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(54) **COMPRESSING MACHINE FOR TABLETS**

MASCHINE ZUM PRESSEN VON TABLETTEN

MACHINE DE COMPRESSION POUR COMPRIMES

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Description

[0001] The present invention relates to a compressing machine for tablets comprising a main wheel peripherally equipped with a plurality of radial compressing pistons whose radial excursions are actuated by internal devices including a feeding device and two compression devices.

[0002] Such a compressing machine is known from document FR 509,362 A.

[0003] In general, the present invention refers to the technology of packaging machines and specifically to high-performance machines for compressing tablets.

STATE OF THE ART

[0004] In the previous state of the art there can be found several different models of machines for compressing tablets. In those already known machines, the compressing equipment consists of two opposite pistons, vertically set up above and below the peripheral zone of a rotating horizontal disc equipped with peripheral piercing holes filled with doses of powder to be compressed.

[0005] Such a machine is known from document US 5, 229, 044 A. In this machine, the upper and lower piston are rotated by an upper and a lower roller, respectively. The upper and the lower roller are rotatably fitted about respective eccentric portions.

[0006] The traditional configuration entails considerable structural hassles, causing trouble to the operation and the maintenance of the machine. The main flaws of the traditional machines can be charged on the fact that the traditional equipment, consisting of two long vertical compressing pistons, requires a troublesome procedure in order to ensure the coaxiality necessary to center the peripheral holes of the main disc.

[0007] During high-speed operation, the centrifugal force causes an uneven wear of the double set of coaxial compressing pistons and of the relative vertical sliding guides. Such uneven wear becomes particularly evident on the external side, where the effect of the centrifugal force is stronger. Furthermore, the impact of both opposite pistons against the tappet rollers produces great noisiness and a considerable wear on the lower edge of the compressing pistons and of the outlined tracks of the guides.

[0008] It must also be highlighted the fact that the horizontal disposition of the revolving turret entails access problems for the adjustment and the substitution of the worn-out elements and for the change of the tablet's shape. One can also find out that in the traditional compressing machines there are relevant problems for the sealing of the lubricating systems and also in the sealing against the infiltration of the powder into the sliding zones of the pistons, inside the guides of the double set of vertical opposite pistons.

[0009] It is the object of the invention to provide an

improved compressing machine for tablets.

[0010] This object is achieved by the compressing machine for tablets, as mentioned at the outset, wherein each of the feeding device and the two compression devices are mounted eccentrically by means of eccentric devices so as to set the dosing of the feeding device and the compression grade of the compression devices by adjusting the radial outward excursions of the compressing pistons through the regulation of the angular positions of the eccentric devices.

[0011] The present invention allows to realize a new class of faster, more silent and more versatile compressing machines with greater operation and maintenance economy.

DESCRIPTION

[0012] The invention is now disclosed with reference to the figures of the attached drawings, as not restrictive example.

[0013] Figure 1 presents a general scheme of the basic kinematics of the compressing machine, consisting in a main wheel externally provided with a set of four operating devices that perform, in coordinated sequence, the operation of powder feeding, the first and the second compression of the doses and eventually the selective expulsion of the compressed tablets. One can observe that said main wheel is also internally provided with a set of four equipments that, in synchronized combination with the external devices, co-operate in performing all the steps of the continuous operative loop.

[0014] Figure 2 shows in greater detail the external devices and the equipment inside the main wheel, combined in order to perform the feeding phase of the single doses of powder to be compressed.

[0015] Figure 3 shows an enlarged radial section of the devices and the instruments to set the exact amount of powder to be loaded at the first compression.

[0016] Figure 4 shows the external devices and the internal equipment to grade and adjust the first compression phase.

[0017] Figure 5 is an enlarged radial section of the devices and instruments for the first compression.

[0018] Figure 6 shows the external devices and the internal instruments to grade the second compression phase.

[0019] Figure 7 is an enlarged radial section of the devices and instruments that adjust the second compression phase.

[0020] Figure 8 shows the devices that perform the phase of the selective final expulsion of the compressed tablets.

[0021] Figure 9 is an enlarged radial section of the devices and instruments for the expulsion of the compressed tablets.

[0022] Figure 10 represents a set of four mechanisms inside the main wheel.

[0023] Figure 11 shows an enlarged radial section of

the operation of the return tracks, specially outlined in order to allow the internal movements of the compressing pistons.

[0024] Figure 12 is a general perspective view of the compressing machine in one of the possible configuration of structural lay-out.

[0025] In the figures of the attached drawings, presented only as illustrating and not-limiting example, every single detail is marked as follows:

1 indicates the hopper feeding the powder, set on the outside of the main wheel.

2 indicates the external roller that performs the first compression phase.

3 indicates the external roller that performs the second compression phase.

4 indicates the external roller that performs the selective expulsion of the compressed tablets.

5 indicates the main wheel peripherally equipped with a set of small cylinders, inside which small pistons slide, whose radial movements are controlled from inside by the action of a four equipment operative set.

6 indicates the mixed powder inside the feeding hopper.

7 indicates the mixing rotating movements of the powder.

8 indicates the eccentric device that controls the dosing instruments.

9 indicates the action of the connecting rod that moves the profiled sliding block in order to set the dosing of the powder.

10 indicates a single dose of powder to be compressed.

11 indicates the profiled sliding block.

12 indicates an eccentric roller that performs from the inside the first compression.

13 indicates an eccentric roller that performs from the inside the second compression.

14 indicates a roller that performs from the inside the expulsion phase.

15 indicates the counterfoil that guides the radial movements of the compressing pistons.

16 indicates the compressing pistons.

17 indicates the eccentric device that sets the compression grade of the first compressing phase.

18 indicates the eccentric device that sets the second compression.

19 indicates the compressed tablets.

20 indicates the peripheral hollows of the external rollers for the first and the second compression.

21, 22, 23 and 24 indicate the profiled tracks that connect and guide the return excursions to the inside of the compressing pistons.

25 indicates the expulsion cells of the selected tablets.

26, 27 and 28 indicate the expulsion conduits of the selected tablets.

29 indicates the single powder dose after the first compression.

[0026] One can notice that 1, 2, 3 and 4 constitute the set of four operative devices set up on the outside of the main wheel and that 11, 12, 13 and 14 constitute the set of four instruments co-operating from the inside of the main wheel. One can eventually notice that 21, 22, 23 and 24 indicate the set of four return profiled tracks that link the outside excursions of the dosing, compressing and expelling pistons.

[0027] As it has been pointed out in the careful analysis of the figure, the number of the compressing pistons (15) is just half of the double set of compressing opposite pistons that is usually provided in the traditional compressing machines.

[0028] This then entails a considerable structural simplification and a greater economy of construction, operation and maintenance as compared to the traditional compressing machines.

[0029] It also came out that the format change, that in the traditional machines requires the substitutions of the double set of opposite pistons and of the relative guide counterfoil, in the solution presented here is less expensive and also more convenient, since it can be done without disassemble the machine. In fact the shouldered structure, as shown in figure 12, allows to intervene from the front to substitute said pistons and the relative guides.

[0030] One can also observe that the compressing pistons (16) are much shorter than those of the traditional compressing machines.

[0031] Furthermore, it is an important feature the fact that the characteristic guide zone of the counterfoil (15) has a diameter much bigger than the tablets' diameter, this ensuring a greater precision, less strain and thus a longer life of the equipment, together with a considerable reduction of the operational costs.

[0032] Compared to the traditional compressing machines, it should also be pointed out that the fragile anti rotation tang is not necessary.

[0033] We must also highlight that solution presented here allows a more effective and inexpensive cleansing operation, even in case of powders harmful for the operator.

[0034] The structural architecture and the general stance of the machine can be realized with configuration different than the almost vertical one, represented as not limiting example in the figure 12 of the attached drawings.

[0035] The technological choices of the construction material, the overall dimensions, the structural proportioning of the machine's organs, the diameter of the main wheel, the number of compressing pistons and other geometric characteristics of the different parts allow of course several variation of realization, according to the industrial demands and the markets requests.

[0036] It is thus clear that all the compressing ma-

chines equipped with a single set of compressing pistons and relative guide counterfoils, set up on the border of a main wheel, being the excursions of said pistons radially performed with internal equipment, and basically presenting the characteristics inventive combination as schematically described, showed and hereinafter claimed, will be then be included in the protection sphere of the present invention.

Claims

1. A compressing machine for tablets comprising a main wheel (5), peripherally equipped with a plurality of radial compressing pistons (16) whose radial excursions are actuated by internal devices (8, 9, 11, 12, 13) including a feeding device (8, 9, 11) and two compression devices (12, 13),

characterized in that

each of the feeding device (8, 9, 11) and the two compression devices (12, 13) are mounted eccentrically by means of respective eccentric devices (8, 17 and 18, respectively) so as to set the dosing of the feeding device (8, 9, 11) and the compression grade of the compression devices (12, 13) by adjusting the radial outward excursions of the compressing pistons (16) through the regulation of the angular positions of the eccentric devices (8, 17, 18).

2. The machine of claim 1, **characterized in that** several radial compressing couples are distributed along the periphery of the main wheel (5), said couples being composed by a counterfoil (15) and by the relative inner radial compression piston (16), whose radial movements perform on their own the whole coordinated sequence of all the steps of the operative process of tablets compressing.

3. The machine of claim 2, **characterized in that** the external radial excursions of the pistons (16), during a fast rotation of the main wheel (5), are fostered by the centrifugal force, which force is oriented radially and does not produce any side strain to the counterfoils (15).

4. The machine of any of claims 2 to 3, **characterized in that** the inward radial excursions of the pistons (16) are performed by return tracks (21, 22, 23 and 24) profiled and linked for that purpose.

5. The machine of any of claims 1 to 4, **characterized in that** the first and the second compression of the tablets are performed and controlled from the inside by the compression devices (12, 13) and from the outside by the external contrast of rollers (2, 3).

6. The machine of claim 5, **characterized in that** the

rollers (2, 3) present peripheral hollows (20), specially shaped and peripherally distributed in order to synchronize the relative phases of the first and second compression.

7. The machine of any of claims 1 to 6, **characterized in that** it comprises an expulsion device (4, 14) for the selective expulsion of the compressed tablets (19).

Patentansprüche

1. Maschine zum Pressen von Tabletten, mit einem Hauptrad (5), das am Umfang mit einer Vielzahl radialer Presskolben (16) ausgestattet ist, deren radiale Bewegung durch innere Vorrichtungen (8, 9, 11, 12, 13) erfolgt, zu welchen eine Zuführvorrichtung (8, 9, 11) und zwei Pressvorrichtungen (12, 13) zählen,

dadurch gekennzeichnet, dass

jede der Zuführvorrichtungen (8, 9, 11) und die beiden Pressvorrichtungen (12, 13) mittels jeweiliger Exzentervorrichtungen (jeweils 8, 17 und 18) exzentrisch angebracht sind, um die Dosierung der Zuführvorrichtung (8, 9, 11) und den Kompressionsgrad der Pressvorrichtungen (12, 13) festzulegen, indem die radiale Bewegung der Presskolben (16) nach außen über die Regulierung der Winkelpositionen der Exzentervorrichtungen (8, 17, 18) eingestellt wird.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** mehrere radiale Presspaare über den Umfang des Hauptrades (5) verteilt sind, wobei sich diese Paare aus einem Gegenelement (15) und aus dem entsprechenden inneren radialen Presskolben (16) zusammensetzen, durch deren radiale Bewegungen selbstständig die gesamte koordinierte Abfolge aller Schritte des Arbeitsprozesses des Tablettenpressens ausgeführt wird.

3. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** die externen radialen Bewegungen der Presskolben (16) während einer schnellen Rotation des Hauptrades (5) durch die Zentrifugalkraft, die radial ausgerichtet ist und keine seitliche Beanspruchung der Gegenelemente (15) erzeugt, gefördert werden.

4. Maschine nach einem der Ansprüche 2 bis 3, **dadurch gekennzeichnet, dass** die nach innen gerichteten radialen Bewegungen der Presskolben (16) durch Rückföhrbahnen (21, 22, 23 und 24) erfolgen, die zu diesem Zweck entsprechend profiliert und verbunden sind.

5. Maschine nach einem der Ansprüche 1 bis 4, **da-**

durch gekennzeichnet, dass die erste und die zweite Pressung der Tabletten von innen durch die Pressvorrichtungen (12, 13) und von außen durch den äußeren Gegendruck von Walzen (2, 3) erfolgen und gesteuert werden.

6. Maschine nach Anspruch 5, **dadurch gekennzeichnet, dass** die Walzen (2, 3) am Umfang Vertiefungen (20) aufweisen, welche speziell geformt und über den Umfang verteilt sind, um die entsprechenden Phasen der ersten und zweiten Pressung zu synchronisieren.

7. Maschine nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** sie einen Auswerfer (4, 14) für das wahlweise Auswerfen der gepressten Tabletten (19) aufweist.

Revendications

1. Machine de compression pour comprimés, comprenant une roue principale (5), équipée en périphérie d'une pluralité de pistons de compression radiale (16) dont les courses radiales sont activées par des dispositifs internes (8, 9, 11, 12, 13) comprenant un dispositif d'alimentation (8, 9, 11) et deux dispositifs de compression (12, 13),

caractérisée en ce que:

chaque dispositif d'alimentation (8, 9, 11) et les deux dispositifs de compression (12, 13) sont montés de manière excentrée au moyen de dispositifs excentriques respectifs (respectivement 8, 17 et 18) de manière à régler le dosage du dispositif d'alimentation (8, 9, 11) et le taux de compression des dispositifs de compression (12, 13) en réglant les courses radiales vers l'extérieur des pistons de compression (16) par la régulation des positions angulaires des dispositifs excentriques (8, 17, 18).

2. Dispositif selon la revendication 1, **caractérisé en ce que** plusieurs couples de compression radiale sont répartis suivant la périphérie de la roue principale (5), lesdits couples étant constitués par un talon (15) et par un piston de compression radiale interne (16) associé, dont les déplacements radiaux réalisent d'eux même la totalité de la séquence coordonnée de l'ensemble des étapes du procédé opérationnel de compression de comprimés.

3. Machine selon la revendication 2, **caractérisée en ce que** les courses radiales des pistons (16), lors de la rotation rapide de la roue principale (5) sont favorisées par la force centrifuge, laquelle force est orientée radialement et ne produit aucune contrainte latérale sur les talons (15).

4. Machine selon l'une quelconque des revendications 2 à 3, **caractérisée en ce que** les courses radiales vers l'intérieur des pistons (16) sont assurées par des chemins de retour (21, 22, 23 et 24) profilés et associés à cet effet.

5. Machine selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** les première et deuxième compressions des comprimés sont réalisées et commandées à partir de l'intérieur par les dispositifs de compression (12, 13) et à partir de l'extérieur par l'application externe de rouleaux (2, 3).

6. Machine selon la revendication 5, **caractérisée en ce que** les rouleaux (2, 3) présentent des creux périphériques (20) formés de manière spécifique et répartis en périphérie dans le but de synchroniser les phases relatives des première et deuxième compressions.

7. Machine selon l'une quelconque des revendications 1 à 6, **caractérisée en ce qu'elle** comprend un dispositif d'expulsion (4, 14) destiné à expulser de manière sélective les comprimés compressés (19).

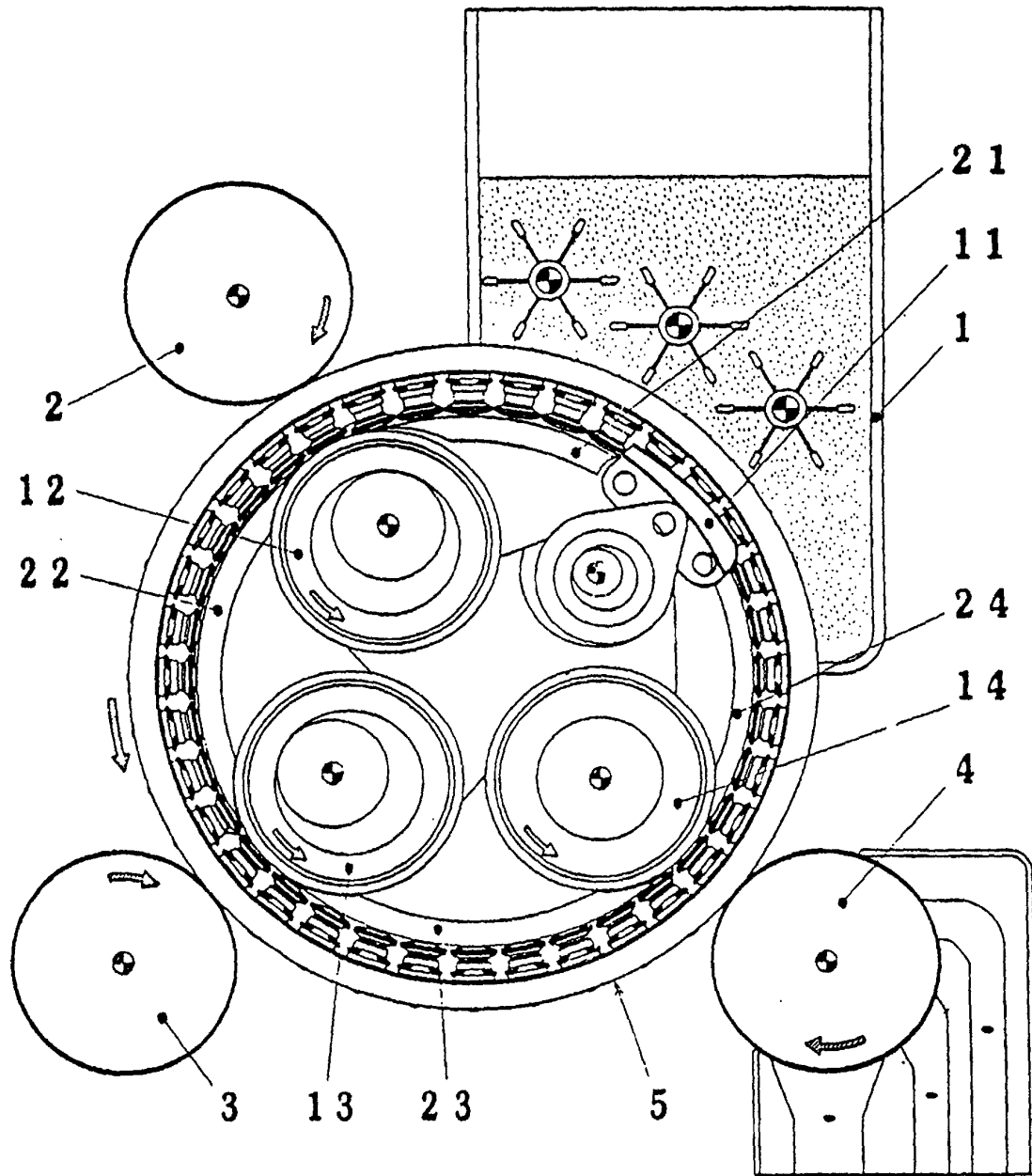


FIG. 1

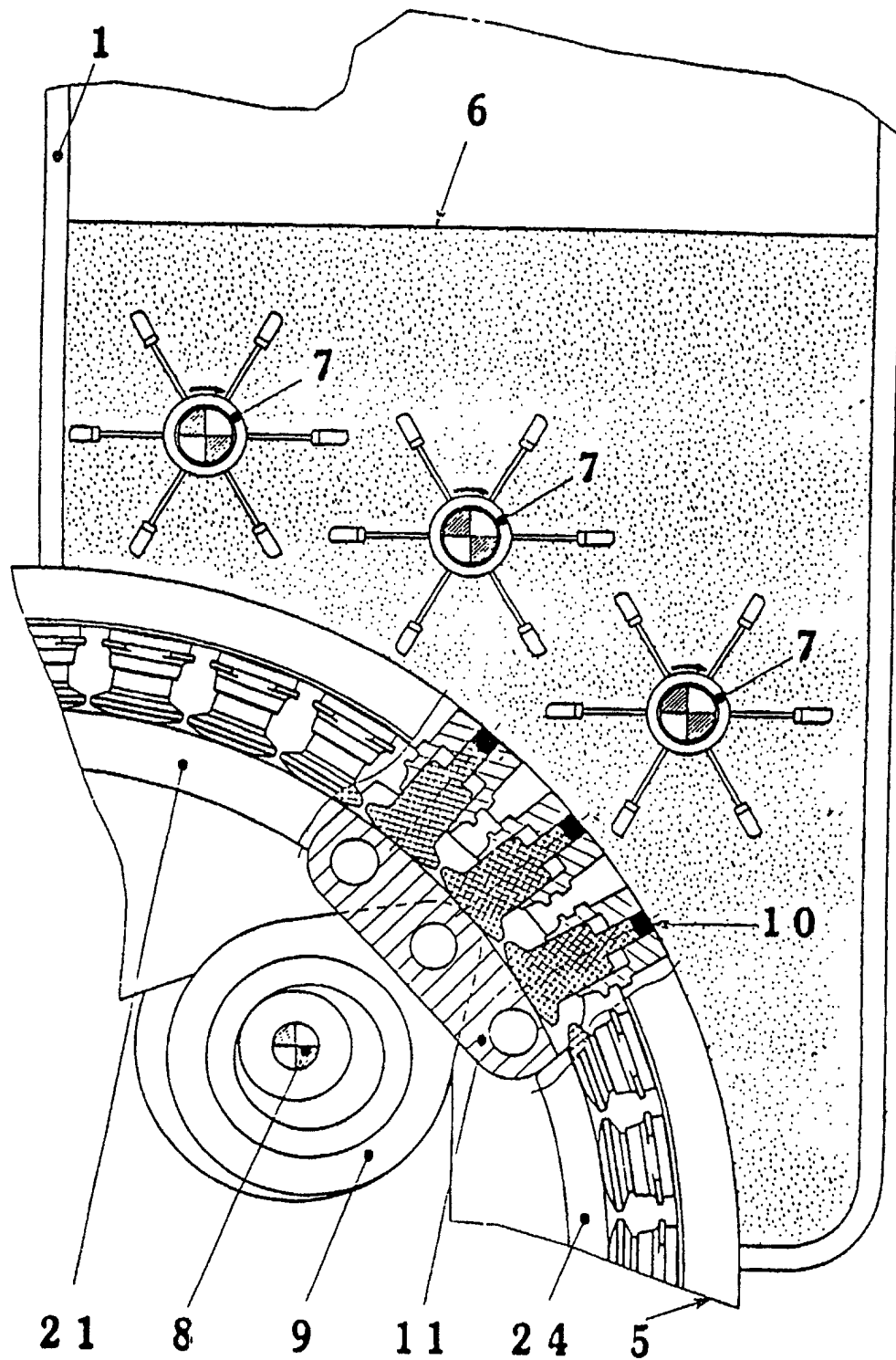


FIG. 2

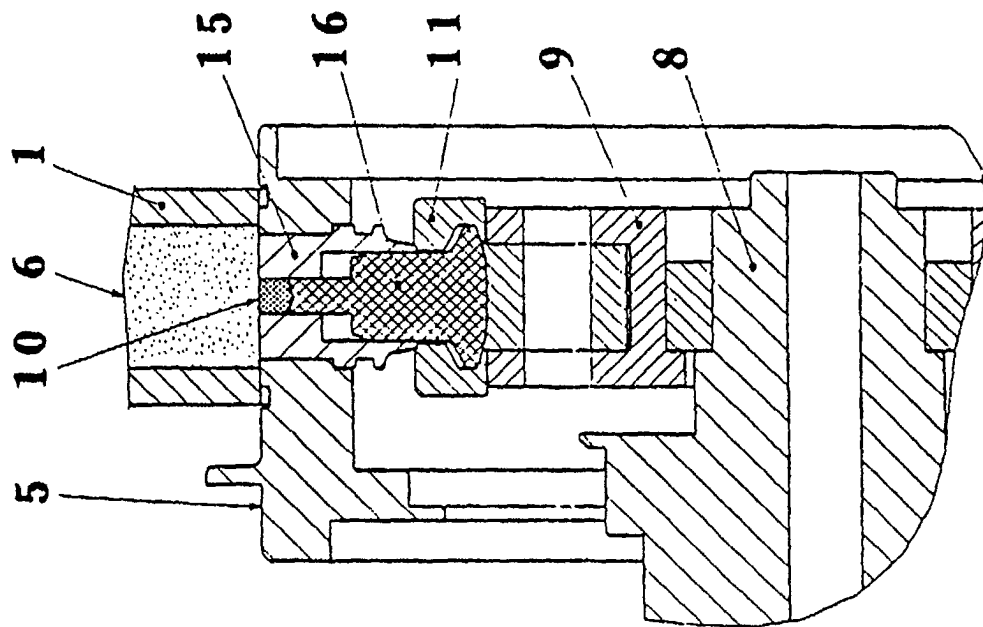


FIG. 3

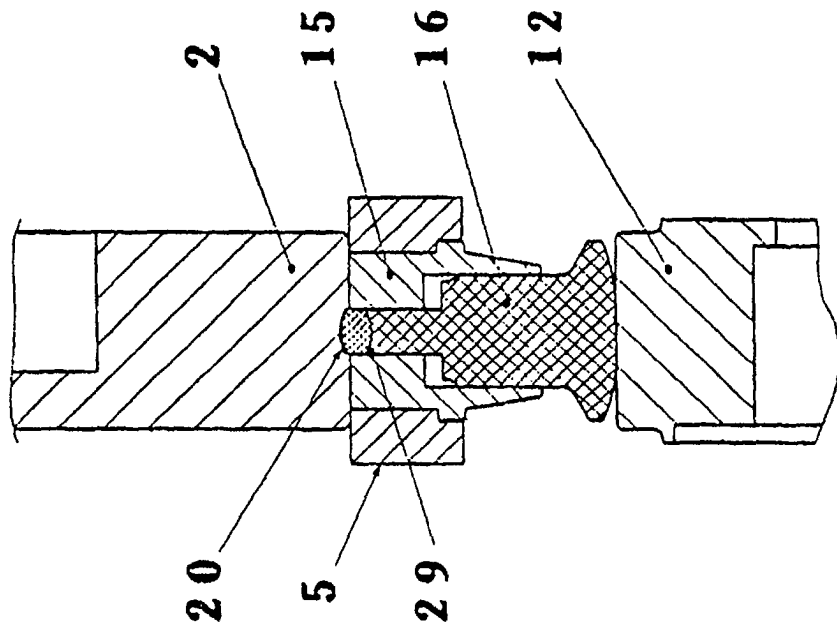


FIG. 5

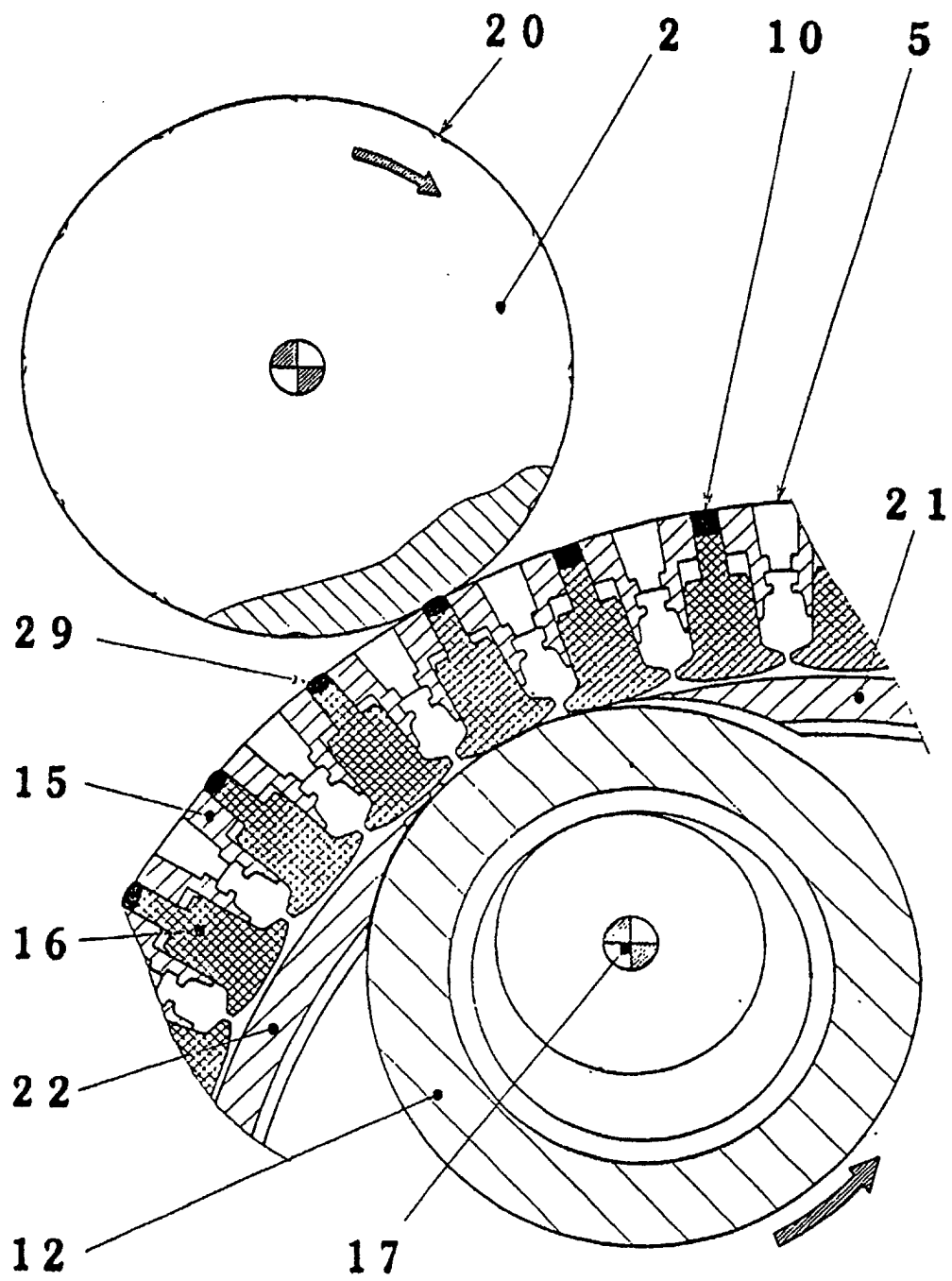


FIG. 4

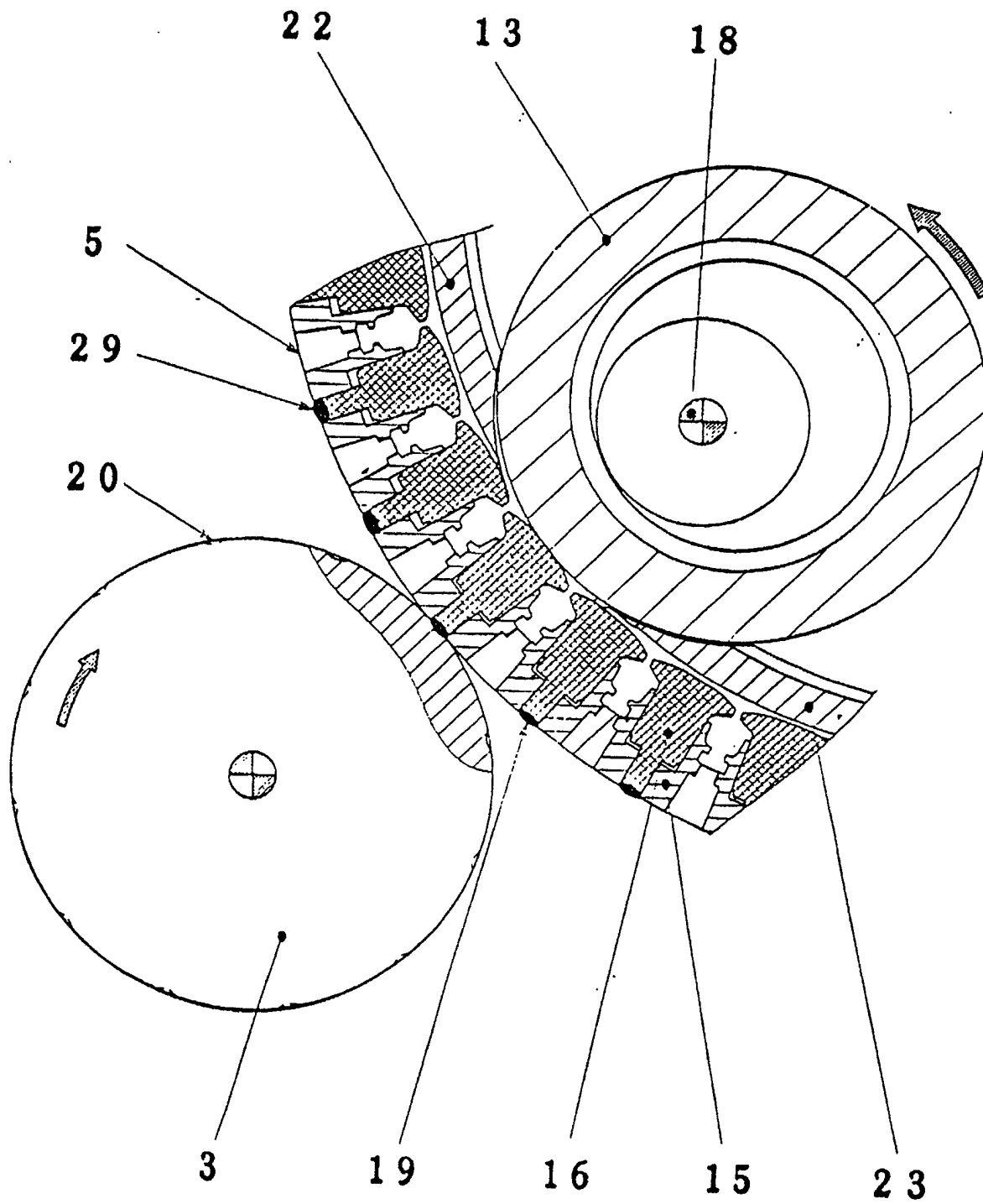


FIG. 6

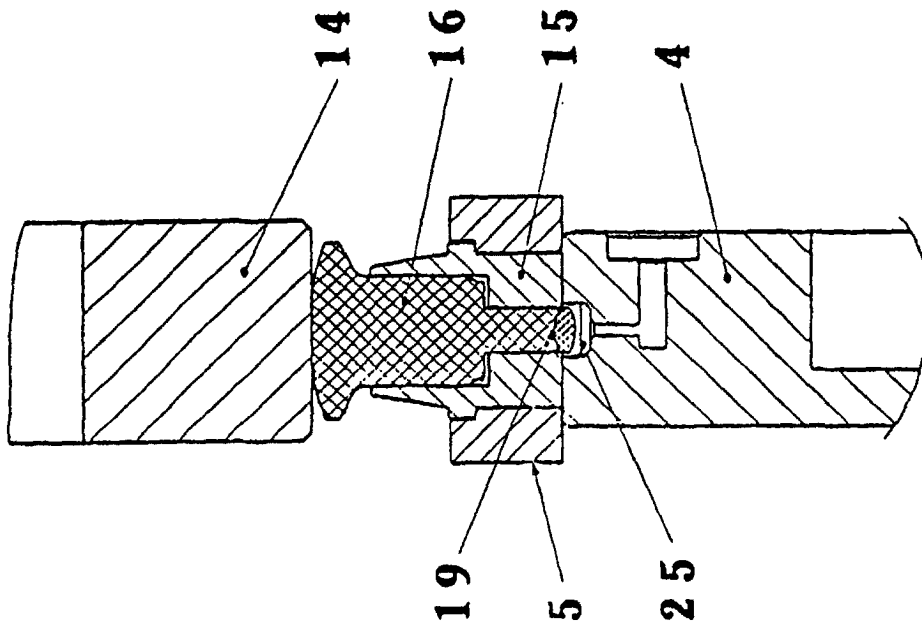


FIG. 9

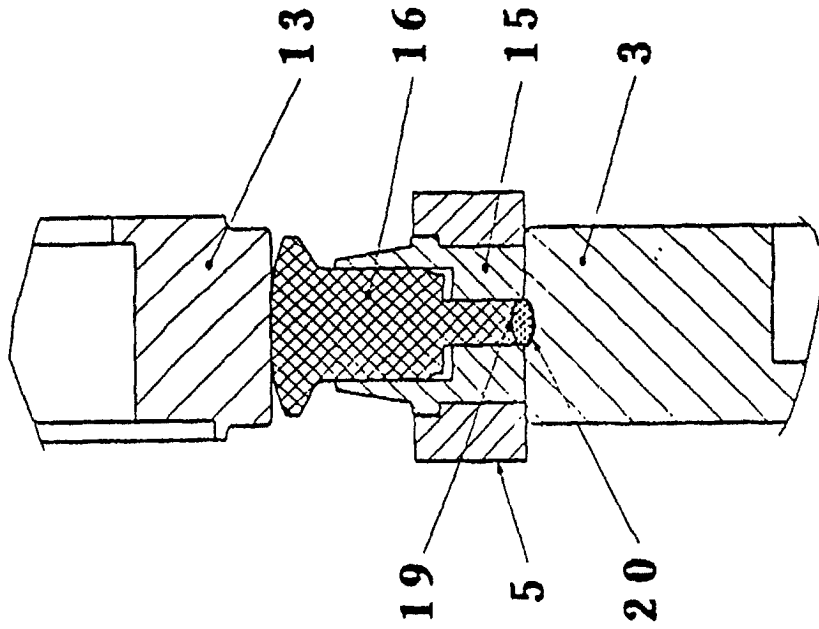


FIG. 7

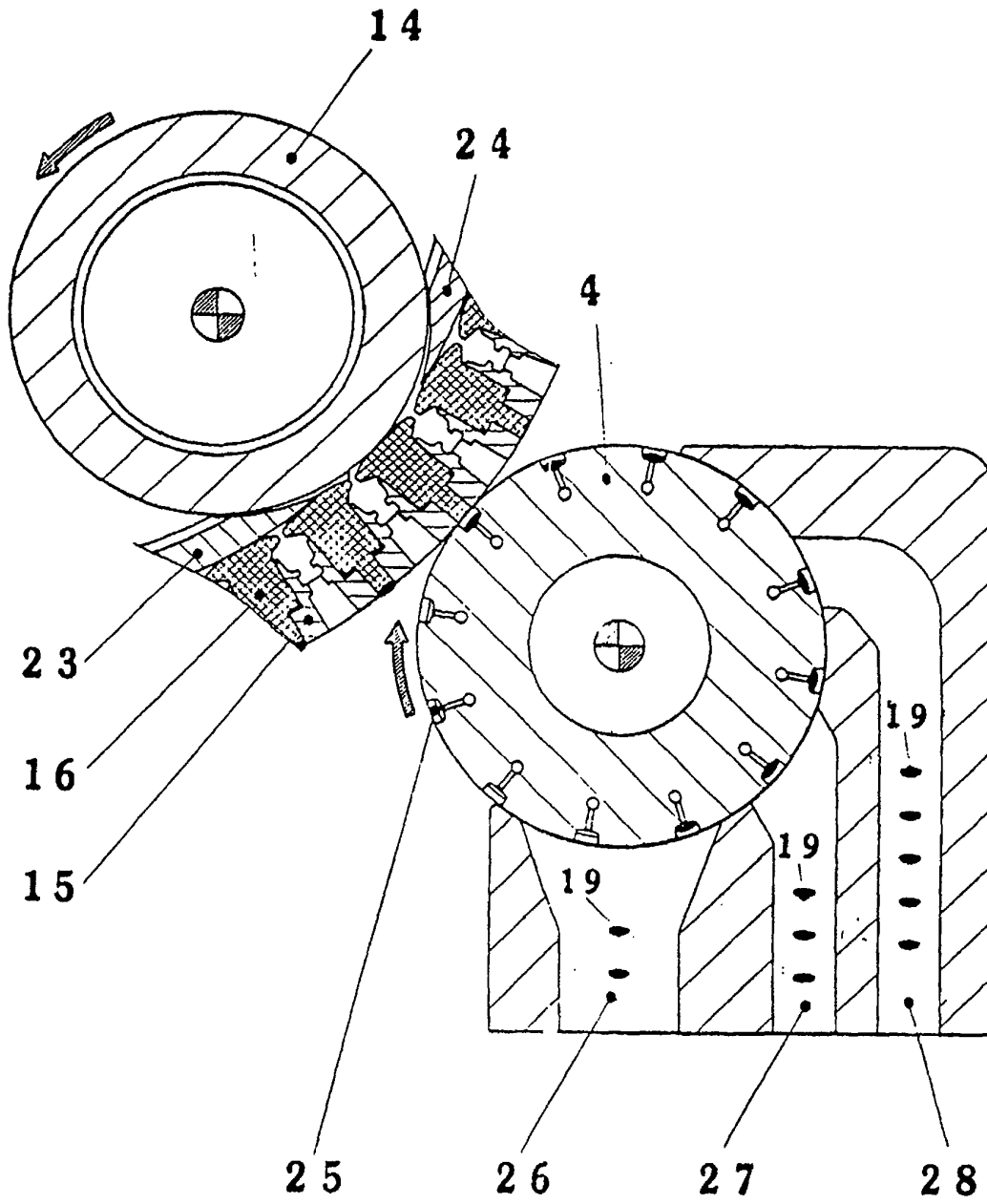


FIG. 8

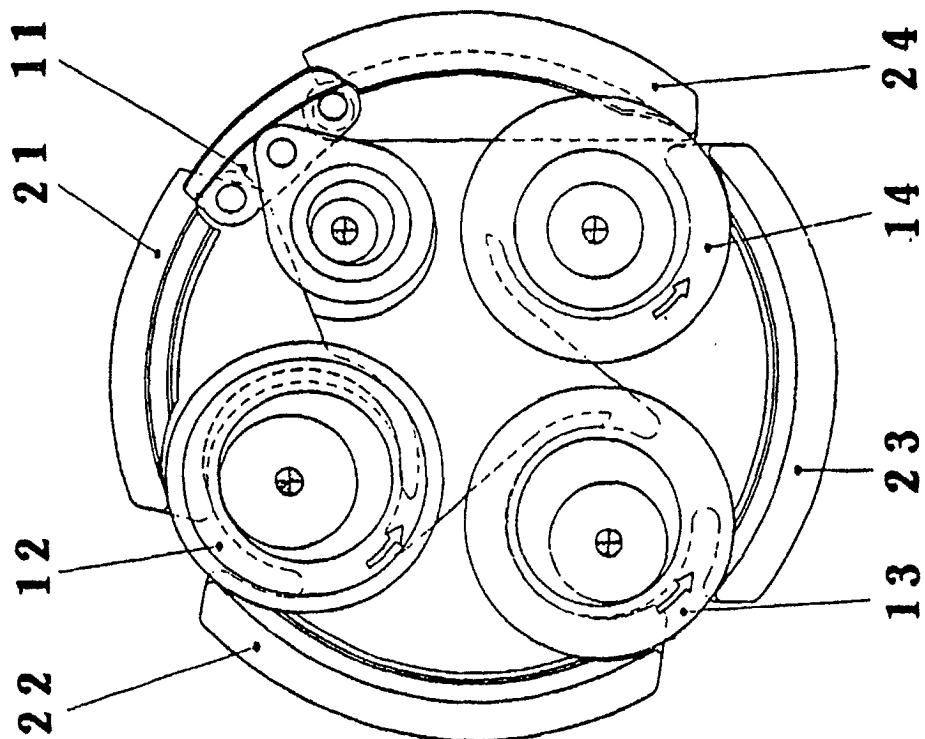


FIG. 10

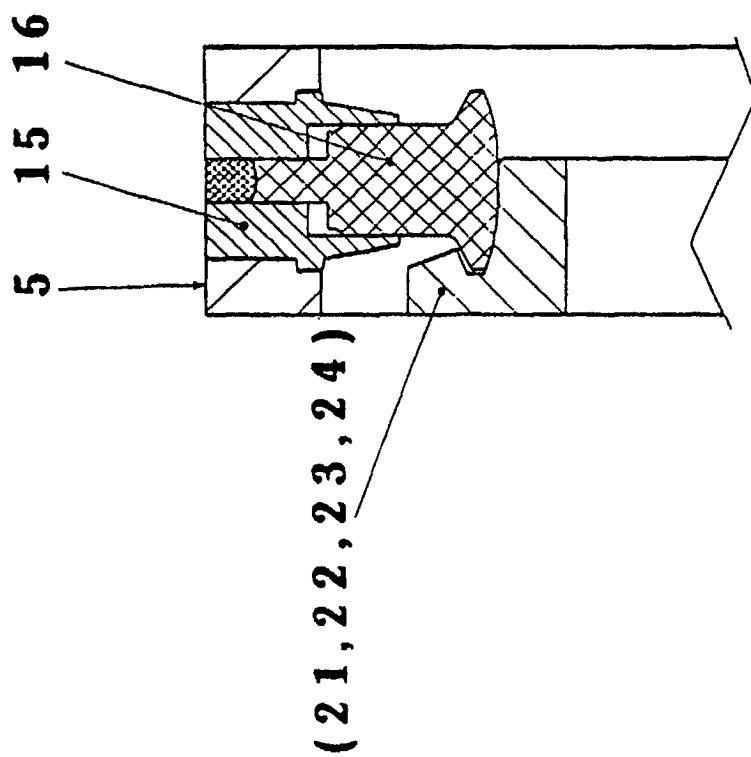


FIG. 11

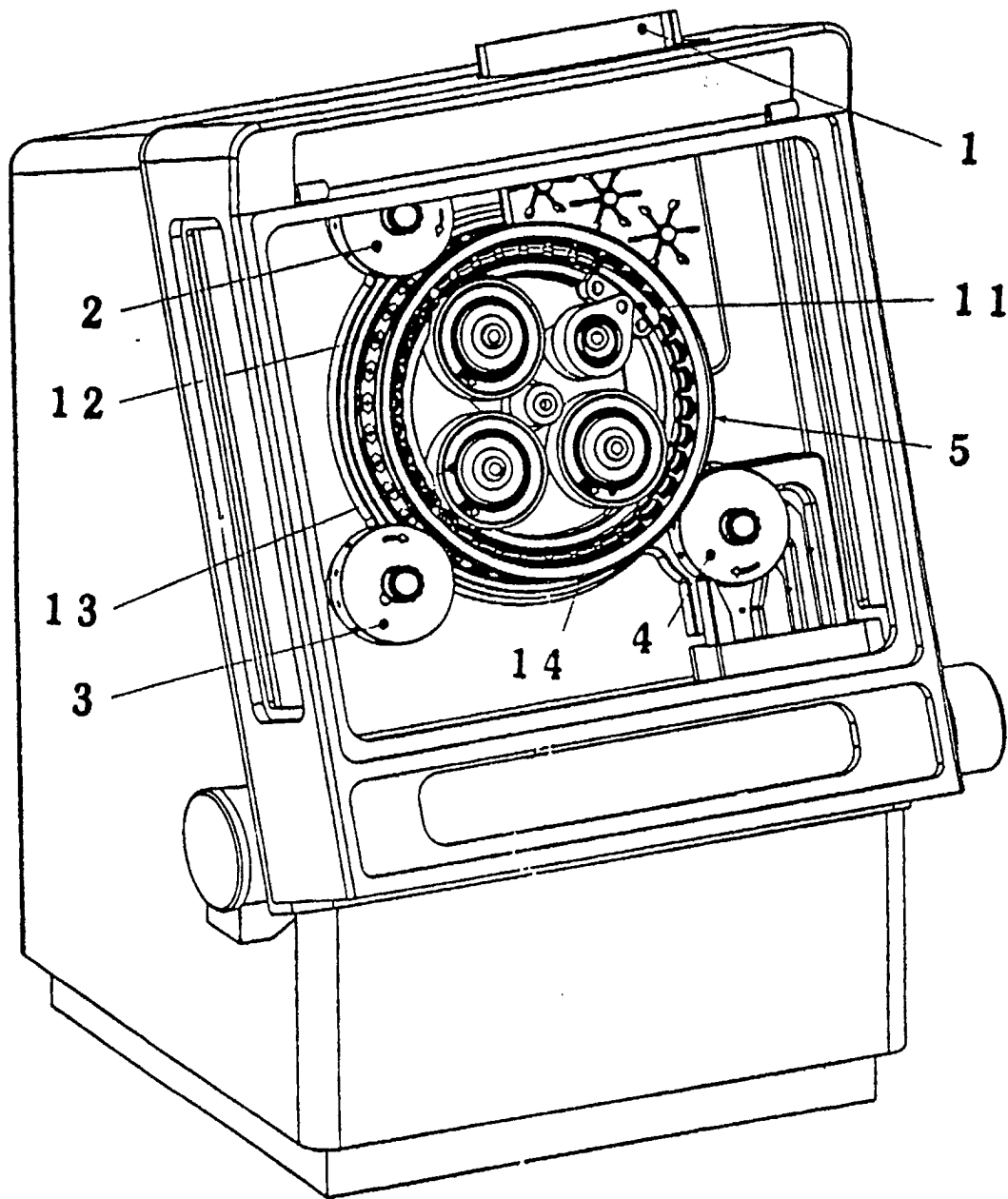


FIG. 12