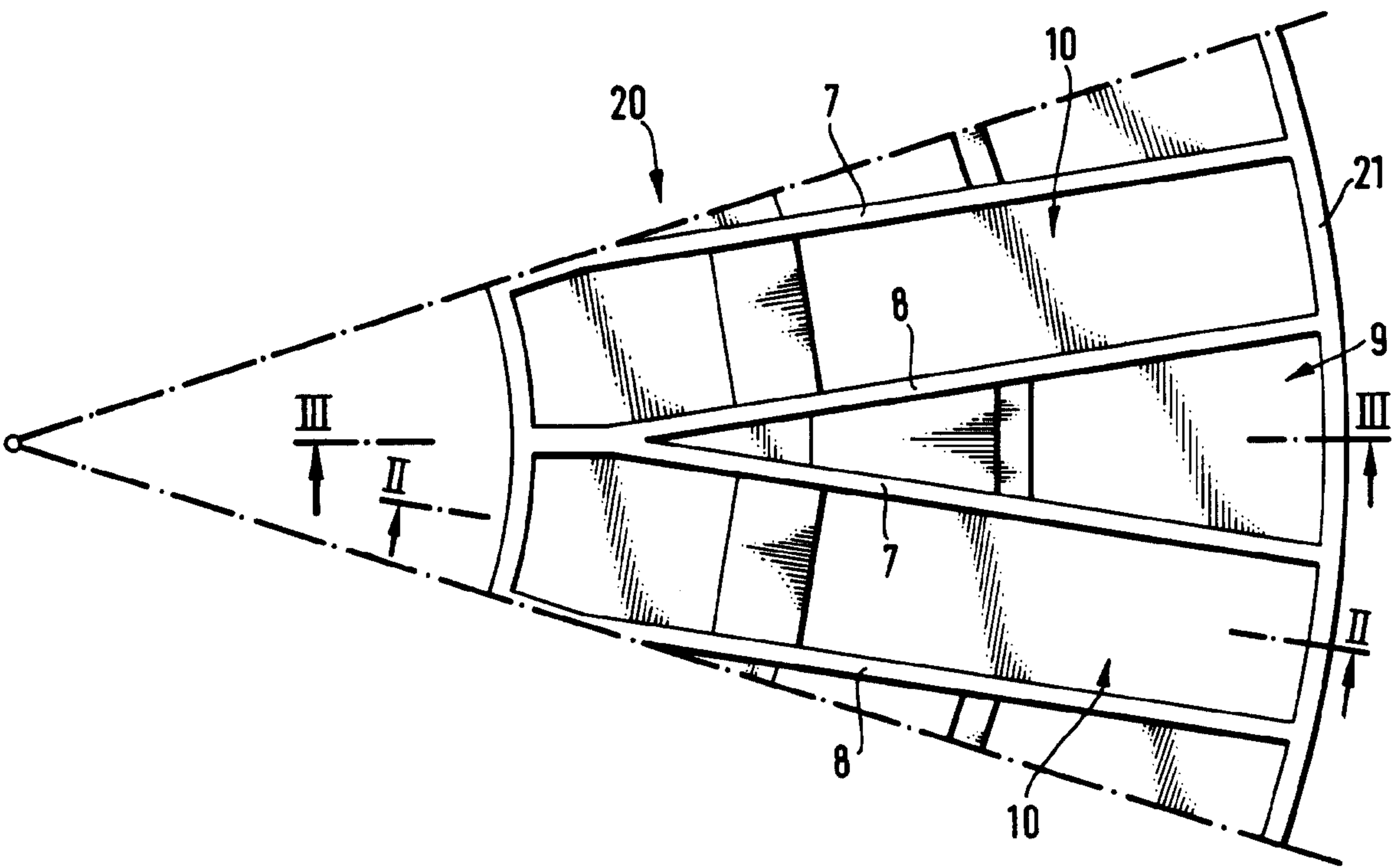
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