Dec. 9, 1969 L. MAMMARELLA 3,482,432

AEROSOL CASCADE SAMPLER

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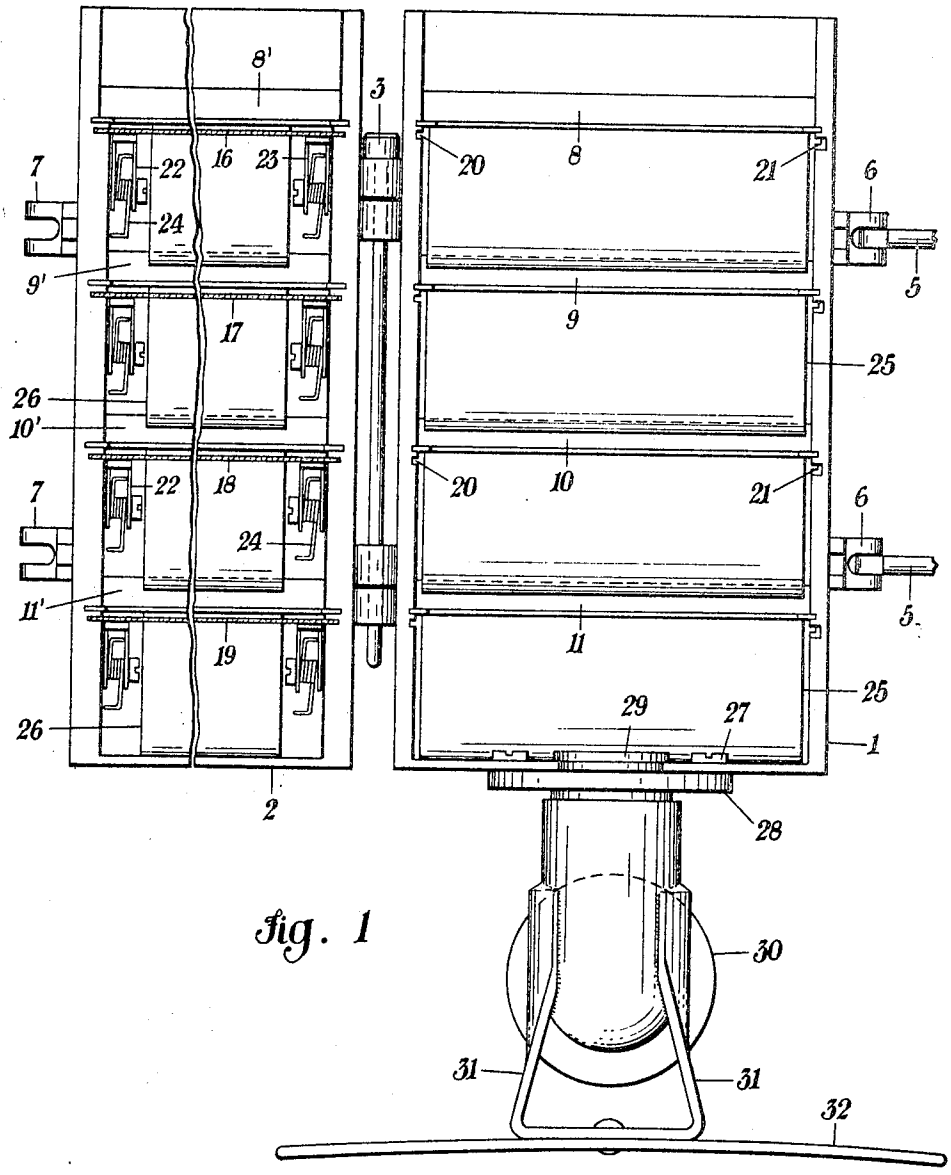

Fig. 1

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Fig. 2

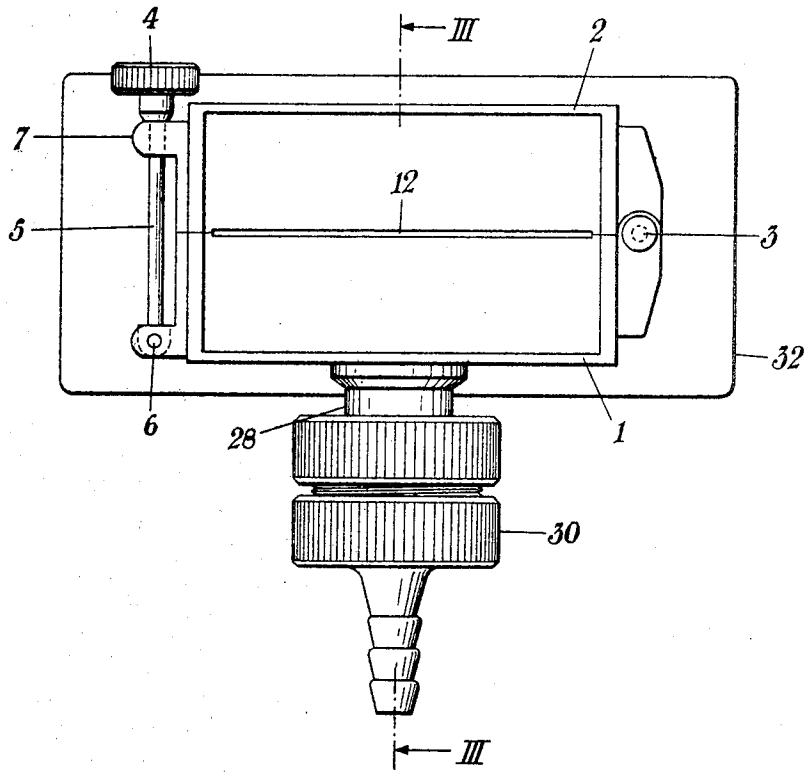

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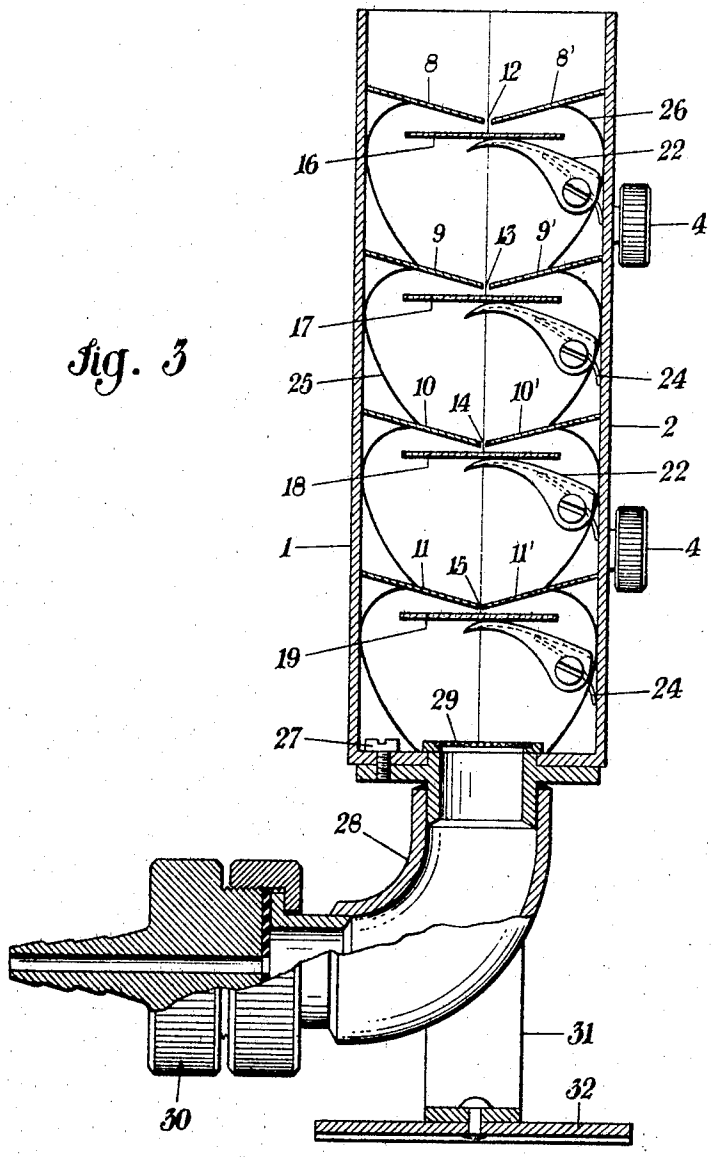
Fig. 3



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AEROSOL CASCADE SAMPLER

Luigino Mammarella, No. 16b, Via Andrea Busiri Vici, Rome, Italy

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U.S. Cl. 73—28 5 Claims

ABSTRACT OF THE DISCLOSURE

The subject apparatus comprises two facing hinged shells forming a parallelepipedon the interior of which is divided by means of inclined thin sheets into chambers laid one upon another each having at the upper part and at the bottom part a slit on the centerline of the apparatus.

Each slit has a width which is less than that of the upper slit. Below each slit, a sampling slide, housed in side grooves and kept firmly joined with one of the shells by means of spring clips, is aranged. Parallel to said slits, in order to avoid the deposition of aerosols along the walls of the apparatus, curved thin sheets are arranged. The lowermost chamber is connected with a suction system. Owing to the decrease in the width of the slits, the aerosol relative flow rate at each of the stages following the first one is greater than that in the preceding stage. In such a way, along the various stages of the sampler as the level decreases, the sampling of aerosols in ever decreasing sizes can be obtained.

Various aerosol samplers are known which utilize the differential draw (or "cascade" draw) principle. With such apparatus the purpose is to divide, in a single operation, the aerosol contaminants caught from a known volume of air in different fractions, namely in as many fractions as there are sampler stages, each formed eminently by classes of particles having a unit particle size ranging within given limits.

In such a way it is possible to bring about readily the assessment of the aerosol contamination of the air, by dividing the aerosols in different fractions, for example; one capable of being settled down, one mediately inhalable, one easily inhalable.

In order to improve such drawing apparatus, according to the invention a sampler is proposed which meets the following requirements:

(1) Simplicity of construction and low cost;

(2) Division of the aerosol components in various classes of sizes with a considerable selectivity in the various classes;

(3) Possibility of collecting the sampled aerosol material on standard slides so as to make easy the subsequent observation under a microscope;

(4) Deposition of the aerogenic material uniformly on the collecting surfaces, so that the assessment of the contamination can be quickly carried out;

(5) Possibility of processing a considerable volume of air without having on the collecting surfaces any accumulation or agglomeration.

The above listed requirements are met by the sampler according to the invention, which is formed by two facing hinged shells forming a parallelepipedon the inside of which is divided, by means of inclined thin sheets into a series of longitudinal chambers, each having at the upper end and at the lower end a slit on the centerline of the apparatus. Each slit has a width which is less than that of the one thereabove. Below each slit is a sampling slide, which is housed in side grooves and kept firmly joined with one of the shells by means of spring clips.

Parallel to said slits are curved thin sheets to avoid the deposition of aerosols along the walls of the apparatus. The lowermost chamber is connected to a suction system. Owing to the decrease in the width of the slits, the aerosol relative flow rate at each of the stages following the first one is greater than that in the preceding stage. In such a way, along the various stages of the sampler, as the height decreases, the sampling of aerosols in ever decreasing sizes can be obtained.

An embodiment of the invention is shown by way of an example in the attached drawings, wherein:

FIGURE 1 is an elevational view of the apparatus in the open condition;

FIGURE 2 is a top view thereof; and

FIGURE 3 is a cross-section taken along line III—III in FIGURE 2.

The apparatus comprises a parallelepipedon-shaped casing formed by two shells **1** and **2** which are held together by a hinge **3**. When the sampler is ready for the drawing of aerosols, the sealing of the two shells is assured by screwing in knurled head screws **4**. Said screws are mounted at the ends of rods **5** pivoted at **6** on the shell **1** and engaging housings **7** carried by the shell **2**.

The casing of the sampler has, in the interior thereof, a plurality of pairs of gently inclined thin sheets (in the drawing, four pairs: **8**, **8'**; **9**, **9'**; **10**, **10'**; **11**, **11'**), converging at the center, at which, when the casing of the sampler is closed, they form a plurality of slits **12**, **13**, **14**, **15** the width of which decreases from top to bottom.

Below each set of slits there are housed, at a short spacing, sampling slides (**16**, **17**, **18**, **19**). Each slide is secured in its housing, formed in the inner thickness of the short sides of the sampler casing (as shown at **20** and **21** in FIGURE 1) by two clips **22** and **23** for each slide, provided in the shell, **2**, each supported by a blade spring **24**.

As shown in FIGURE 1, when the sampler is opened, the slides remain connected with the shell **2** and they can be easily withdrawn. In such a way the sampler casing is divided, when ready for use, into a plurality of chambers connected one to another by means of said slits.

In line with each stage, at each of the two shells of the sampler, and parallel to said slits are gently curved metal sheets **25** and **26** to reduce the impact and therefore the abnormal deposition of aerosols along the sampler walls.

The shell **1** is fastened by screws **27** to a manifold **28** provided with a strainer **29**, the purpose of which is to connect the sampler with a suction system.

The manifold **28** has a double-knurled universal coupling **30**. At two sides of the manifold **28** a connecting standard **31** is fastened which standard in turn is secured to a supporting plate **32**.

It is evident that owing to the decreasing width of the slits **12**, **13**, **14** and **15**, the intake rate at the various subsequent levels, increases with the decrease in the width of the air flow opening, and therefore the capacity of catching aerosols having a decreasing size increases in consequence.

The sampler according to the invention has been described with reference to a four-stage embodiment thereof, but it is understood that it can be provided with a greater or smaller number of stages.

Having thus described the present invention, what is claimed is:

1. An aerosol sampler comprising two substantially similar mating shells which when mated together form an elongated housing, a plurality of pairs of thin baffle sheets within the housing, means on each of said shells for mounting each one of each pair of said sheets in edge abutting relationship to the other of said pair to form a

series of chambers longitudinally in the housing, means forming a slit in the abutting portion of each of said pairs, and a slide mounted downstream of each of said slits for receiving particulate matter issuing from the slit.

2. A sampling apparatus according to claim 1, comprising means for elastically holding said slides in position in said shells.

3. A sampling apparatus according to claim 1, wherein grooves are provided in each of the two shells for guiding said slides and spring clips are in one of the two shells for holding said slides fast.

4. A sampling apparatus according to claim 1, comprising an inwardly convex curved thin sheet on the walls of the two shells between successive baffle plates, said thin sheets extending parallel to said slits.

5. A sampling apparatus according to claim 1, comprising a hinge connecting said shells, means for fastening the shells in the mating position, means for holding the two shells in a vertical position and a manifold provided with a strainer for connection to a suction source, arranged at the bottom of the shells, below the last baffle plate.

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S. CLEMENT SWISHER, Primary Examiner