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(54) **Mixing unit**

Mischeinheit

Unité de mélange

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Description

[0001] The present invention relates to a unit for mixing a pulverized or granulated product.

[0002] More specifically, the present invention relates to a unit for mixing a hygroscopic product, i.e. a product capable of absorbing atmospheric moisture, to which the following description refers purely by way of example.

[0003] For mixing pulverized or granulated products, a mixing unit is known to be used comprising a mixing chamber, in turn comprising a tubular casing having a given longitudinal axis, and mixing means housed inside the tubular casing to mix at least one hygroscopic pulverized or granulated product.

[0004] The tubular casing is normally made of metal and relatively rigid; and the mixing means comprise a number of devices, such as blades, scoops, etc., arranged about and along the axis and mounted to rotate about the axis to impart to the product inside the tubular casing a substantially cylindrical spiral motion along the inner surface of the tubular casing.

[0005] Consequently, part of the product being mixed comes into contact with, and may possibly adhere to, the inner surface of the tubular casing.

[0006] This is particularly so when dealing with hygroscopic or soft products, i.e. with a strong tendency to form lumps and cling to the wall of the tubular casing and/or to the surfaces of the blades or scoops.

[0007] A major drawback, therefore, of the above known mixing unit is that, on hardening, the portion of the product adhering to the tubular casing eventually results in wear of or damage in general to the inner walls of the mixing unit and/or the blades.

[0008] Another drawback of the above known mixing unit is the relatively frequent, thorough cleaning required of the tubular casing.

[0009] It is an object of the present invention to provide a mixing unit designed to eliminate the aforementioned drawbacks.

[0010] According to the present invention, there is provided a unit for mixing at least one pulverized or granulated product; the unit comprising at least one mixing chamber, in turn comprising a tubular casing having a given longitudinal axis, and mixing means housed inside said tubular casing to mix said product; and the unit being characterized in that said tubular casing is substantially made of a plastic material; reinforcing means being provided to divide said tubular casing into a number of portions, which, when contacted by said product as said product is fed through and mixed, vibrate and/or move from the initial position to detach said product from an inner surface of said tubular casing, thus reducing wear of said inner surface and/or said mixing means.

[0011] In other words, the casing of the mixing unit is, so to speak, "movable", by virtue of the elasticity of the material from which it is made, and also the particular construction design of the casing. And the greater the

vibration is, the more effectively the pulverized or granulated product is prevented from adhering to and hardening on the inner surface of the casing and/or the blade surfaces.

[0012] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view of a first embodiment of the mixing unit according to the present invention;

Figure 2 shows a section of a detail in Figure 1;

Figure 3 shows an assembly of a number of components of the Figure 1, 2 mixing unit;

Figure 4 shows an exploded view of the Figure 3 components;

Figure 5 shows a longitudinal section of a detail of a second embodiment of the unit according to the present invention.

[0013] Number 1 in Figure 1 indicates as a whole a unit for mixing a pulverized or granulated product 2, which may be hygroscopic, i.e. capable of absorbing atmospheric moisture or any liquid with which it comes into contact along its path.

[0014] Unit 1 comprises a supply device 3; an unloading device 4; and a mixing chamber 5 located between devices 3 and 4 and aligned with devices 3 and 4 in the traveling direction 6 of product 2 along unit 1.

[0015] Unit 1 also comprises a powered shaft 7, which has a longitudinal axis 8 substantially parallel to direction 6, and is rotated continuously about axis 8 by a known motor reducer 9.

[0016] Device 3 comprises a tubular casing 10 coaxial with axis 8 and having a loading station 11 for loading product 2, and a known screw 12 fitted to shaft 7 and for feeding product 2 in direction 6 from station 11 to an input station 13 of chamber 5.

[0017] Chamber 5 comprises a substantially tubular casing 14 coaxial with axis 8 and having, on the ends, two annular flanges 15 extending radially outwards from the outer surface of casing 14, and one of which (hereinafter indicated 15a) connects casing 14 to casing 10, while the other (hereinafter indicated 15b) connects casing 14 to device 4 as described in detail later on.

[0018] Casing 14 is made of plastic material - preferably, though not necessarily, polyurethane, is relatively thin, is defined internally and externally by respective cylindrical surfaces 16 and 17 coaxial with axis 8, and comprises, at outer surface 17, two numbers of reinforcing elements 18 so arranged as to divide casing 14 into a number of portions 19, each defined by a respective cylindrical sector coaxial with axis 8.

[0019] More specifically, elements 18 in one of the two numbers of reinforcing elements 18 are defined by annular elements (hereinafter indicated 18a) coaxial with and preferably, though not necessarily, equally spaced along axis 8; while elements 18 in the other of the two

numbers of reinforcing elements 18 are defined by longitudinal ribs (hereinafter indicated 18b) extending between elements 18a and parallel to and equally spaced about axis 8.

[0020] Chamber 5 also comprises a number of known mixing members 20 or so-called "scoops", which are arranged about and along axis 8, project radially outwards from the outer surface of shaft 7, and provide, in use, for imparting to product 2 inside chamber 5 a substantially cylindrical spiral motion along casing 14, between station 13 and an output station 21 of chamber 5.

[0021] In other words, casing 14 is "movable", so to speak, alongside passage of the product pushed on to inner surface 16 by the centrifugal action of scoops 20. Which deformation and the immediate return of casing 14 to its initial configuration have the desired effect of detaching the product from inner surface 16.

[0022] Device 4 comprises a box body 22, which is substantially U-shaped with the concavity facing downwards, extends about shaft 7, and has, at a first end facing chamber 5, a frame 23 contacting flange 15b (Figures 1, 2), and, at a second end, a flat plate 24 crosswise to axis 8.

[0023] Device 4 also comprises a U-shaped element 25 extending crosswise to axis 8 and located downstream from body 22 in direction 6. A number of ties 26 (Figure 1), extending parallel to axis 8, are also provided to lock, by known means not shown, plate 24 against frame 23 of body 22, and the assembly defined by body 22 and by plate 24 against flange 15b of casing 14. Each tie 26 extends, in use, through a respective through hole F1 formed in frame 23, and a respective through hole F2 formed in plate 24 and aligned with respective hole F1.

[0024] Element 25, which, as stated, is substantially U-shaped, has its concavity facing chamber 5, and is hinged to a bottom edge 28 of plate 24 to oscillate, with respect to plate 24, about a hinge axis 29 crosswise to axis 8.

[0025] Together with element 25 and a plate 30 fitted to flange 15b and crosswise to axis 8, body 22 defines an opening 31 for the passage of product 2 through device 4, and the cross section of which is controllable selectively by a movable wall (not shown) crosswise to axis 8. The position of the movable wall can be adjusted either manually or by means of a known actuating device not shown.

[0026] Unit 1 also comprises two members 33 for supporting unit 1, and which project downwards from the respective outer surfaces of casings 10 and 14.

[0027] As shown in Figure 4, body 22 comprises a through hole 22a, and plate 24 comprises a through hole 24a, which, when plate 24 is fitted to body 22, is aligned with hole 22a along axis 8.

[0028] In use, through holes 22a and 24a are fitted through with an end pin 7a (Figure 1) of shaft 7; pin 7a projects from plate 24 to engage a bush 24b connected integrally to plate 24 by known means (not shown) and

by means of holes 24c; and bush 24b has a bearing (not shown) inside for receiving at least a portion of pin 7a to support shaft 7 as required.

[0029] Being also made of plastic material and being secured to mixing chamber 5 by ties 26, unloading device 4 is vibrated at the unloading stage by the forward movement imparted to product 2 by mixing members 20, thus detaching any lumps of product 2 adhering to the inner walls of device 4.

[0030] Figure 5 shows an alternative embodiment of unit 1, which differs from the Figure 1 embodiment only as regards casings 10 and 14. That is, the second embodiment in Figure 5 comprises a single tubular casing 34, which replaces casings 10, 14 in Figure 1, is formed in one piece from plastic material, e.g. polyurethane, and comprises a supply device 35 housing screw 12, and a mixing chamber 36 in series with device 35 and housing mixing members 20. As shown in Figure 5, in this case, too, device 35 may also comprise a number of reinforcing elements 18a, 18b and, therefore, a number of portions 19, each defined by a respective cylindrical sector coaxial with axis 8.

[0031] It is important to stress that, in the Figure 5 embodiment, reinforcing elements 18a and 18b are distributed along the whole length of casing 34.

[0032] Operation can easily be deduced from the foregoing description.

[0033] In particular, with reference to Figure 1, product 2 is loaded at loading station 11 and fed by screw 12, rotated by motor reducer 9, towards mixing chamber 5 where the pulverized or granulated product is mixed to remove any lumps formed as a result of product 2 absorbing moisture, or to mix product 2 with other material.

[0034] As stated, portions 19 on the surface of chamber 5 and defined by respective cylindrical sectors coaxial with axis 8 vibrate when contacted by product 2 being mixed, so as to detach any lumps from the inner walls of chamber 5; and the same principle, as shown in the second embodiment in Figure 5, may also be applied successfully in the construction of supply device 35.

[0035] Being also made of plastic material and being secured to the rest of the structure by ties 26, unloading device 4 is also vibrated when unloading the material on to a user unit (not shown) located downstream from mixing unit 1 according to the present invention. The rocking movement of element 25 about hinge axis 29 between element 25 and plate 24 also provides, when unloading, for detaching the product from the inner surface of device 4.

Claims

1. A unit (1) for mixing at least one pulverized or granulated product (2); the unit (1) comprising at least one mixing chamber (5; 36), in turn comprising a

tubular casing (14; 34) having a given longitudinal axis (8), and mixing means (20) housed inside said tubular casing (14; 34) to mix said product (2); and the unit (1) being **characterized in that** said tubular casing (14; 34) is substantially made of a plastic material; reinforcing means (18a, 18b) being provided to divide said tubular casing (14; 34) into a number of portions (19), which, when contacted by said product (2) as said product (2) is fed through and mixed, vibrate and/or move from the initial position to detach said product (2) from an inner surface (16) of said tubular casing (14; 34), thus reducing wear of said inner surface (16) and/or said mixing means (20).

2. A unit (1) as claimed in Claim 1, wherein said reinforcing means (18a, 18b) comprise two numbers of reinforcing elements; the elements in one of said two numbers of reinforcing elements being defined by annular elements (18a) coaxial with said axis (8); and the elements in the other of said two numbers of reinforcing elements being defined by longitudinal ribs (18b) substantially parallel to said axis (8).
3. A unit (1) as claimed in Claim 2, wherein said reinforcing means (18a, 18b) define a number of said portions (19), each of which is defined by a respective cylindrical sector coaxial with said axis (8).
4. A unit (1) as claimed in any one of the foregoing Claims, wherein said reinforcing means (18a, 18b) are formed in one piece with the rest of said tubular casing (14).
5. A unit (1) as claimed in any one of the foregoing Claims, and also comprising a supply device (3; 35) for feeding said product (2) to said mixing chamber (5; 36).
6. A unit (1) as claimed in Claim 5, wherein said supply device (35) is formed in one piece with said mixing chamber (36).
7. A unit (1) as claimed in Claim 5 or 6, wherein said supply device (35) is substantially made of plastic material; and wherein the outer surface of said supply device (35) also comprises reinforcing means (18a, 18b).
8. A unit (1) as claimed in any one of Claims 5 to 7, wherein said supply device (3; 35) comprises screw means (12) for feeding said product (2) to said mixing chamber (5; 36); said screw means (12), in particular, comprising at least one screw (12) substantially coaxial with said axis (8).
9. A unit (1) as claimed in Claim 1, wherein, in addition to said mixing chamber (5; 36), there is also provided

an unloading device (4) made of plastic material; said unloading device (4) being designed to vibrate, when unloading, to detach said product (2) from the inner walls of said unloading device (4).

10. A unit (1) as claimed in any one of the foregoing Claims, wherein said plastic material is polyurethane.

Patentansprüche

1. Einheit (1) zum Mischen von mindestens einem pulverisierten oder granulierten Produkt (2); wobei die Einheit (1) mindestens eine Mischkammer (5; 36), die ihrerseits ein Rohrgehäuse (14; 34) mit einer vorgegebenen Längsachse (8) umfasst, und in dem Rohrgehäuse (14; 34) untergebrachte Mischmittel (20), um das Produkt (2) zu mischen, umfasst; und die Einheit (1) **dadurch gekennzeichnet ist, dass** das Rohrgehäuse (14; 34) im Wesentlichen aus einem Kunststoffmaterial hergestellt ist; wobei Verstärkungsmittel (18a; 18b) vorgesehen sind, um das Rohrgehäuse (14; 34) in eine Anzahl von Abschnitten (19) zu unterteilen, die, wenn sie von dem Produkt (2) kontaktiert werden, wenn das Produkt (2) durchgeführt und gemischt wird, schwingen und/oder sich von der Anfangsposition bewegen, um das Produkt (2) von einer inneren Oberfläche (16) des Rohrgehäuses (14; 34) abzulösen, womit Verschleiß der inneren Oberfläche (16) und/oder der Mischmittel (20) verringert wird.
2. Einheit (1) gemäß Anspruch 1, bei der das Verstärkungsmittel (18a, 18b) zwei Mengen von Verstärkungselementen umfasst; wobei die Elemente in einer der beiden Mengen von Verstärkungselementen durch mit der Achse (8) koaxiale ringförmige Elementen (18a) definiert werden; und die Elemente in der anderen der beiden Mengen von Verstärkungselementen durch im Wesentlichen zu der Achse (8) parallele longitudinale Rippen (18b) definiert werden.
3. Einheit (1) gemäß Anspruch 2, bei der die Verstärkungsmittel (18a, 18b) eine Menge der Abschnitte (19) definieren, wobei jeder dieser durch einen mit der Achse (8) koaxialen jeweiligen zylindrischen Sektor definiert ist.
4. Einheit (1) gemäß einem der vorhergehenden Ansprüche, bei der die Verstärkungsmittel (18a, 18b) in einem Stück mit dem Rest des Rohrgehäuses (14) ausgebildet sind.
5. Einheit (1) gemäß einem der vorhergehenden Ansprüche und ebenfalls mit einer Versorgungsvorrichtung (3; 35) zum Zuführen des Produkts (2) zu

der Mischkammer (5; 36).

6. Einheit (1) gemäß Anspruch 5, bei der die Versorgungsvorrichtung (35) in einem Stück mit der Mischkammer (36) ausgebildet ist.

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7. Einheit (1) gemäß Anspruch 5 oder 6, bei der die Versorgungsvorrichtung (35) im Wesentlichen aus Kunststoffmaterial hergestellt ist; und wobei die äußere Oberfläche der Versorgungsvorrichtung (35) ebenfalls Verstärkungsmittel (18a, 18b) umfasst.

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8. Einheit (1) gemäß einem der Ansprüche 5 bis 7, bei der die Versorgungsvorrichtung (3; 35) Schraubennittel (12) zum Zuführen des Produkts (2) zu der Mischkammer (5; 36) umfasst; wobei die Schraubennittel (12) insbesondere mindestens eine im Wesentlichen mit der Achse (8) koaxiale Schraube (12) umfassen.

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9. Einheit (1) gemäß Anspruch 1, bei der zusätzlich zu der Mischkammer (5; 36) ebenfalls eine aus Kunststoffmaterial hergestellte Entladevorrichtung (4) bereitgestellt wird; wobei die Entladevorrichtung (4) ausgestaltet ist, um beim Entladen zu schwingen, um das Produkt (2) von dem inneren Wänden der Entladevorrichtung (4) abzulösen.

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10. Einheit (1) gemäß einem der vorhergehenden Ansprüche, bei der das Kunststoffmaterial Polyurethan ist.

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Revendications

1. Unité (1) pour mélanger au moins un produit (2) cristallisé ou en poudre ; l'unité (1) comprenant au moins une chambre de mélange (5 ; 36) comprenant à son tour une enveloppe tubulaire (14 ; 34) ayant un axe longitudinal (8) donné, et des moyens de mélange (20) logés à l'intérieur de ladite enveloppe tubulaire (14 ; 34) pour mélanger ledit produit (2) ; et l'unité (1) étant **caractérisée en ce que** ladite enveloppe tubulaire (14 ; 34) est en grande partie réalisée en matière plastique ; des moyens de renforcement (18a, 18b) étant ménagés pour diviser ladite enveloppe tubulaire (14 ; 34) en un nombre de portions (19) qui, lorsqu'elles sont entrées en contact avec ledit produit (2), puisque ledit produit (2) passe à travers et est mélangé, vibrent et/ou se déplacent de la position initiale pour détacher ledit produit (2) d'une surface interne (16) de ladite enveloppe tubulaire (14 ; 34), réduisant par conséquent l'usure de ladite surface interne (16) et/ou desdits moyens de mélange (20).

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2. Unité (1) telle que revendiquée dans la revendication 1, dans laquelle lesdits moyens de renforce-

ment (18a, 18b) comprennent deux groupes d'éléments de renforcement ; les éléments de l'un desdits deux groupes d'éléments de renforcement étant définis par des éléments annulaires (18a) coaxiaux avec ledit axe (8) ; et les éléments de l'autre desdits deux groupes d'éléments de renforcement étant définis par des nervures longitudinales (18b) sensiblement parallèles audit axe (8).

3. Unité (1) telle que revendiquée dans la revendication 2, dans laquelle lesdits moyens de renforcement (18a, 18b) définissent un nombre desdites portions (19), chacune desquelles étant définie par un secteur cylindrique respectif coaxial avec ledit axe (8).

4. Unité (1) telle que revendiquée dans l'une quelconque des revendications précédentes, dans laquelle lesdits moyens de renforcement (18a, 18b) sont formés d'une seule pièce avec le reste de ladite enveloppe tubulaire (14).

5. Unité (1) telle que revendiquée dans l'une quelconque des revendications précédentes, comprenant aussi un dispositif d'alimentation (3 ; 35) pour alimenter ladite chambre de mélange (5 ; 36) avec ledit produit (2).

6. Unité (1) telle que revendiquée dans la revendication 5, dans laquelle ledit dispositif d'alimentation (35) est formé d'une seule pièce avec ladite chambre de mélange (36).

7. Unité (1) telle que revendiquée dans la revendication 5 ou 6, dans laquelle ledit dispositif d'alimentation (35) est en grande partie réalisé en matière plastique ; et dans laquelle la surface extérieure dudit dispositif d'alimentation (35) comporte également des moyens de renforcement (18a, 18b).

8. Unité (1) telle que revendiquée dans l'une quelconque des revendications 5 à 7, dans laquelle ledit dispositif d'alimentation (3 ; 35) comprend des moyens à vis (12) pour alimenter ladite chambre de mélange (5 ; 36) avec ledit produit (2) ; lesdits moyens à vis (12) comprenant notamment au moins une vis (12) sensiblement coaxiale avec ledit axe (8).

9. Unité (1) telle que revendiquée dans la revendication 1, dans laquelle, en plus de ladite chambre de mélange (5 ; 36), ladite unité comprend également un dispositif de déchargement (4) réalisé en matière plastique ; ledit dispositif de déchargement (4) étant agencé pour vibrer, lors du déchargement, pour détacher ledit produit (2) des parois intérieures dudit dispositif de déchargement (4).

10. Unité (1) telle que revendiquée dans l'une quelcon-

que des revendications précédentes, dans laquelle ladite matière plastique est du polyuréthane.

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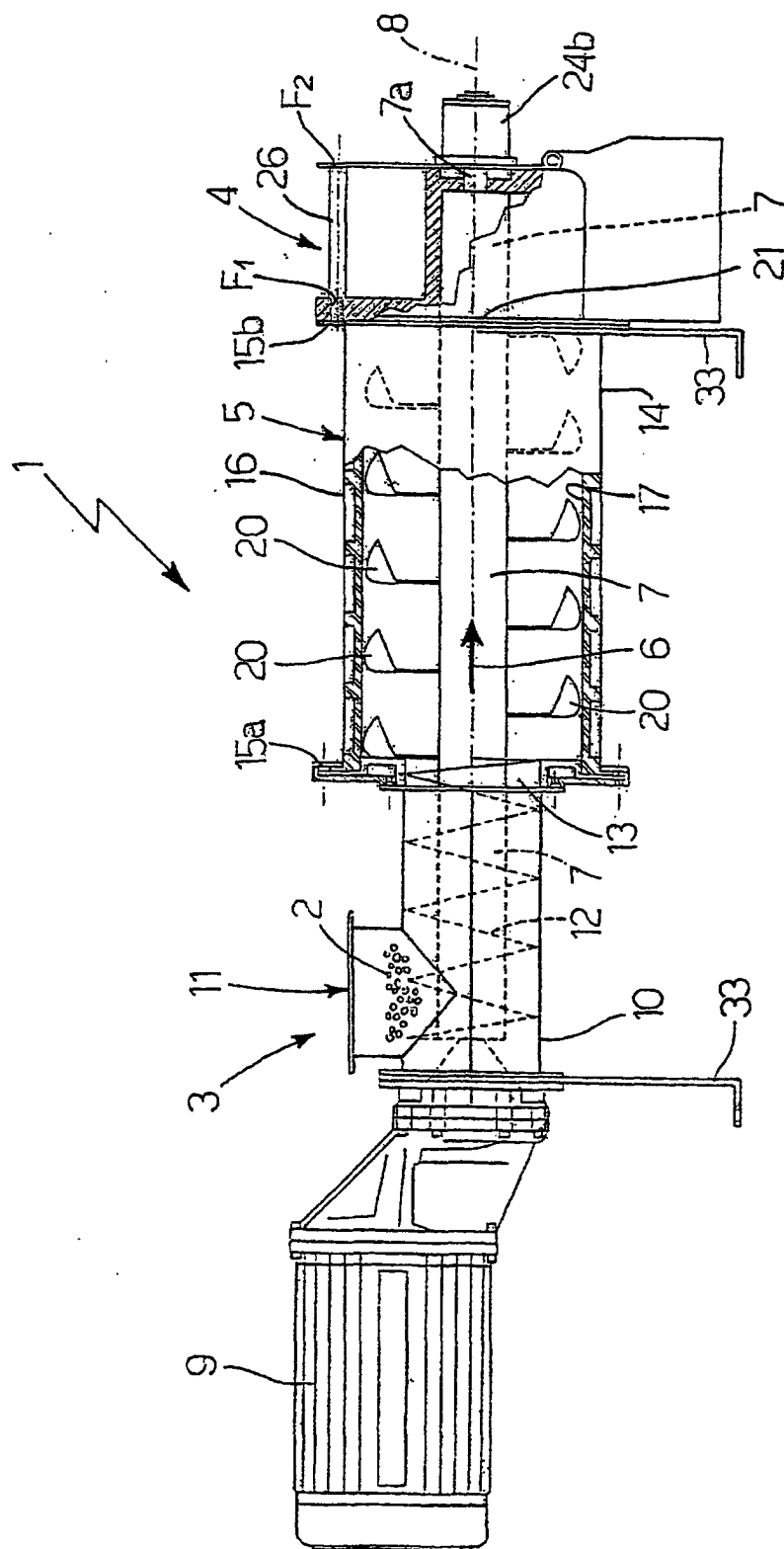
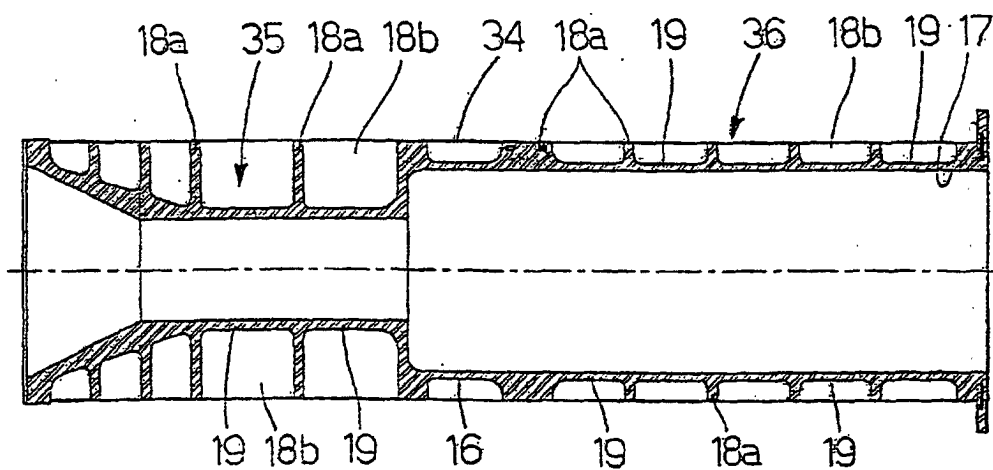
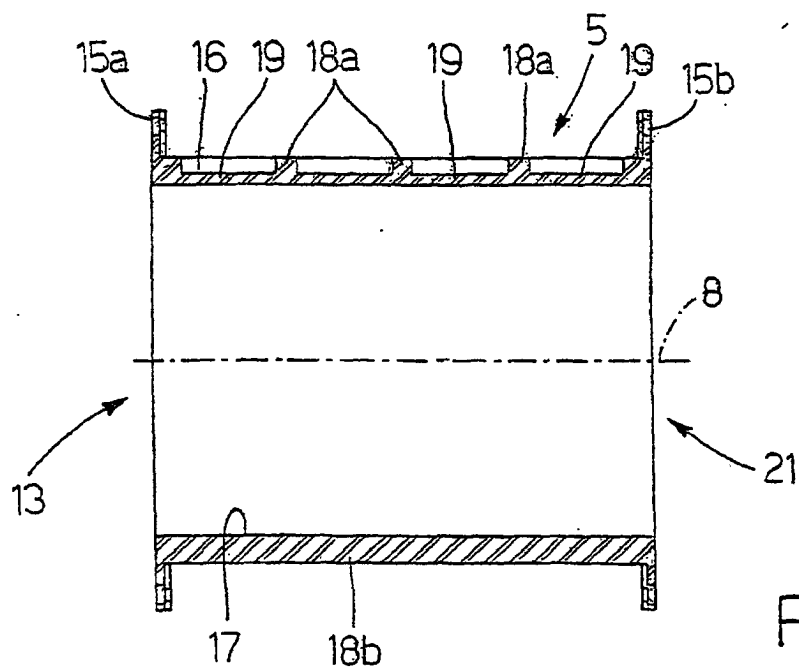


Fig.1



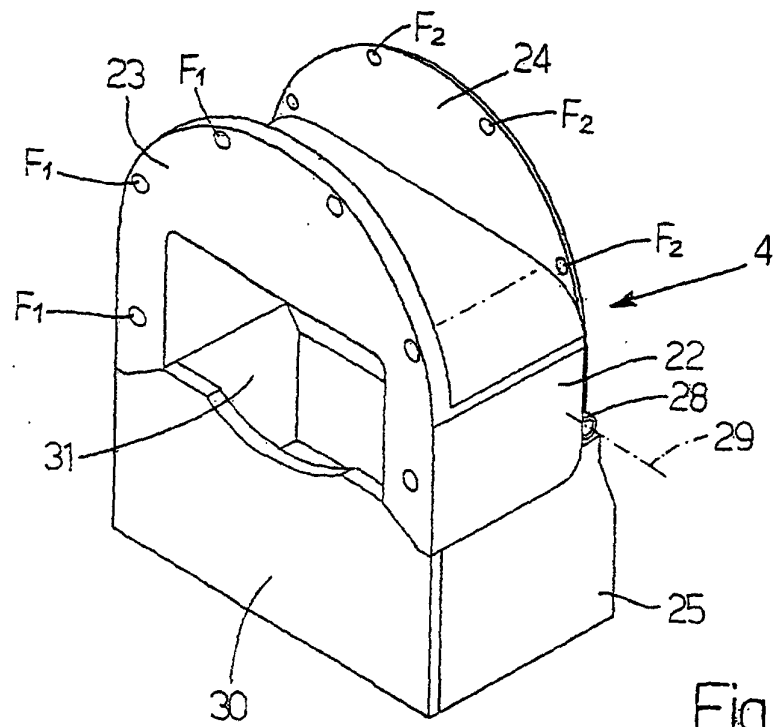


Fig.3

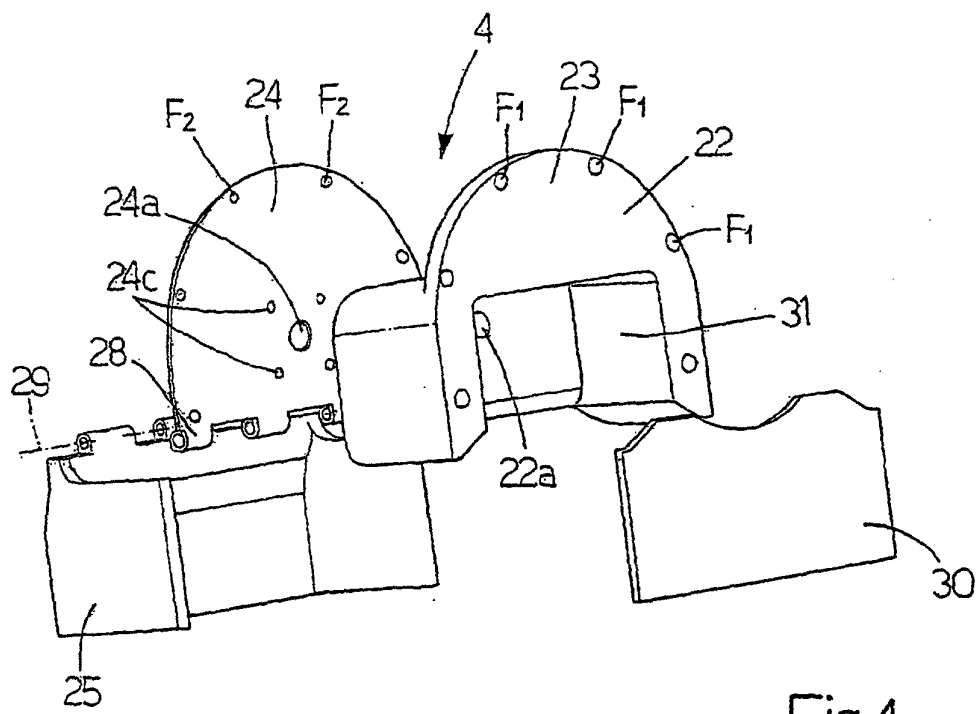


Fig.4