

(19)



(11)

**EP 2 196 106 B9**

(12)

**CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:

**Corrected version no 1 (W1 B1)**  
**Corrections, see**  
**Claims EN 1**

(51) Int Cl.:

**A45D 34/04 (2006.01) A45D 40/26 (2006.01)**

(48) Corrigendum issued on:

**02.10.2013 Bulletin 2013/40**

(45) Date of publication and mention of the grant of the patent:

**03.07.2013 Bulletin 2013/27**

(21) Application number: **09177584.1**

(22) Date of filing: **01.12.2009**

(54) **Composite applicator for decorative cosmetic products, in liquid, viscous or paste form**

Verbundstoffapplikator für dekorative Produkte in flüssiger, viskoser oder pastöser Form

Applicateur composite pour produits cosmétiques décoratifs, sous forme liquide, visqueuse ou pâteuse

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR**  
**HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL**  
**PT RO SE SI SK SM TR**

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(30) Priority: **12.12.2008 IT MI20082197**  
**04.08.2009 IT MI20091410**

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(43) Date of publication of application:  
**16.06.2010 Bulletin 2010/24**

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## Description

**[0001]** The invention relates to a composite applicator for decorative cosmetic products in liquid, viscous or paste form, and more particularly for applying mascara to the eyelashes.

**[0002]** It is known that a mascara applicator must contemporaneously exert a series of functions. It must ensure that the mascara cosmetic product is uniformly applied to the eyelashes in a simple manner, requiring one or at the most very few application passages to obtain the desired effect. It must comb and separate the eyelashes, orienting them in the desired direction. It must be capable of collecting a sufficient quantity of product and depositing it effectively and homogeneously on the whole length of the eyelashes. Ideally, the quantity of product must be sufficient for making up a whole eyelid without having to insert the applicator in the container to collect further product. It must not be excessively loaded with product to avoid creating the stagnation of unused product on the applicator, or depositing too much product on the eyelashes, irregularly or in clots.

**[0003]** These numerous functions and requirements, if adequately satisfied, help to achieve two main objectives that a mascara applicator must exert:

- separating and combing the eyelashes, so that they do not become glued to each other in "clots";
- uniformly and homogeneously distributing a quantity of product on the whole length of the eyelash.

**[0004]** The mascara applicator is part of a container set which can be defined as follows.

**[0005]** A typical container set for mascara, schematically illustrated in Figure 1, consists of a set (shown in exploded form) suitable for containing the mascara cosmetic product, consisting of an actual hollow container 52, generally called "bottle", in whose mouth an element 53, generally called "scraper", is typically inserted, having a calibrated hole 58, necessary for enabling the insertion and subsequent extraction of an applicator 54, consisting of a stick generally having a cylindrical form 55 on which an actual applying element 56 is assembled, consisting of a central axis or nucleus, having a typically longitudinal development, on which a series of elements generally having a radial development, are arranged, produced in different ways. Said applicator 54 is completed by an element 57, connected to the stick 55 and generally called "capsule" or "cap", suitable for being gripped by the user during the application of the product. The mascara container is typically provided with a system, generally based on the screw/lead-screw principle, suitable for guaranteeing airtight closure, to avoid the evaporation and drying of the product, typically obtained through surfaces of the applicator 54, which are brought into forced coupling with suitable surfaces of the scraper 53.

**[0006]** The applying element 56 (also shown in figure 2a), inserted in the container 52, is immersed in the prod-

uct in strict contact with it. The interstices existing between the radial elements forming it, are soaked by the product, thus "loading" the product applicator. During use, the consumer set is open and the applicator 54 is extracted from the container 52. During the extraction, the applicator 54 runs through the hole 58 of the scraper 53. The effect of this calibrated hole is to remove, "dose" or "scrape" away from the applying element 56 the excess product of which it is soaked, so that only a certain quantity of product, adequate for making up the eyelashes, is available on the applicator. The hole of the scraper generally has a smaller diameter than the maximum diameter of the applicator.

**[0007]** There are various types of applicators for mascara which can be briefly listed as follows. A first type is based on a series of bristles or fibres contained in a wire, typically steel, bent in the form of a hair-grip and twisted in helicoidal coils to create a kind of cleaner, conventionally called "twisted wire brush".

**[0008]** A second type of applicator has been developed more recently as an alternative to the applicators of the former type, or "twisted wire brushes". This second type of applicator, commonly called "moulded" and commonly available on the market, generally consists of a series of radial elements in the form of bristles which extend radially from a central body longitudinally elongated in the form of a rod, said radial elements and central body generally being produced by injection moulding of polymeric materials. In a very wide range of different productions, this type of applicator can consist of a single or two or more different parts, the central body typically being one part and the radial elements being the other or others, said parts generally being connected with each other either by means of co-moulding technologies or by assembly of the same.

**[0009]** This second type of moulded applicator generally consists of a series of bristles arranged in various straight rows, aligned according to the longitudinal axis of the applicator. The rows of bristles are in turn positioned beside each other according to an approximately circular arrangement so as to create a radial orientation of the bristles (figure 2a).

**[0010]** As a consequence of this configuration, the bristles are arranged on a series of rings i.e. on circular crowns, creating a kind of circular "curtain" of bristles. The number of bristles in each circular crown depends on the total number of rows present on the applicator (figure 2b), or only on some of the rows if the bristles of one row are distributed in an offset position with respect to those of the adjacent rows (figure 2c).

**[0011]** The first type of applicator has various disadvantages, such as for example:

- the reduced diameter of the twisted wire causes a good part of the product or bulk to permanently cover the wire, without being able to be applied to the eyelashes as it is too deeply inserted inside the brush to be able to come into contact with the eyelashes

- themselves. This bulk tends to dry and harden and can be a source of contamination, both in the form of impurities which gradually accumulate and also in the form of biological agents. This bulk with non-optimum characteristics can also cause the performance of the applicator to deteriorate with time;
- the efficacy of this applicator in adequately combing and separating the eyelashes is limited by the fact that the fibres must be sufficiently numerous to be able to be firmly withheld by the twisted wire, creating a relatively dense applicator. This density of fibres prevents the penetration of the same fibres between the eyelashes, to a greater or lesser extent, correspondingly limiting the capacity of the applicator to comb, separate and/or transfer the necessary quantity of bulk to the eyelashes;
  - the types of fibre that can be used for this type of applicator are intrinsically limited. They are typically extruded filaments of polymeric materials, in particular polyamides and to a lesser degree polyesters and other synthetic fibres. The rigidity or elasticity of these fibres is limited by the physico-mechanical characteristics of the polymeric materials available in this form and by the characteristics of the section of the fibres themselves. As there are very few polymeric materials commonly used and available, and as there are few forms and dimensions of the section of the same, the variation of an important characteristic, such as rigidity or elasticity of the fibre, is in turn intrinsically limited;
  - the arrangement of the fibres along the two longitudinal and radial directions is imposed by the manufacturing method, based on the twisting of the steel wire, and can therefore be controlled within narrow margins by the designer of the applicator, who can only act on the indirect parameters relating to the dimension and transversal section of the fibre, the total number of fibres and diameter of the steel wire, which, as already indicated, are limited. These parameters are also interconnected with each other and limited by the manufacturing process, i.e. by the possibility of the twisted wire firmly keeping the fibres in position in the specified quantity. The limited field of the arrangement modes of the fibres has the effect of imposing limits to the design possibilities of the applicator and consequently to the possibility of optimizing the performance of the applicator in relation to the specific cosmetic result desired;
  - as the fibres are obtained from extruded filaments having an unlimited length, it is not possible to introduce variations to the transversal section of the fibre, in the direction of the length of the fibre, suitable for example for improving the capacity of the fibre itself of being loaded with bulk in a more effective and controlled way, or of increasing the combing and separating efficacy;
  - the presence of metallic wire represents a potential element of risk for the safety in use of the applicator;
- the presence of metallic wire limits the recycling possibilities of the applicator and the whole container of which the applicator is a part.
- 5 **[0012]** The second type of applicator also has various drawbacks, such as for example:
- the number of radial elements in the conventional products ("finger") is limited by the injection moulding technology and by the complexity of the necessary moulds. The configuration and arrangement of these radial elements result in a series of undercuts which impose complex moulding solutions, making use of numerous moveable parts necessary for the extraction of the moulded item. The number of moveable parts, however, is limited by the encumbrances and small dimensions of the applicator. This type of applicator is consequently intrinsically limited in reaching a sufficient number of radial elements for loading a high quantity of bulk and for transferring it to the eyelashes;
  - as this second type of applicator is based on injection moulding, it requires a specific mould for each applicator model or, at least, that all the moulding parts of the mould be specific for each applicator model. The production cost of the moulds, which as already indicated are particularly complex in their construction, greatly limits the availability of different applicator models. For the same reason the design flexibility is also limited: each modification of the number, dimensions and/or arrangement of the radial elements possibly necessary for optimizing the performance of the applicator requires the modification, or even the remaking of the whole mould or at least the moulding parts, making the development and optimization phase particularly onerous. This leads to substantially long development and preparation times and also long production times, in contrast with the demands of the modern cosmetic market. For the same reason, the personalization of the applicator on the basis of specific cosmetic demands is considerably limited, as this factor is also in contrast with the requirements of the cosmetic market;
  - the construction procedures of the moulds, and in particular the extraction modes of the radial elements from the mould, prevent the latter from having a form with undercuts with respect to the radial direction, for example significant branchings or variations in the transversal section. The typical forms of the radial elements commonly obtained for this second type of applicator are cylindrical or conical, with the larger axis oriented in the radial direction, in this respect not significantly different from what can be obtained with the first type of applicator;
  - the arrangement in a longitudinal direction of the radial elements is typically limited to various rows of elements, each row having said elements aligned with respect to each other in a longitudinal direction.

This limitation is caused by the geometrical restrictions imposed by the production of the mould;

- the production technology and in particular the cost of the moulds, in addition to limiting the number of models, represents a jeopardizing cost element, above all when there is not a request for high quantities of a certain type of applicator.

**[0013]** An example of the second type of applicator is described in US 2008/0142034 A1 where, in an attempt to overcome the above problems, bristles are produced, which are selectively tilted in various different directions with respect to the radial direction for the various central supporting rings or crowns of the bristles which can be coupled on a central supporting stick.

**[0014]** Document EP 1 767 119 A1 discloses a device for applying a liquid or semi-liquid composition to eyelashes comprising a stack of individual elements mounted on a common stem. Each individual element is provided with a plurality of radial projections each having the shape of a single elongate blade. The projections are arranged in pair facing each other and spaced apart with respect to the longitudinal axis of the stem by an interstitial gap forming an hollow for the containment of the product and the passage of the eyelashes.

**[0015]** Document US 6,345,626 discloses a cosmetic applicator comprising an array of independent discs which are slidably mounted on a common stem. The peripheral portion of the discs has a plurality of radial projections extending therefrom, each projection having the shape of a single elongate linear tooth.

**[0016]** Document WO 2006/130642 discloses an apparatus for applying a cosmetic product to eyelashes comprising a stem provided with a plurality of radial projections, each projection having the shape of a single elongate finger of different cross-section.

**[0017]** From the above description it has been found that although this second type of applicator obtains better results in some areas with respect to the first type, it is not capable of completely overcoming the above-mentioned limits.

**[0018]** The main objective of the invention is to eliminate the disadvantages of the first type of applicator, as also the second type. In particular, the objective of the invention is to:

- obtain high performances with respect to combing, separation, volumizing, lengthening or curving eyelashes, combinable with each other in varying proportions to optimally satisfy each specific objective of cosmetic result;
- enable a density range (number of elements) and spectrum of different forms of radial elements, sufficiently wide as to allow the development of combing and separation performances, as also distribution of quantities of product on the eyelashes, which can be combined with each other in various degrees and with flexibility, depending on the cosmetic effect de-

sired;

- combine radial elements with each other, when considered advantageous, consisting of different materials, in order to obtain radial elements with a different elasticity in the same applicator;
- allow the production of radial elements spatially arranged according to extremely diversified procedures, suitable for obtaining a series of different applicator models through the combination of different radial elements;
- increase the volumizing, lengthening, curving, combing and separating effect.

**[0019]** These and other objectives are achieved with the applicator according to the enclosed claims.

**[0020]** These and other objectives, advantages and characteristics are evident from the following description of preferred production modes of the applicator of the present invention illustrated, for exemplifying and non-limiting purposes, in the enclosed figures, in which:

- figure 1 illustrates an exploded raised, partially sectional, side view of a known container set for mascara of its component elements;
- figure 2a shows an enlarged perspective view of the applicator element forming part of the set of figure 1;
- figures 2b and 2c illustrate enlarged perspective views of portions of the applicator element of figure 2a, in a first and second illustrative embodiment respectively;
- figure 3 shows a schematic perspective view of the applicator element of figure 2 in use on an eyelid with relative eyelashes;
- figures 4a and 4a' respectively illustrate in a front and sectional view, a first embodiment of a star element which does not form part of the present invention which can be used in a series for obtaining an applicator element for a container set according to figure 1;
- figure 4b illustrates in a front view alone, a second embodiment of a star element according to the present invention;
- figure 5a illustrates in a front view alone, a third embodiment of a star element according to the present invention;
- figure 5b illustrates in a front view alone, a fourth embodiment of a star element according to the present invention;
- figure 6 illustrates in a front view alone, a fifth embodiment of a star element according to the present invention;
- figures 7a and 7b illustrate further embodiment variants of star elements of the invention;
- figures 8a and 8b illustrate even more embodiment variants of star elements of the invention;
- figures 9a-9f illustrative in perspective further embodiment variants of bristles of star elements of which the ones of figures 9a, 9b, 9d and 9f do not

form part of the invention.

**[0021]** An applicator according to the invention also consists, as previously specified, of an applicator element 56 comprising a series of star elements 10 aligned in sequence with respect to each other, according to a known technique, on a cylindrical rod or stick 55.

**[0022]** According to the invention, each star element 10 of the applicator element 56 comprises a central body 11 equipped with a hole 12 for coupling with the rod or stick 55. More specifically, the central body 11 of the star element 10 has radial bristles with a branched structure.

**[0023]** The bristles with a branched structure are composed of a main "trunk" 13 connected through a base 14 to the central body 11 of the star element 10. "Branches" 15, which also have a radial arrangement all identical in the example of figure 4a which does not form part of the present invention, are suitably inserted in said trunk 13. The representations show a trunk 13 carrying three branches 15, but the branches are typically and advantageously in a number ranging from 2 to 7, more preferably from 2 to 5.

**[0024]** The bristles in any case with a branched structure have a number of branches equal to the total number of apexes belonging to the bristle in question. The branches can separate from the trunk from the same point or from different points. The apexes of the branches can be positioned close to or on a circumference 16 which defines the maximum diameter of the star element (figures 4a and 4a').

**[0025]** Alternatively, the apexes of some of the branches can be conveniently arranged, as schematized in Figure 4b, inside concentric rings defined by two diameters 16 and 17, the outer maximum and inner minimum of the star element 10, respectively, the value of the inner minimum diameter preferably ranging from 60% to 90% of the value of the outer maximum diameter.

**[0026]** From these first illustrations, it can be understood that the branched form of the bristles can vary with the sole limit imposed, of not forming undercuts in the direction of the longitudinal axis of the star element, which would prevent this from being extracted from the mould.

**[0027]** Figures 5a and 5b show how branches 18 can be advantageously arranged in sequence along the trunk 13 in a counteropposed mode, or branches 19 in an alternating mode (figure 5b). Figure 6 even shows how branches 20 can be positioned on the bristles in a prevalently tangential direction at various heights, as schematized.

**[0028]** Bristles having a different number and configurations of branches can be combined in the same star element, also possibly with bristles having a purely linear structure in order to obtain a curtain having the desired number of apexes per star element, provided the variably structured bristles are carefully distributed on the star element in a sufficiently homogeneous manner.

**[0029]** The branchings illustrated are particularly advantageous as they contribute to increasing the surfaces

suitable for collecting the product and entering into contact with the eyelashes. Furthermore, these branchings are advantageously positioned in the radially external area of the applicator elements, which, as is known, is the most active area in the loading and deposition phases of the product on the eyelashes. The insertion of suitable branchings consequently allows the formation of a particularly effective "curtain" of bristles, which would not be possible for conventional applicators based on bristles having an essentially linear radial structure.

**[0030]** The number of bristles arranged in each circular crown or curtain is particularly important as it is correlated to the capacity of an applicator of loading and transferring the product to the eyelashes.

**[0031]** It has been customary for quite some time, in the field of applicators of the "brush" type, to give a simple and immediately comprehensible quantification of the density of the bristles present on a certain applicator, through a parameter defined as "number of bristles per spire", this meaning the number of fibres or bristles included in a spire consisting of the double twisted steel wire, as described above. The bristles included in a spire are generally arranged in a fan configuration creating an approximately helicoidal-shaped "curtain".

**[0032]** The concept of number of bristles per spire can be conveniently extended to both brushes and moulded applicators, allowing it to be significantly used for a wide range of applicators. For this purpose, it would be advantageous to define the new parameter as "number of points per curtain" or "Npc" as follows: the number of apexes of fibres or bristles included in a spire of an applicator of the brush type, or the number of apexes of the bristles arranged on a single circular crown, in the case of a moulded applicator, are counted; this number forms the number of points per curtain or Npc. In the case of brush applicators, Npc corresponds to twice the traditional number of fibres per spire.

**[0033]** In the case of conventional moulded applicators, available on the market, the Npc generally ranges from a minimum of 4, sometimes 6, and a maximum of 10 or 12.

**[0034]** Furthermore, it is also useful to define a general parameter suitable for measuring the spacing between the curtains, or Gc.

**[0035]** Gc is defined as the pitch which exists between the adjacent circular crowns of bristles for moulded applicators which generally ranges from 0.4 to 0.7 mm approximately, and which is not sufficient for creating an adequate spacing between the curtains. Furthermore, the "thickness" of the bristles must be considered, which generally have a tapered form in a radial direction, with transversal sections having a linear dimension, measured at half height of the bristle, approximately ranging from 0.2 to 0.5 mm. The bristles are consequently relatively voluminous and therefore reduce the already restricted space available between the curtains.

**[0036]** It should also be taken into account that during the movement of the applicator, the user never keeps

the applicator accurately parallel to the eyelid and, although the eyelashes generally extend radially with respect to the eyelids, they are oriented, however, in naturally variable directions. Due to the gripping mode of the applicator on the part of the user, the eyelashes will therefore be oblique with respect to the applicator, thus encountering the obstacle caused by the encumbrance of the bristles, which will prevent penetration in the free spaces between the curtains, in any case too narrow, as schematically illustrated in figure 3, which illustrates the positioning of a generic conventional applicator close to the eyelid and relative eyelashes.

**[0037]** What is described above explains the reasons for the limited performance of conventional moulded applicators, which can be synthesized in excessively low Npc and Gc values.

**[0038]** Another fundamental attribute for the appropriate functioning of a moulded applicator is the flexibility of the bristles forming it. It is first of all important, in fact, for the bending and straightening mechanism of the bristles during the passage through the hole of the scraper, to be appropriately exerted. "Stubby" bristles which are consequently too rigid can be harmful to the mechanism described above, causing an irregular distribution of the product on the applicator and an inadequate or unsatisfactory product application.

**[0039]** Secondly, during the application and combing phase of the eyelashes, the bristles must be sufficiently flexible, "pliant" so as to be non-aggressive for sensitive eyes, also giving the user, during use, a comfortable sensation, not of roughness but of pleasant softness. They must however maintain a certain degree of rigidity to be able to effectively exert their functions.

**[0040]** The flexibility of the bristle is determined by both the geometrical characteristics of its form and also by the mechanical properties of the material used for its production.

**[0041]** With respect to the former aspect, it is useful to be able to quantify the bending capacity of a bristle by the introduction of a quantitative parameter, the slenderness factor or Sf.

**[0042]** Assuming that the bristles are uniformly tapered from the base to the apex, Sf is equal to the square root of the ratio between the length of the bristle, measured between its base and apex, squared, and the area of the section of the base of the bristle.

**[0043]** The higher the slenderness factor of the bristle, the greater its flexibility will be. A serious limitation of some conventional moulded applicators is that they consist of substantially stubby bristles which are not very flexible, characterized by Sf values generally not higher than 3, or even lower than 2.5.

**[0044]** As far as the characteristics of the material are concerned, it is common practice to use elastomeric materials, generally thermoplastic, for moulded applicators. It is fundamental however for the elastic characteristics of the material, practically synthesizable with their Shore D hardness degree, to be accurately calibrated with the

other dimensional characteristics of the bristle, to create the necessary flexibility.

**[0045]** The examples illustrated of star elements according to the invention have preferable Npc values which can be defined within a much higher range than that typical of conventional moulded applicators, therefore preferably ranging from 21 to 95.

**[0046]** Preferable Gc values, on the other hand, range from 0.9 to 2 mm, provided they are obtained through configurations which simultaneously comply with the Npc values established above.

**[0047]** The preferable Npc range can be considered adequate for a generic applicator, which can be schematized as having a prevalently cylindrical form. It is often preferable, however, to give the applicator a different and more functional form, for example conical, truncated-conical, double coned joined at the larger or smaller ends, or combinations of these. The applicator is often given, for example, a suitably tapered form in the front part, i.e. that not assembled to the stick 55. This tapered form is particularly useful for allowing the user to reach and make up the eyelashes near the ends of the eyelid, i.e. to be able to touch up the desired points. It can therefore be advantageous to proportionally reduce not only the height of the bristles of the stars which must form sections of applicator having a smaller diameter, but also to proportionally modify the Npc values of the above stars, also below the range indicated above. In the same way, it can be equally advantage to reduce the Gc value for the above-mentioned stars in order to progressively reduce the spacing between the curtains, proportionally to the reduction in the Npc value.

**[0048]** The desired flexibility of the bristles can be controlled through a suitable dimensioning of the relative section at the base, in relation to a predetermined length, so as to produce Sf values preferably ranging from 2.5 to 8. For the evaluation of the Sf, the length of the bristle measured between the base and the point of the most distant branch from its base, can be used with good approximation.

**[0049]** A further parameter which is used for controlling the elasticity of the bristles, consists in the selection of elastomeric materials, such as, typically, polypropylene and copolymers of the same, other polyolefins and copolymers of the same, polyacetal polymers, thermoplastic elastomers (TPE) based on polyetherester amides, polyetheramides (TPE-A), co-polyester (TPE-E), olefins (TPE-O, TPE-V) : ethylene-propylene-diene (EPDM) ethylene-propylene-propylene (TE- (EPDM+PP) terpolymer, polyamide elastomers (PEBA), whose relative Shore D hardness value preferably ranges from 20 to 72.

**[0050]** In a further embodiment, an applicator such as that described above can be advantageously composed of stars as described above, whose bristles have a differentiated flexibility, some of them having a relatively greater rigidity, to further increase the combing capacity of the applicator, others having a relatively greater flexibility, mainly suitable for the application function. The

more rigid bristles will be characterized by a Sf preferably ranging from 2.5 to 6. The more flexible bristles will be characterized by a Sf preferably ranging from 4 to 8. The bristles of the first type are preferably in a number between 10% and 40% of the total number of bristles. These values can be obtained by suitably dimensioning the section of bristles in relation to their length.

**[0051]** In a further embodiment, a series of relatively longer bristles, generally branched, having the function of increasing the combing capacity of the applicator, can be advantageously added to the curtain of bristles suitably branched and having an adequate flexibility, described above.

**[0052]** The bristles of the former combing type arranged on the star are preferably longer and correspondingly those of the second type are not so long, so that the length of the bristles of the second type is less than that of the longer bristles by a percentage ranging from 10% to 25%, more preferably from 12% to 18%.

**[0053]** The bristles of the former type are preferably in a number ranging from 10% to 40% of the total number of bristles. Each of them can advantageously have branches in a number ranging from 1 (linear bristle) 2 (2 branches) or 3 (3 branches).

**[0054]** The distribution of the combing bristles is preferably such that their apexes or the apexes of their branchings are close to the vertex of a polygon having 3, 4, 5 or 6 sides, whereas the apexes of the bristles of the second type are approximately arranged on the circumference defined by their length.

**[0055]** An illustrative embodiment of a star structured according to some of the modes described is shown in figures 7a and 7b.

**[0056]** In another embodiment, the apexes of the branchings of the bristles of the second type, are approximately arranged on sides of the polygon having 3, 4, 5 or 6 sides identified by the position of the apexes of the bristles of the first type, as schematized for illustrative purposes in figure 8a. Again, the sides can have a slight concavity, as illustrated in figure 8b.

**[0057]** A further embodiment comprises the production of bristles, as described in the first embodiment, but having suitable enlargements and protrusions, in the form of areas characterized by convex, flat or concave surfaces with the purpose of increasing the surface available for the loading and application of the product, these areas preferably being situated on the apexes of the branches, according to an appropriate angular orientation, as shown in a simplified way with only one bristle for purely illustrative purposes in figures 9a, 9b, 9c or in the joining points of the branchings, as exemplified in figures 9d and 9e, this generally being situated in the radially external area of the applicator, which is more active in the transfer phase of the product onto the eyelashes. Alternatively, two arms can be joined in the form of a ring, as schematized in figure 9f, again for improving the adhesion, loading and application of the product.

**[0058]** The enlargements described can be advanta-

geously combined with each other and can be distributed on all the branchings and/or on all the apexes, or only on some of these, controlling however the regularity of the arrangement.

5 **[0059]** Mixed forms of what has been illustrated so far can also be used.

**[0060]** In another embodiment, the applicator consists of stars described in one of the previous embodiments, assembled on the stick, arranged in sequence without any of the stars being rotated with respect to the previous adjacent star.

10 **[0061]** In a variant, the applicator consists of stars described in one of the previous embodiments, assembled on the stick, arranged in sequence so that each star is rotated by an angle equal to 180° with respect to the previous adjacent star.

15 **[0062]** Or, the applicator consists of stars assembled in sequence so that each star is rotated by a preestablished angle with respect to the previous adjacent star, said angle preferably being established within a range varying from 12° to 30°, preferably from 15° to 18°.

20 **[0063]** The applicator can consist of stars assembled in sequence so that each star is rotated by an angle • with respect to the previous adjacent star, said angle • being equal to 45° in the case of arrangement on a 4-sided polygon and 36° in the case of arrangement on a 5-sided polygon.

25 **[0064]** An advantageous means for ensuring the absence of reciprocal rotation between the stars and the stick on which they are assembled, consists in introducing an adequate interference degree between the circular hole effected in the central body of the star and the stick, having a circular section. It is advantageous to adopt an interference ranging from 10% to 20% of the diameter of the stick. If the diameter of the stick is 1.4 mm, for example, the diameter of the hole of the stars will range from 1.26 to 1.12 mm. This solution avoids the production of complex coupling sections of the hole and axis, at the same time offering a simpler, more versatile and economic alternative which can be adopted in any of the embodiments described above.

30 **[0065]** It is also advantageous to provide an applicator according to any of the embodiments described above, **characterized in that** the stick on which the star elements are assembled has a suitable curvature.

35 **[0066]** Finally, the applicator can be produced by assembling a combination of stars created as described in the previous embodiments, one or more of these being produced by diversely varying one or more of the parameters and production criteria described, the latter however remaining within the preferred variation ranges described above.

## 55 Claims

1. A composite applicator for decorative cosmetic products in liquid, viscous or paste form and more par-

- particularly for applying mascara to the eyelashes, essentially consisting of a stick (55) with a longitudinal axis, in addition to a series of star elements (10) arranged on the above stick (55), each of said star elements (10) comprises a central body (11) having an engagement hole (12) of the respective element (10) on said stick (55), and also a series of arms or bristles which extend radially from the above body (11), said arms or bristles having a branched structure (15, 18, 19, 20) which ends in at least two apexes for each bristle, **characterised in that** the apexes of some of the branches are arranged inside concentric rings defined by two diameters of which one is an outer maximum diameter and the other one is an inner minimum diameter.
2. The device according to claim 1, **characterized in that** said arms or bristles have arms (15, 18, 19, 20) in a number ranging from 2 to 7, more preferably from 2 to 5.
  3. The device according to claim 1, **characterized in that** said arms of said branched structure extend from a main base trunk (13) of each bristle.
  4. The device according to claim 3, **characterized in that** said arms extend from said trunk from a same point or from different points.
  5. The device according to claim 1, **characterized in that** the value of a minimum internal diameter of said circumferences (17) ranges from 60% to 90% of the value of a maximum external diameter of said circumferences.
  6. The device according to any of the previous claims, **characterized in that** said arms or bristles have a differentiated flexibility.
  7. The device according to any of the previous claims, **characterized in that** said arms or bristles have shaped enlargements on themselves.
  8. The device according to any of the previous claims, **characterized in that** it envisages Npc values ranging from 21 to 95.
  9. The device according to any of the previous claims, **characterized in that** it envisages Gc values ranging from 0.9 to 2 mm.
  10. The device according to any of the previous claims, **characterized in that** it envisages Sf values ranging from 2.5 to 8.
  11. The device according to any of the previous claims, **characterized in that** said star elements (10) are produced with elastomeric materials having a Shore D hardness value ranging from 20 to 72.
  12. The device according to any of the previous claims, **characterized in that** in said star elements (10), said apexes of said bristles are arranged on sides of a polygon.
  13. The device according to claim 12, **characterized in that** said sides have a concavity.
  14. The device according to any of the previous claims, **characterized in that** said star elements (10) are arranged in sequence so that each star is rotated by 180° with respect to the subsequent one.
  15. The device according to claims 1 to 14, **characterized in that** said star elements (10) are arranged in sequence so that each star is rotated by a fixed angle with respect to the subsequent one, said angle having a value ranging from 12 to 30°.
  16. The device according to any of the previous claims, **characterized in that** the stick on which the star elements are assembled has a suitable curvature.

#### Patentansprüche

1. Verbundstoffapplikator für dekorative Kosmetikprodukte in flüssiger, viskoser oder pastöser Form und insbesondere zum Auftragen von Mascara auf die Wimpern, im Wesentlichen bestehend aus einem Stab (55) mit einer Längsachse, zusammen mit einer Reihe von sternförmigen Elementen (10), die auf dem Stab (55) angeordnet sind, wobei jedes sternförmige Element (10) einen zentralen Körper (11) mit einer Einrastöffnung (12) für das jeweilige Element (10) auf dem Stab (55) sowie eine Reihe von Armen oder Borsten umfasst, die sich radial aus dem Körper (11) erstrecken, wobei die Arme oder Borsten eine verzweigte Struktur (15, 18, 19, 20) aufweisen, welche in mindestens zwei Spitzen pro Borste endet, **dadurch gekennzeichnet, dass** die Spitzen einiger Zweige im Innern von konzentrischen Ringen angeordnet sind, die durch zwei Durchmesser definiert sind, von denen der eine ein äußerer Höchstdurchmesser und der andere ein innerer Mindestdurchmesser ist.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Arme oder Borsten Arme (15, 18, 19, 20) in einer zwischen 2 und 7, vorzugsweise zwischen 2 und 5 liegenden Anzahl aufweisen.
3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Arme der verzweigten Struktur sich von einem Hauptstammfuß (13) einer jeden Borste erstrecken.

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die Arme sich von dem Stamm von demselben oder von verschiedenen Punkten aus erstrecken.
5. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Wert eines inneren Mindestdurchmessers des Umfangs (17) 60% bis 90% des Werts eines äußeren Höchstdurchmessers des Umfangs ist.
6. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Arme oder Borsten eine unterschiedliche Biegsamkeit besitzen.
7. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sich auf den Armen oder Borsten geformte Verbreiterungen befinden.
8. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Npc-Werte vorsieht, die im Bereich von 21 bis 95 liegen.
9. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Gc-Werte vorsieht, die im Bereich von 0,9 bis 2 mm liegen.
10. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Sf-Werte vorsieht, die im Bereich von 2,5 bis 8 liegen.
11. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die sternförmigen Elemente (10) aus einem Elastomermaterial hergestellt werden, dessen Shore-D-Härte im Bereich von 20 bis 72 liegen.
12. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** bei den sternförmigen Elementen (10) die Spitzen der Borsten an den Seiten eines Vielecks angeordnet sind.
13. Vorrichtung nach Anspruch 12, **dadurch gekennzeichnet, dass** die Seiten eine Aushöhlung aufweisen.
14. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die sternförmigen Elemente (10) so hintereinander angeordnet sind, dass jeder Stern um 180° bezogen auf den nachfolgenden Stern gedreht ist.
15. Vorrichtung nach den Ansprüchen 1 bis 14, **dadurch gekennzeichnet, dass** die sternförmigen Elemente (10) so hintereinander angeordnet sind, dass jeder

Stern um einen festen Winkel bezogen auf den nachfolgenden Stern gedreht ist, wobei der Winkel einen Wert aufweist, der im Bereich von 12° bis 30° liegt.

- 5 16. Vorrichtung nach irgendeinem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Stab, auf dem die sternförmigen Elemente angebracht sind, eine geeignete Biegung aufweist.

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### Revendications

1. Applicateur composite pour produits cosmétiques décoratifs, sous forme liquide, visqueuse ou pâteuse et notamment pour l'application de mascara sur les cils, constitué essentiellement d'une baguette (55) ayant un axe longitudinal, outre à une série d'éléments en forme d'étoile (10) ménagés au-dessus de la baguette (55), chacun desdits éléments en forme d'étoile (10) comporte un corps central (11) ayant un trou d'engagement (12) du respectif élément (10) sur ladite baguette (55), aussi bien qu'une série de bras ou poils qui s'étendent suivant une direction radiale du corps (11) susmentionné, lesdits bras ou poils ayant une structure ramifiée (15, 18, 19, 20) qui se termine par au moins deux sommets pour chaque poil, **caractérisé en ce que** les sommets de certains des branches sont ménagés à l'intérieur d'anneaux concentriques définis par deux diamètres dont l'un est un diamètre extérieur maximum et l'autre est un diamètre intérieur minimum.
2. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits bras ou poils aient des bras (15, 18, 19, 20) en quantité comprise entre 2 et 7, de préférence comprise entre 2 et 5.
3. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits bras de ladite structure ramifiée s'étendent à partir d'un fût de base principal (13) de chaque poil.
4. Dispositif selon la revendication 3, **caractérisé en ce que** lesdits bras s'étendent dudit fût à partir du même point ou des points différents.
5. Dispositif selon la revendication 1, **caractérisé en ce que** la valeur d'un diamètre intérieur minimum desdites circonférences (17) est dans la plage de 60% à 90% de la valeur d'un diamètre extérieur maximum desdites circonférences.
6. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits bras ou poils ont une flexibilité différente.
7. Dispositif selon l'une quelconque des revendications précédentes **caractérisé en ce que** lesdits bras ou

poils comportent des élargissements façonnés sur eux-mêmes.

8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** envisage des valeurs NPC dans la plage de 21 à 95. 5
9. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** envisage des valeurs Gc dans la plage de 0,9 à 2 mm. 10
10. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** envisage des valeurs Sf dans la plage de 2,5 à 8. 15
11. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits éléments en forme d'étoile (10) sont réalisés en matériaux élastomériques ayant une valeur de dureté Shore D dans la plage de 20 à 72. 20
12. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** dans lesdits éléments en forme d'étoiles (10), lesdits sommets desdits poils sont disposés sur les côtés d'un polygone. 25
13. Dispositif selon la revendication 12, **caractérisé en ce que** lesdits côtés comportent une concavité. 30
14. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits éléments en forme d'étoile (10) sont ménagés en séquence de sorte que chaque étoile soit pivotée de 180 degrés par rapport à l'étoile suivante. 35
15. Dispositif selon les revendications 1 à 14, **caractérisé en ce que** lesdits éléments en forme d'étoile (10) sont ménagés en séquence de sorte que chaque étoile soit pivotée d'un angle fixe par rapport à l'étoile suivante, ledit angle étant dans la plage de 12° à 30°. 40
16. Dispositif selon l'une quelconque des revendications précédentes **caractérisé en ce que** la baguette sur laquelle les éléments en forme d'étoile sont assemblés a une courbure appropriée. 45

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Fig. 1

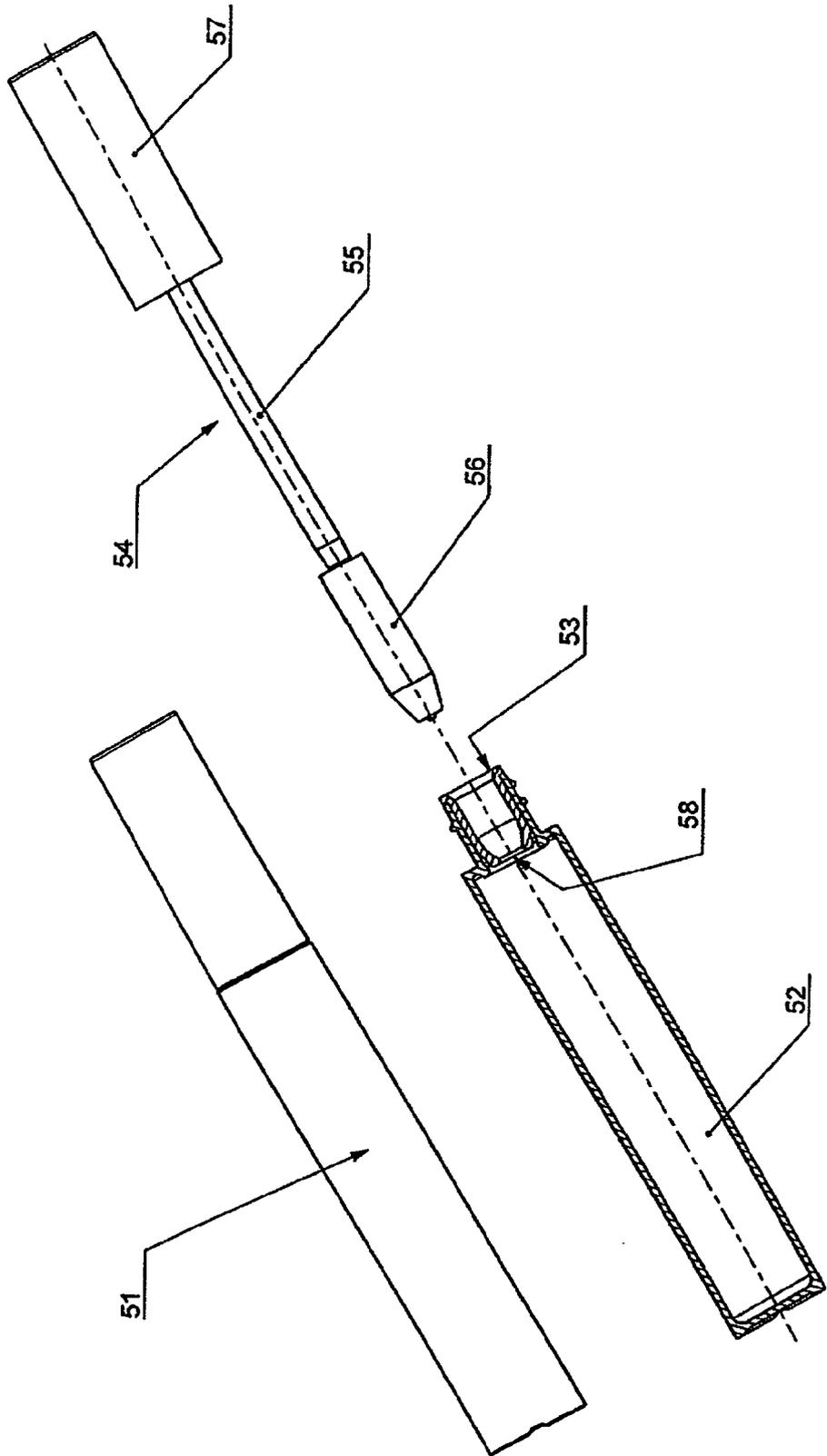


Fig. 2a

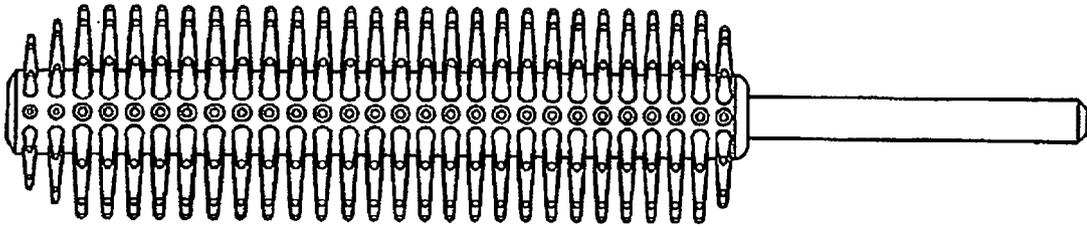


Fig. 2b

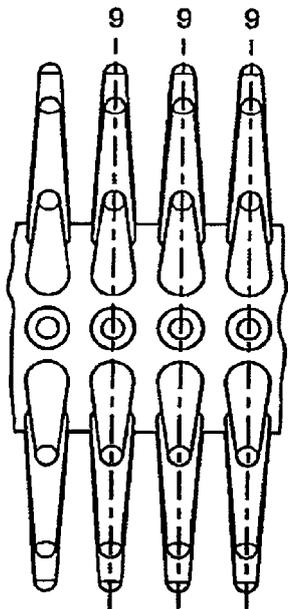


Fig. 2c

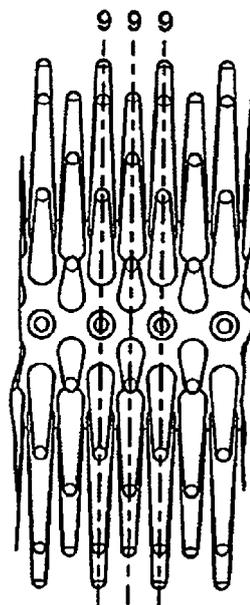


Fig. 3

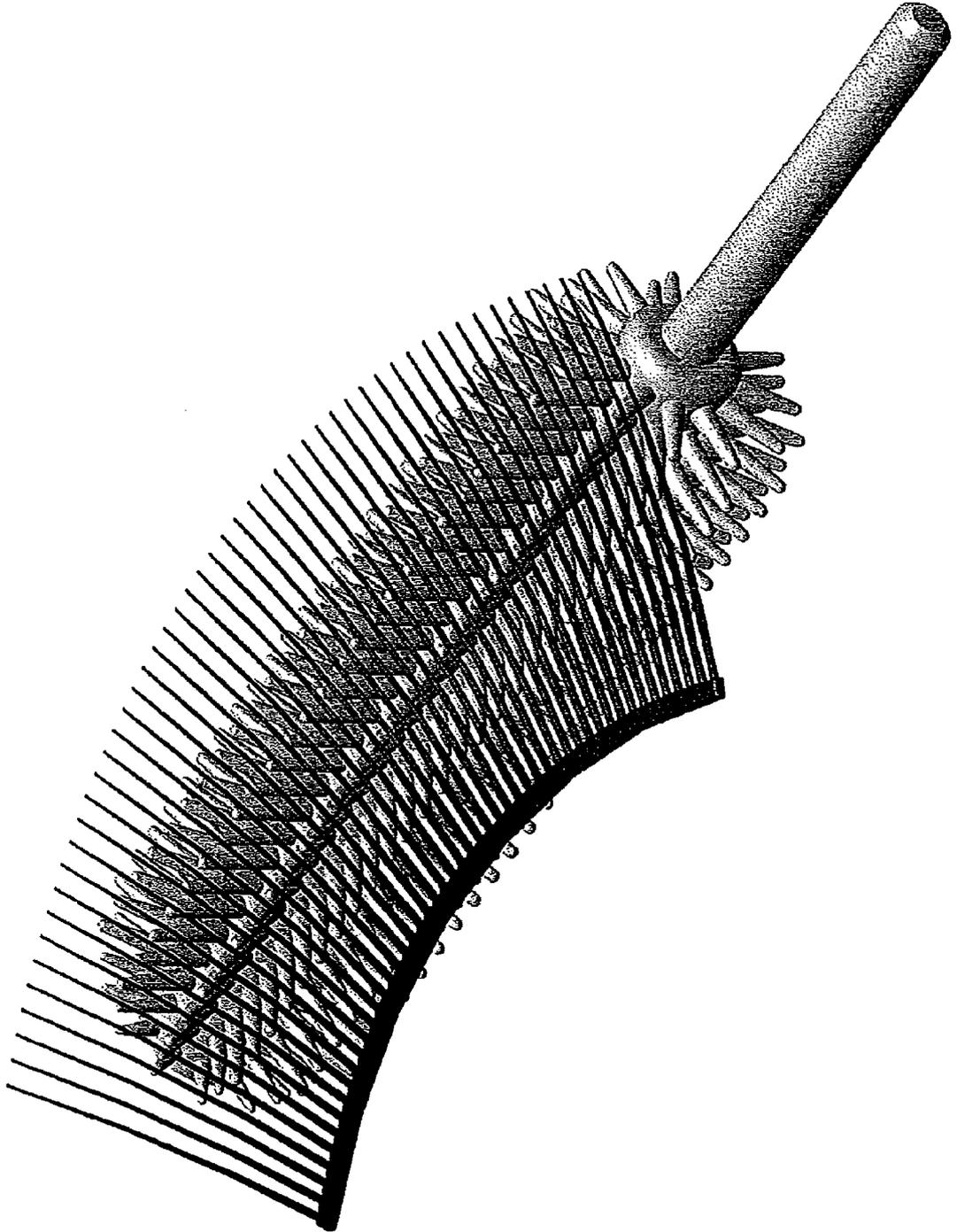


Fig. 4a'

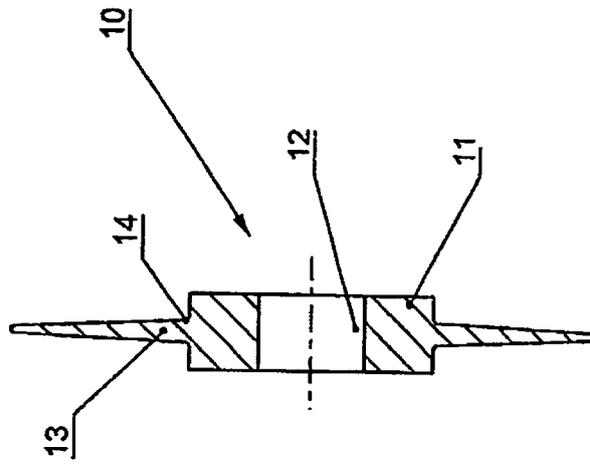
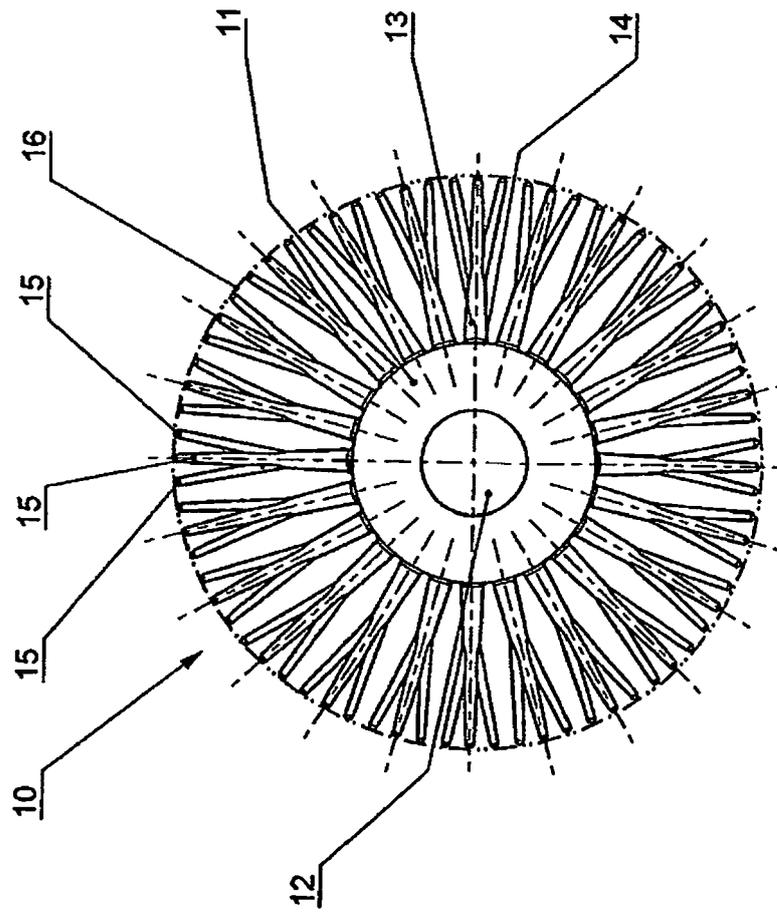


Fig. 4a



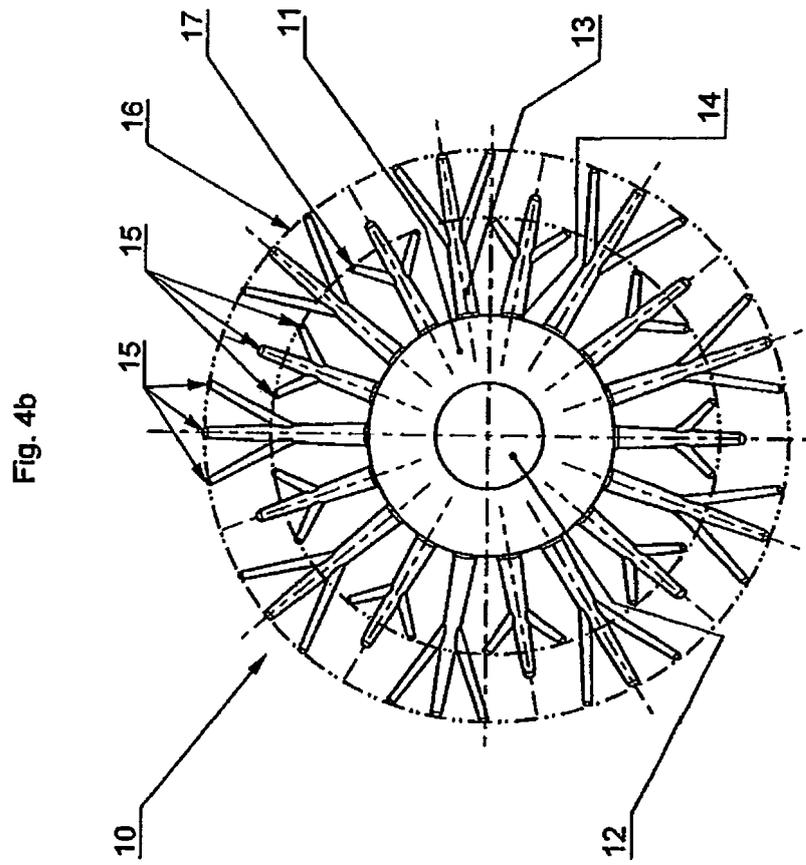


Fig. 5a

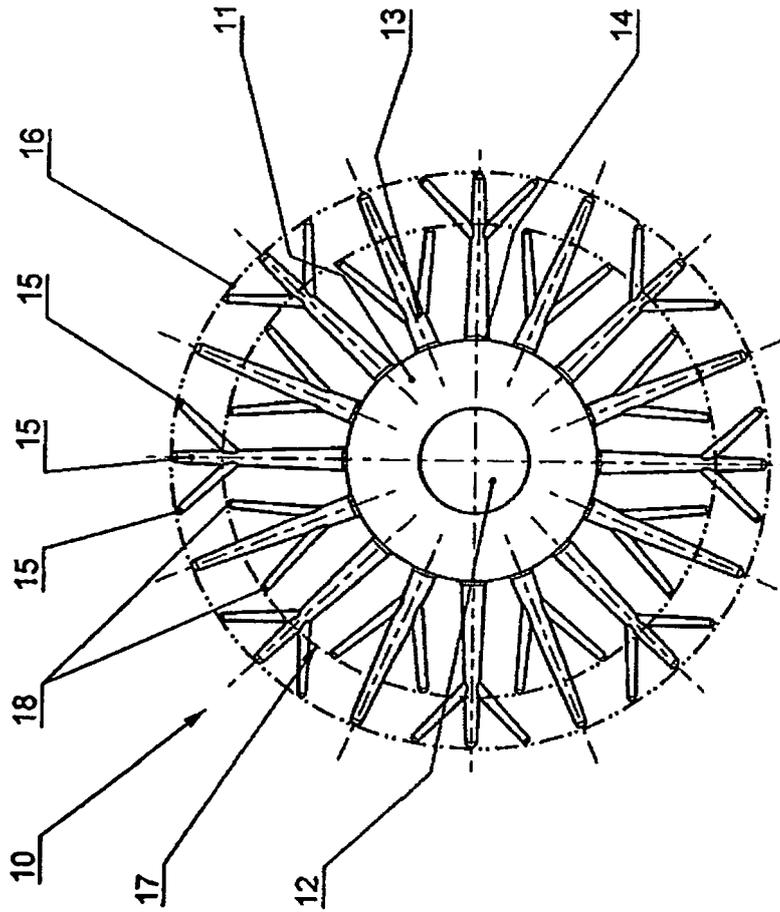


Fig. 5b

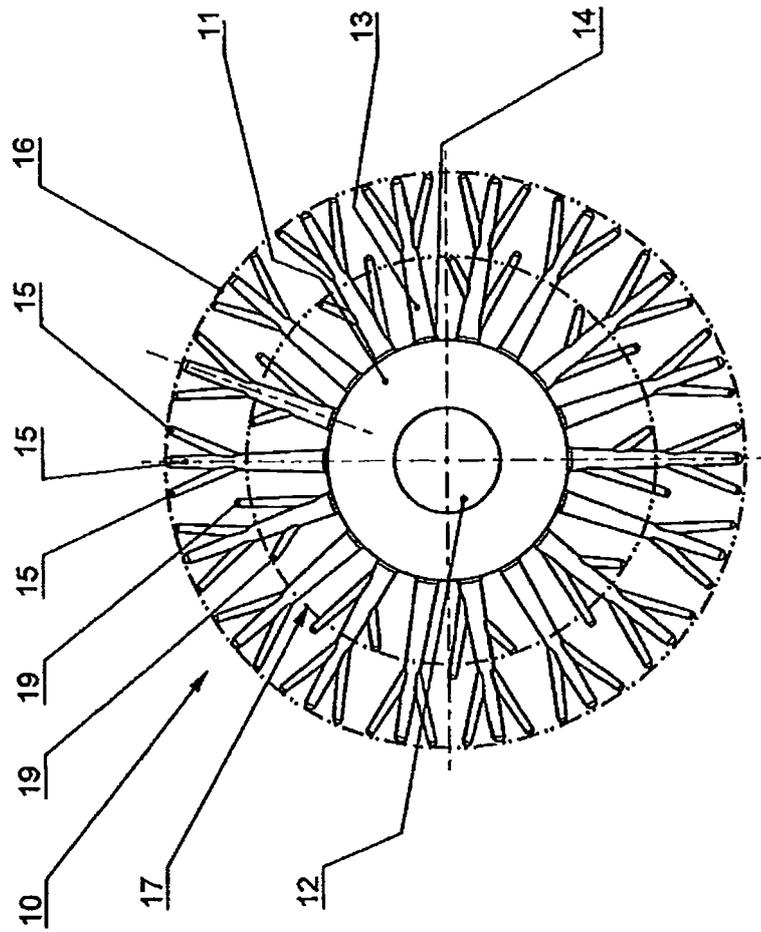


Fig. 6

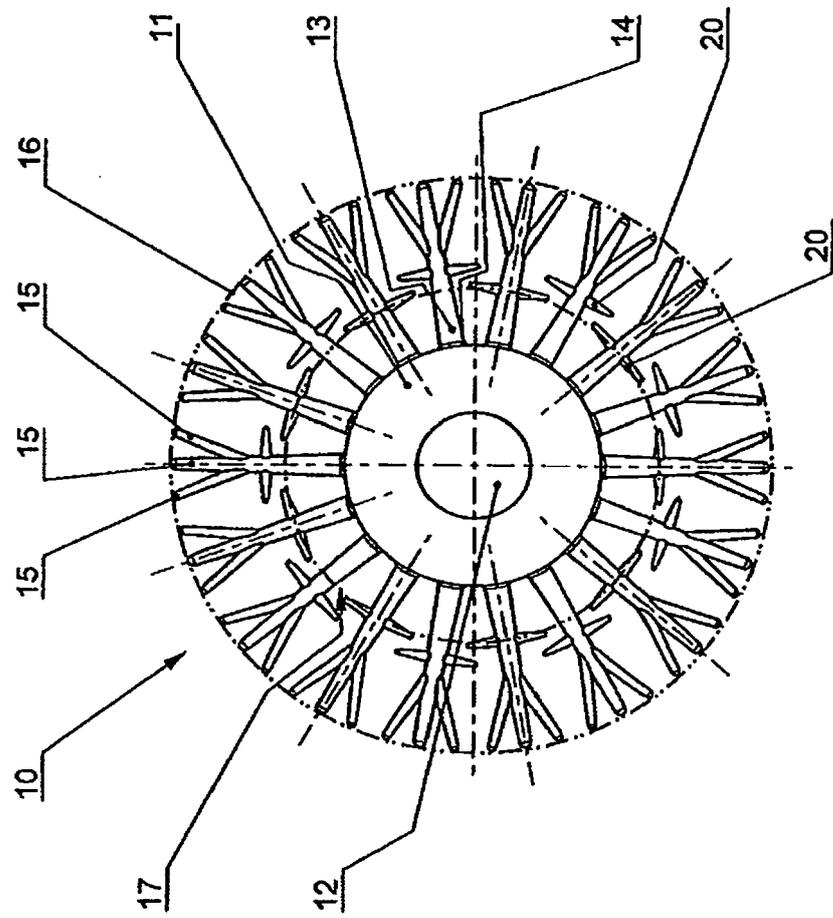


Fig. 7a

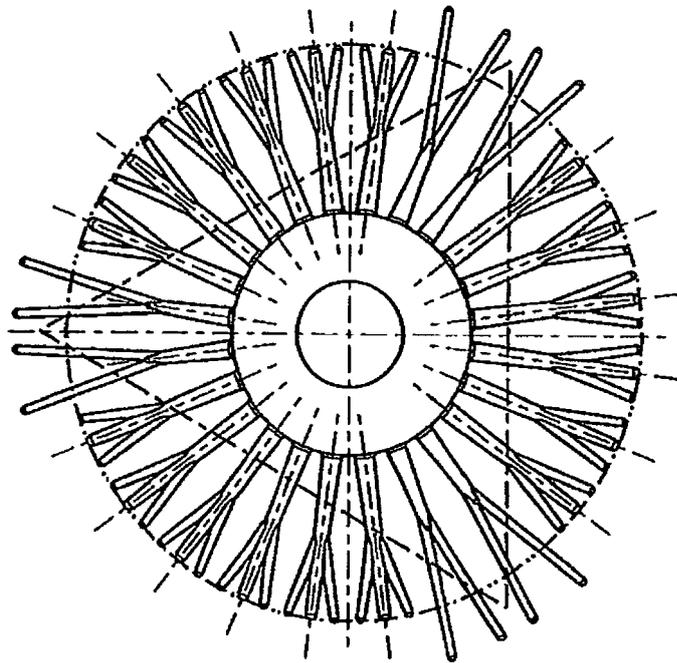


Fig. 7b

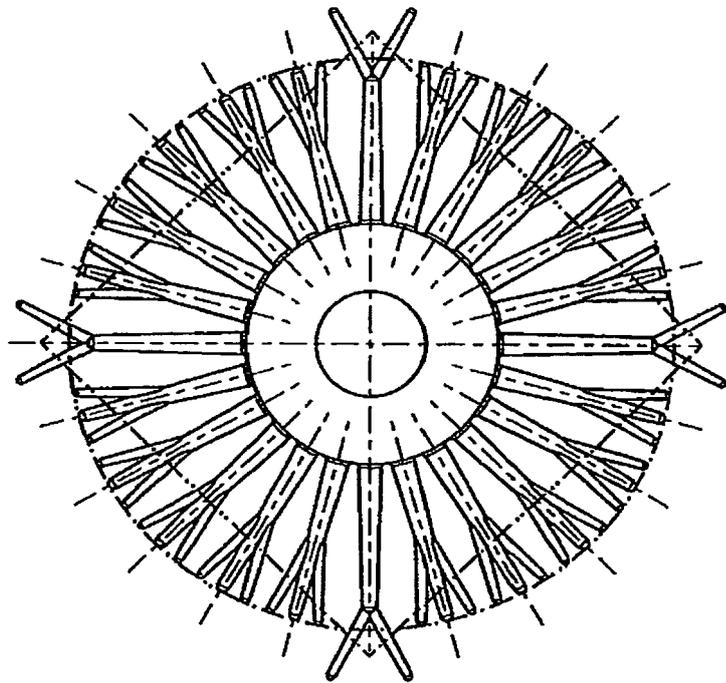


Fig. 8a

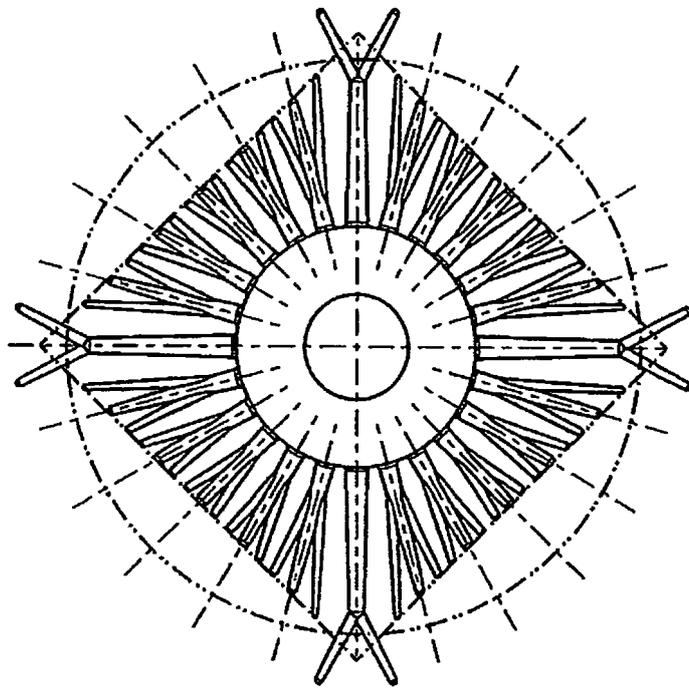


Fig. 8b

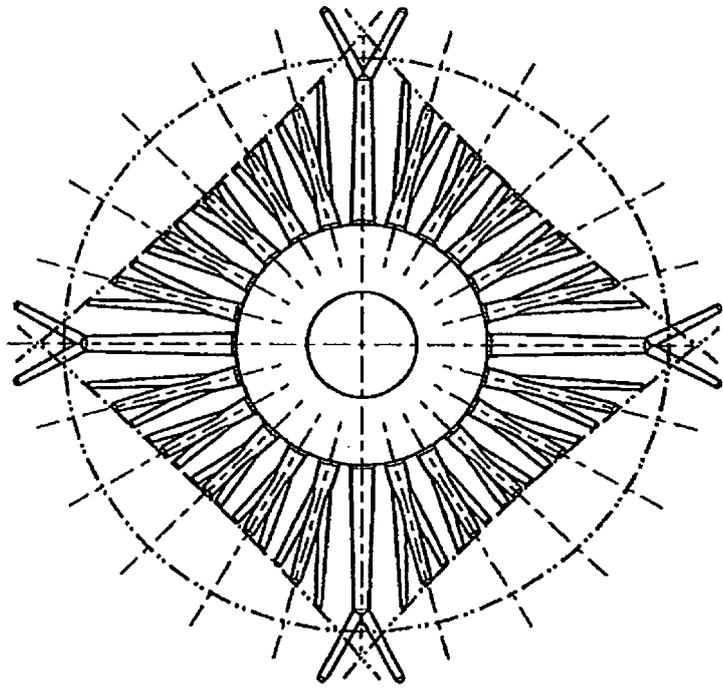


Fig. 9a

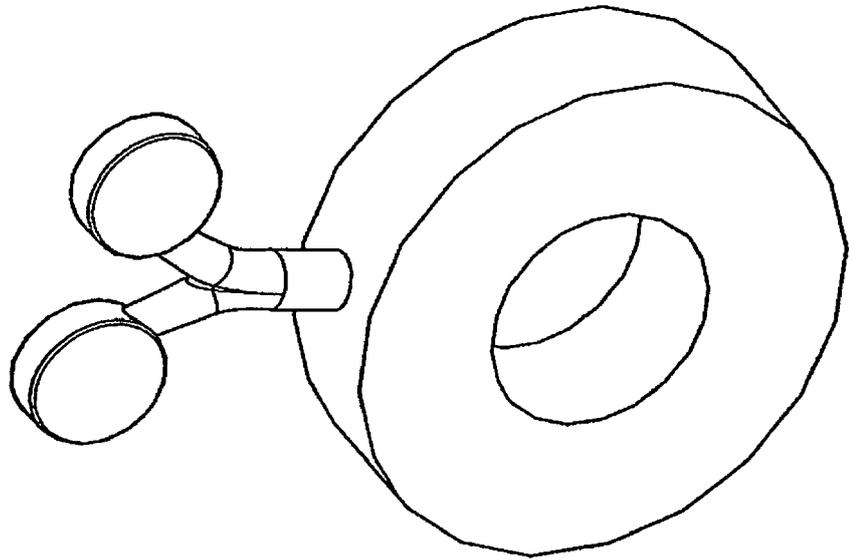


Fig. 9b

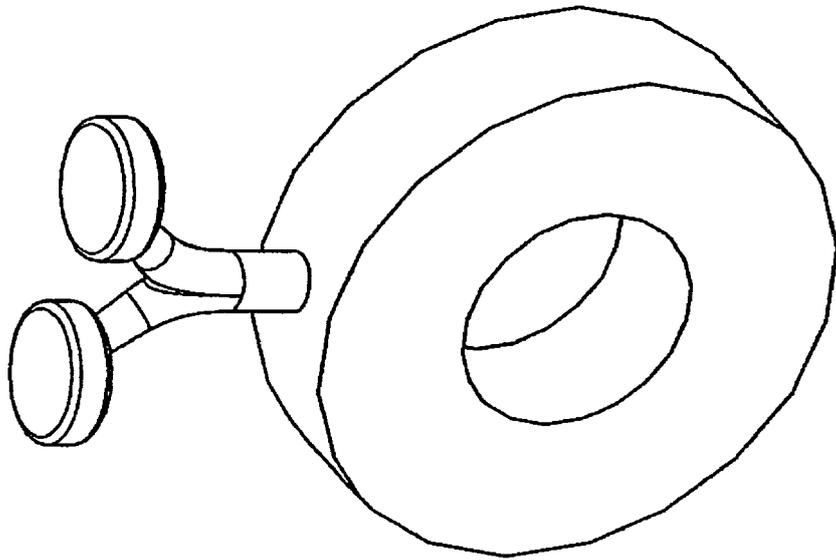


Fig. 9c

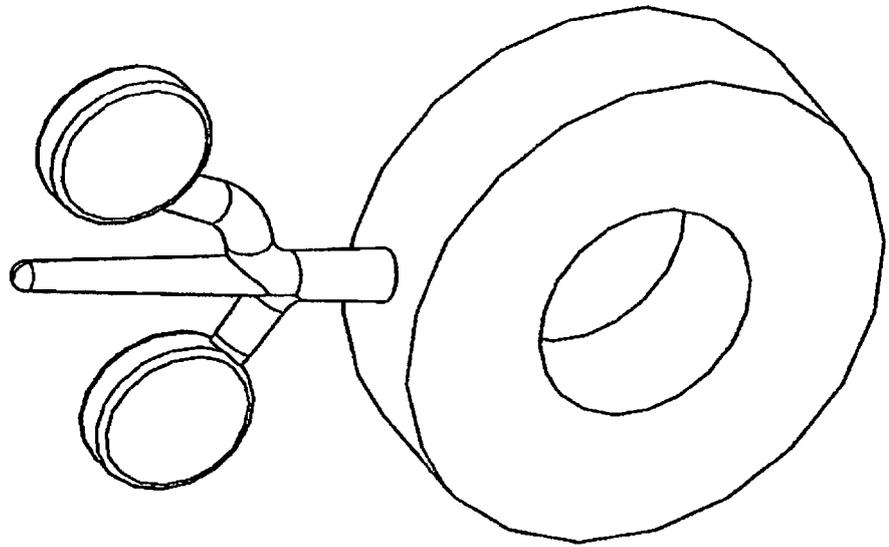


Fig. 9d

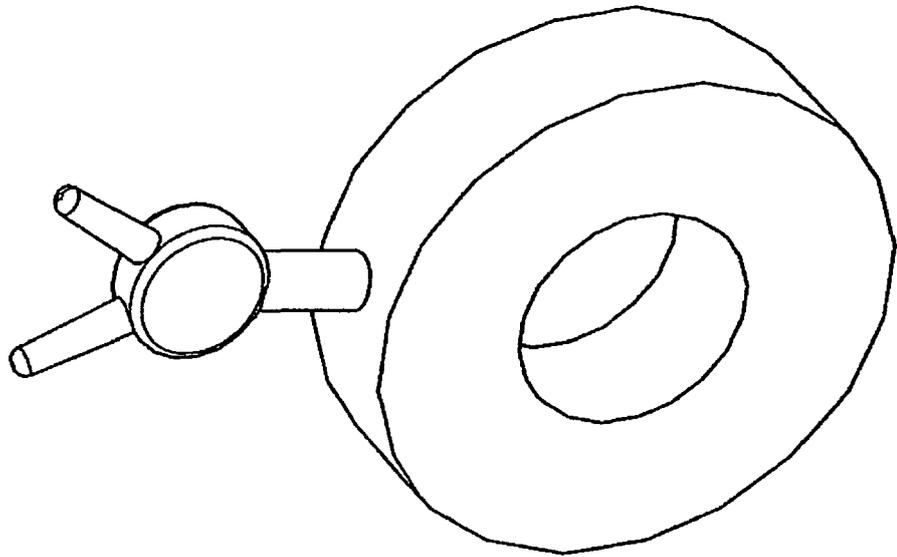


Fig. 9e

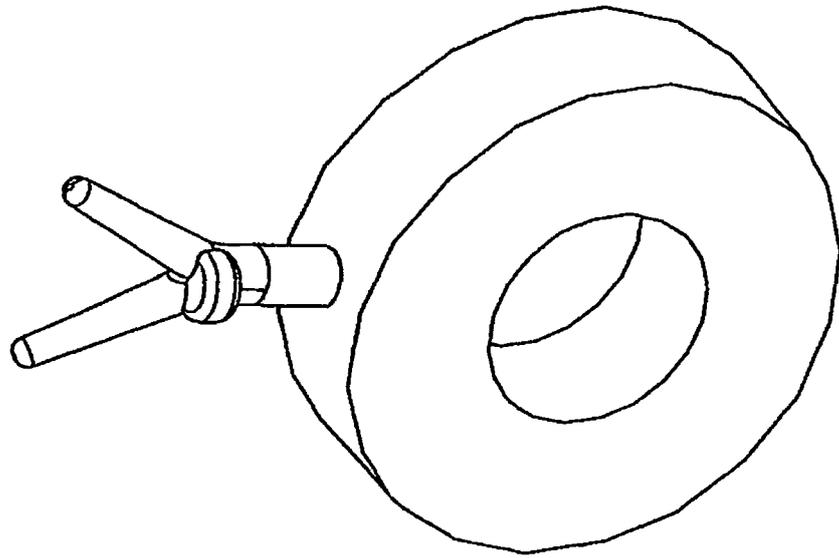
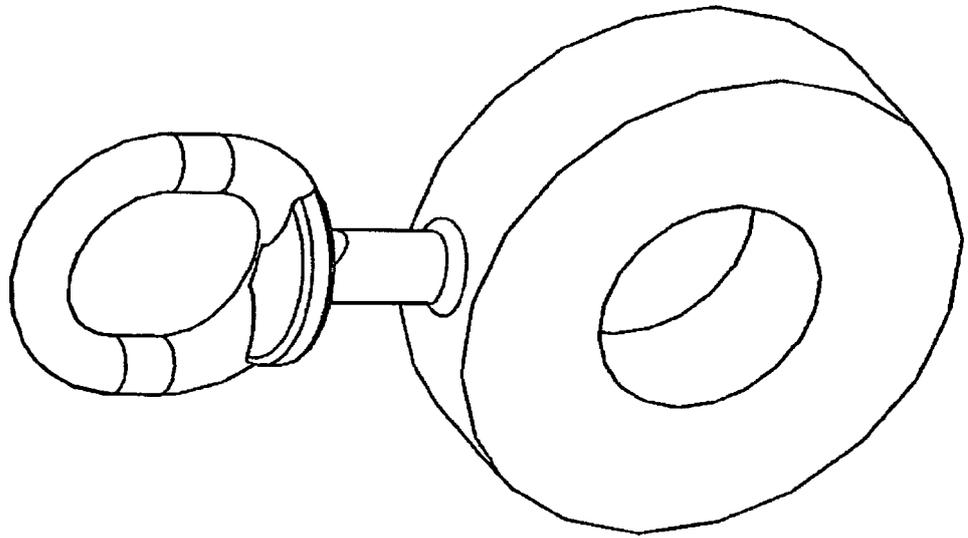


Fig. 9f



**REFERENCES CITED IN THE DESCRIPTION**

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