

615844

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

~~I~~/WE, RHEON AUTOMATIC MACHINERY CO., LTD
of 2-3, Nozawa-machi, Utsunomiya-shi,
Tochigi-ken, JAPAN

hereby apply for the grant of a Standard Patent for an invention
entitled:

"APPARATUS FOR CUTTING AND SHAPING A SPHERICAL BODY"

• which is described in the accompanying complete specification.

This application is made under the provision of Part XVI of the

• Patents Act 1952 and is based on an application for a patent

• or similar protection made

in JAPAN

on 1 December 1989

(No. 1-313654)

My/Our address for service is:-

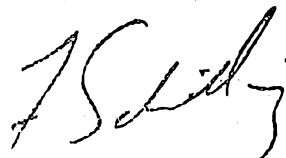
F.B. RICE & CO.

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BALMAIN NSW 2041

Dated this 2nd day of July 1990

RHEON AUTOMATIC MACHINERY CO., LTD

By: 
Registered Patent Attorney

To: The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA

5015825 03/07/90

Commonwealth of Australia
The Patents Act 1952
DECLARATION IN SUPPORT

In support of the (Convention) Application made by: RHEON AUTOMATIC MACHINERY CO., LTD
2-3, Nozawa-machi, Utsunomiya-shi, Tochigi-ken, JAPAN

for a patent for an invention entitled: APPARATUS FOR CUTTING AND SHAPING A
SPHERICAL BODY

I ~~(We)~~ Torahiko Hayashi-Representative Director
of and care of the applicant company do solemnly and sincerely declare as follows:

~~a) I am (We are) the applicant(s) for the patent—~~

or

b) I am ~~(We are)~~ authorised by the applicant(s) for the patent to make this declaration on its behalf.

Delete the following if not a Convention Application.

The basic application(s) as defined by section 141 (~~142~~) of the Act was (~~were~~) made

on 1 December 1989 in JAPAN

~~on~~

~~in~~

~~on~~

~~in~~

by RHEON AUTOMATIC MACHINERY CO., LTD

The basic application(s) referred to in this paragraph is (~~are~~) the first application(s) made in
a Convention country in respect of the invention the subject of the application.

~~a) I am (We are) the actual inventor(s) of the invention—~~

or

b) Yasunori Tashiro of 611-170 Yokoyama-cho, Utsunomiya-shi
Tochigi-ken, JAPAN

is (~~are~~) the actual inventor(s) of the invention and the facts upon which
THE APPLICANT COMPANY

~~is~~ (are) entitled to make the application are as follows:

The applicant is a person who would if a patent were granted
upon an application made by the actual inventor be entitled
to have the patent assigned to it.

Declared at Utsunomiya-shi this 15th day of June 1990

Signed

Torahiko Hayashi Status Representative Director of RHEON
AUTOMATIC MACHINERY CO., LTD.

Declarant's Name TORAHIKO HAYASHI

F. B. RICE & CO PATENT ATTORNEYS

This form is suitable for any type of Patent Application. No legalisation required.

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(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 615844

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APPARATUS FOR CUTTING AND SHAPING A SPHERICAL BODY
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- (56) Prior Art Documents
AU 580711 73224/87 A21C 5/00
AU 582691 73222/87 A21C 5/00
AU 568252 62624/86 A21C 5/00

(57) Claim

1. An apparatus for cutting and shaping a spherical material, comprising an assembly consisting of a plurality of shaped members each pivotally mounted to respective pivot axes that are equidistantly disposed in a circle on a support means so that, in combination, they form a variable opening at the centre thereof, wherein each of the members have first and second curved sides, surfaces joining at a tip opposite to the pivot axis and being associated such that when the opening is closed and opened by pivotal movement of the members about their respective pivot axes the tip of each member tracks the first curved side surface of an adjacent member, and the first and second curved surfaces of adjacent members abut each other when the opening is closed, and wherein the opening is defined by, in combination, an exposed part of the first curved surface of each of the members for cutting and shaping a material which passes through the opening.
2. The apparatus of claim 1, wherein the first and second curved side surfaces are each an arc of a circle with a radius equal to a distance a' between any pair of adjacent pivot axes, and when the tip of a member is at the centre of the opening, the centre of curvature of the

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first curved side surface is located at a distance from the pivot axis of that member which is equal to the radius of the circle and at a distance from the centre of the opening that is equal to the distance a' and whereat the centre of curvature of the second curved side surface is located at a distance from the pivot axis of the adjacent member which is equal to the radius of the circle and at a distance from the centre of the opening which is equal to the distance a' .

Technical field

This invention is in general concerned with an apparatus for cutting and shaping a spherical body. It is particularly useful for processing a substantially round food product consisting of soft, very sticky material without generating the problems of dough adhesion or clogging as well as of protrusions from a filling.

Background of the Invention

Australian Patent No. 568252 discloses an apparatus for shaping a round body consisting of a dough coating and a filling, which comprises an assembly comprising a plurality of circumferentially disposed members combined to shape a spheroidal body. Each of the members has at least two sliding surfaces, and they are so combined that a sliding surface of one member is slidable on a sliding surface of another member, that the opening is closed and opened by sliding the members, and that the opening is confined by walls consisting of the inwardly exposed part of the sliding surfaces of the members and is of a cross-sectional area, when the opening is fully open, sufficient to pass a cylindrical body passing therethrough.

While shaping a spheroidal body through the assembly of

slidable members is effective, particularly in precluding a member from intruding into the body, it has certain disadvantages. Because of the structural conditions of the assembly, the number of slidable members is limited to up to about six, so that only polygonally-

5 shaped products have been obtained. The external appearance of these polygonal products falls far below that of those hand-shaped spherical ones. Further, owing to mechanical and dimensional imperfections in the shape of the slidable members, especially when processing a very sticky, soft material, there was also some difficulty in completely preventing materials from adhering to the cutting part, or in uniformly and neatly shaping a spherical product.

~~Accordingly, it is an object of the subject invention to provide a new and improved apparatus for cutting and shaping a spherical body.~~

~~It is another object of the subject invention to provide an improved apparatus for cutting and shaping a spherical body using a new shutter or iris mechanism comprising a number of rotatable polygonal members.~~

20 It is a further object of the subject invention to provide an improved apparatus for cutting and shaping a spherical body which completely precludes coatings or fillings from adhering to the cutting members through new specially configured polygonal members.



Summary of the Invention

In accordance with those and other objects, this invention provides an apparatus for cutting and shaping a spherical material, comprising an assembly consisting of a plurality of shaped members each pivotally mounted to respective pivot axes that are equidistantly disposed in a circle on a support means so that, in combination, they form a variable opening at the centre thereof, wherein each of the members have first and second curved sides surfaces joining at a tip opposite to the pivot axis and being associated such that when the opening is closed and opened by pivotal movement of the members about their respective pivot axes the tip of each member tracks the first curved side surface of an adjacent member, and the first and second curved surfaces of adjacent members abut each other when the opening is closed, and wherein the opening is defined by, in combination, an exposed part of the first curved surface of each of the members for cutting and shaping a material which passes through the opening.

In a preferred embodiment the first and second curved side surfaces are each an arc of a circle with a radius equal to a distance a' between any pair of adjacent pivot axes, and when the tip of a member is at the centre of the opening, the centre of curvature of the first curved side surface is located at a distance from the pivot axis of that member which is equal to the radius of the circle and at a distance from the centre of the opening that is equal to the distance a' and whereat the centre of curvature of the second curved side surface is located at a distance from the pivot axis of the adjacent member which is equal to the radius of the circle and at a distance from the centre of the opening which is equal to the distance a' .



~~are of the second curved side surface is at the same time located at a distance from the fulcrum of the next member that is equal to the radius of the circle and at a distance from the center of the opening that is equal to the distance between the fulcrums.~~

5 In another preferred embodiment of the invention, the first curved side surface of each of the polygonal members has a uniform thickness that is thick enough to preclude the member from wedging into the material except for the area near the tip thereof, where the thickness decreases toward the tip.

Further ~~objects and~~ advantages of the invention will become apparent from the following detailed description, taken in conjunction with the drawings.

Brief Description of the Drawings

Fig. 1 is a simplified view of a polygonal member for forming an enclosure to cut a material passing therethrough.

Fig. 2 is a schematic plan view of the collectively assembled polygonal members when the enclosure is closed.

Fig. 3 is a schematic plan view of the assembled polygonal members when the enclosure is opened.

Fig. 4 is a schematic plan view of the assembled polygonal members of another embodiment, and illustrates a method of driving them.

Figs. 5-8 are schematic cross sections of the material and polygonal members showing stepwise the process of cutting a



spherical body.

Figs. 9 and 10 are each a schematic partial plan view of the polygonal members, and illustrate the effect of the invention in eliminating sticky materials from the cutting members.

5 Fig. 11 is a cross section of a polygonal member 10, and shows its thickness, which gradually decreases towards its tip.

Detailed Description of the Invention

Referring to Fig. 1, the feature of polygonal members 10 constituting the shutter mechanism of this invention is shown. Fulcrums B are equidistantly disposed on a circle "a" with a radius R around the center A. At each fulcrum is positioned an axis 13 to which the polygonal member is pivotally fitted.

The distance between the two adjacent fulcrums B_1 and B_2 is represented by a' .

A curve y_1 is an arc of a circle whose radius is equal to the distance a' and whose center x_1 is at the same time located at a distance from the fulcrum B_1 that is equal to the radius R and at a distance from the center A that is equal to the distance a' .

20 A side surface defined by the curve y_1 constitutes the blade part 19 of the polygonal member with a tip 20. The blade contacts and cuts a material.

A curve y_2 is an arc of a circle whose radius is equal to the distance a' and whose center x_2 is at the same time located at a distance from the fulcrum B_2 that is equal to the radius R and at a



distance from the center A that is equal to the distance a' .

A side surface defined by the curve y_2 is positioned in the rear of the curve y_1 , and limits the width of the blade 19 at the tip thereof.

5 Side surfaces 11 and 12 constituting the neck of the polygonal member are formed such that there is no interference among any adjacent polygonal members during the course of the rotation shown in Figs. 2 and 3. The axis 13 to be fitted to the fulcrum B, is located at the end of the neck.

10 In Fig. 4, showing another embodiment of this invention, each of polygonal members 10', is coincidentally and orderly rotated through a gear or pin mechanism without any mutual interference therebetween. A pinion 14 pivoted to the axis 13 rotates the polygonal members 10'.

15 An internal gear 15, engaged with the pinion 14, is mounted on a frame 16. The polygonal members 10' are coincidentally rotated to open and close a central enclosure formed around the center A via the pinion 14 driven by the rotation of the frame 16.

~~Owing to the structure of such rotary polygonal members free~~
20 from mutual interference, restriction on the number of them that can be mounted on a frame is reduced so that, by mounting a number of polygonal members up to 24 or more on the frame, forming a product that is almost a sphere has been achieved.

The cutting functions and effects of the apparatus of this

~~25 invention will now be described by referring to Figs. 5-11.~~



Owing to the structure of such rotary polygonal members free from mutual interference, restriction on the number of them that can be mounted on a frame is reduced so that, by mounting a number of polygonal members from
5 12 to 24 on the frame, forming a product that is almost a sphere has been achieved. It is of course possible to produce a product nearer to a sphere by using more than 24 members.

The cutting functions and effects of the apparatus of
10 this invention will now be described by referring to Figs. 5-11.



In the upper part of Fig. 5 is shown a cross section of a continuous bar of a material consisting of a coating 17 consisting of dough with a filling 18 therein. In its lower part, the continuous bar is held in the opening formed by the polygonal members. The continuous bar is in contact with the blades 19 of the curved surface y_1 having a uniform thickness T_1 .

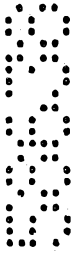
The blade 19 of each polygonal member has a uniform thickness that is thick enough to prevent the member from wedging into the coating except for its tip area, where the thickness decreases toward the tip 20.

As the polygonal members swing toward the center of the frame, the blades come closer to the center to narrow the opening and thus restrict the continuous bar. Due to the structure of the blades, the thickness of the blades where they contact the continuous bar is reduced from T_1 to T_4 . In Fig. 6, an intermediate thickness of the blades is T_2 when the continuous bar is constricted in a state as shown by the position of its coating 17'.

Fig. 7 shows a state wherein the continuous bar is further constricted so that the coating forms a neck therein. In this state, the thickness T_3 is much smaller than T_2 and is close to that of T_4 , the thickness of the tip. The improved shutter mechanism, which is based on the principle of rheology, enables the apparatus to press the filling 18 aside into the upper and lower parts of the bar while the coating part in the neck maintains its continuity both

in the upper and lower parts of the bar at the time of separation.

This is because the force applied to the bar through the blades rheologically generates two different stresses: one is a shearing stress to cut the coating 20, and the other is a normal stress to press the filling 18 aside into the upper and lower directions. Thus, when the bar is cut the outer layer of the bar envelops the inner layer of the cut product.



~~in the upper and lower parts of the bar at the time of separation.~~

As shown in Fig. 8, when the polygonal members close the opening, with the tip of T_4 being abutted, a spherical product is completed. Usually a tray (not shown) is provided underneath the
5 apparatus and receives the spherical product.

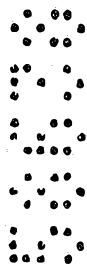
In short, while the thickness of the surfaces T_1 of the blade 19 gradually decreases from T_1 to T_2 , T_3 , and T_4 , they urge the sides of the coating toward the cutting position so that the
10 coating is finally and perfectly cut by each of the blades 19 at the tip 20. In the above-mentioned cutting process, the continuous bar consists of the coating 17 and the filling 18. However, the bar can be single-layered.

Referring to Figs. 9 and 10, when the enclosure is closing, every polygonal member 10 is, as already detailed, driven via the
15 axis 13, so that a forward swing results, and the tip 20 of each polygonal member 10 tracks the curve y_1 , formed along a dotted circle 22 around the center A, in a scraping way in the direction indicated by arrows D.

Since, as a result of the above-mentioned tracking movement,
20 materials 21 that have adhered to the blade surfaces are scraped off, the assembly of the invention enables the cutting and shaping process to be continued without generating any difficulty caused by such adhering materials, even when processing very sticky, soft materials. The invention provides a new and improved apparatus for
25 cutting and shaping very sticky cake-like materials to obtain



substantially spherical products free from any impediments caused by adhesion, and without the use of any special parting agents or powdering.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for cutting and shaping a spherical material, comprising an assembly consisting of a plurality of shaped members each pivotally mounted to respective

5 pivot axes that are equidistantly disposed in a circle on a support means so that, in combination, they form a variable opening at the centre thereof, wherein each of the members have first and second curved sides surfaces joining at a tip opposite to the pivot axis and being

10 associated such that when the opening is closed and opened by pivotal movement of the members about their respective pivot axes the tip of each member tracks the first curved side surface of an adjacent member, and the first and second curved surfaces of adjacent members abut each other
15 when the opening is closed, and wherein the opening is defined by, in combination, an exposed part of the first curved surface of each of the members for cutting and shaping a material which passes through the opening.

2. The apparatus of claim 1, wherein the first and
20 second curved side surfaces are each an arc of a circle with a radius equal to a distance a' between any pair of adjacent pivot axes, and when the tip of a member is at the centre of the opening, the centre of curvature of the first curved side surface is located at a distance from
25 the pivot axis of that member which is equal to the radius of the circle and at a distance from the centre of the opening that is equal to the distance a' and whereat the centre of curvature of the second curved side surface is located at a distance from the pivot axis of the adjacent
30 member which is equal to the radius of the circle and at a distance from the centre of the opening which is equal to the distance a' .



3. The apparatus of claim 2, wherein the first curved side surface of each of the polygonal members has a uniform thickness that is thick enough to preclude the member from wedging into the material except for the area
- 5 near the tip thereof, wherein the thickness decreases toward the tip.
4. An apparatus for cutting and shaping a spherical material as hereinbefore described with reference to the accompanying drawings.

DATED this 15 day of July 1991

RHEON AUTOMATIC MACHINERY CO
LTD
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Applicant:

F.B. RICE & CO.



FIG. 1

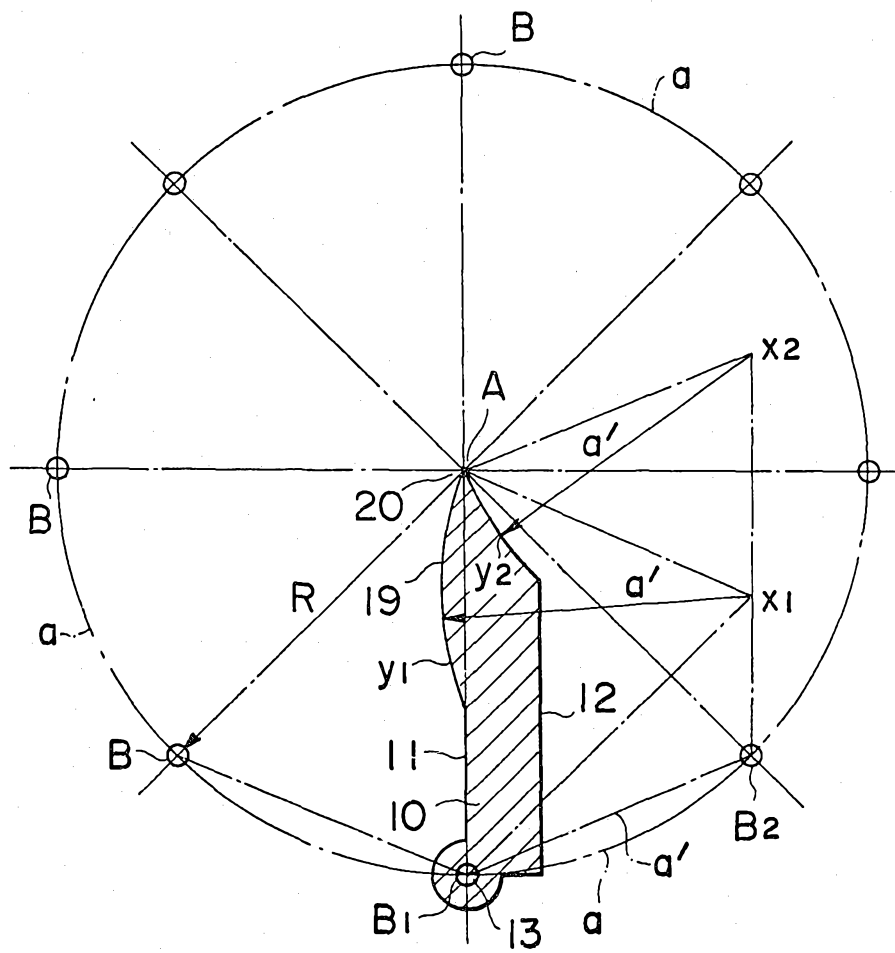
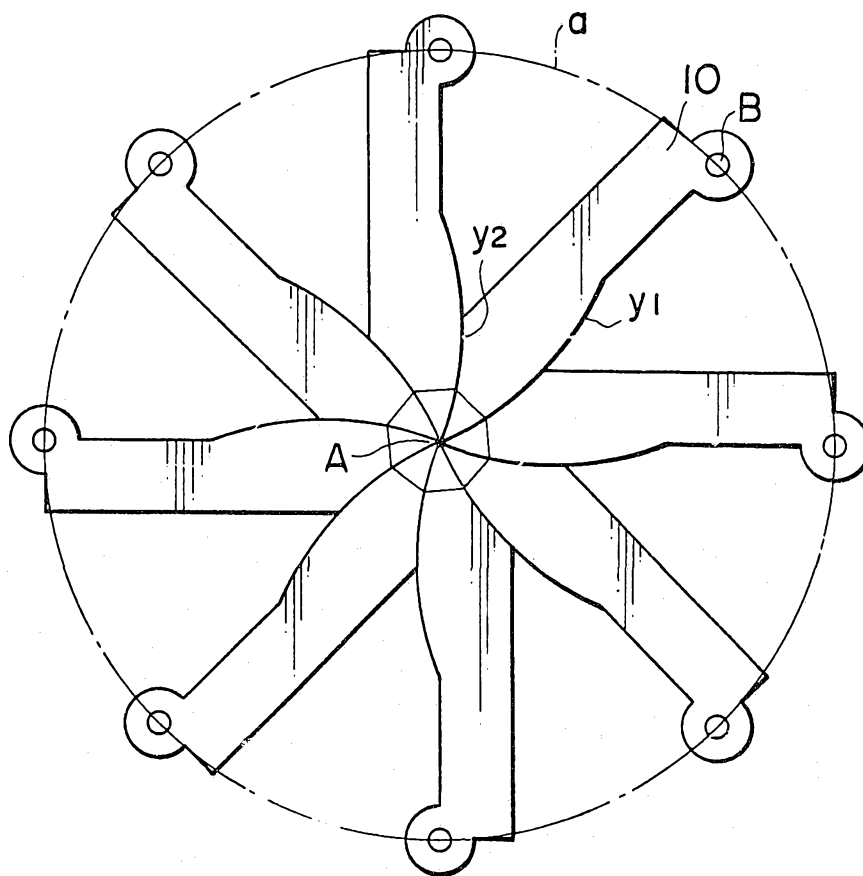
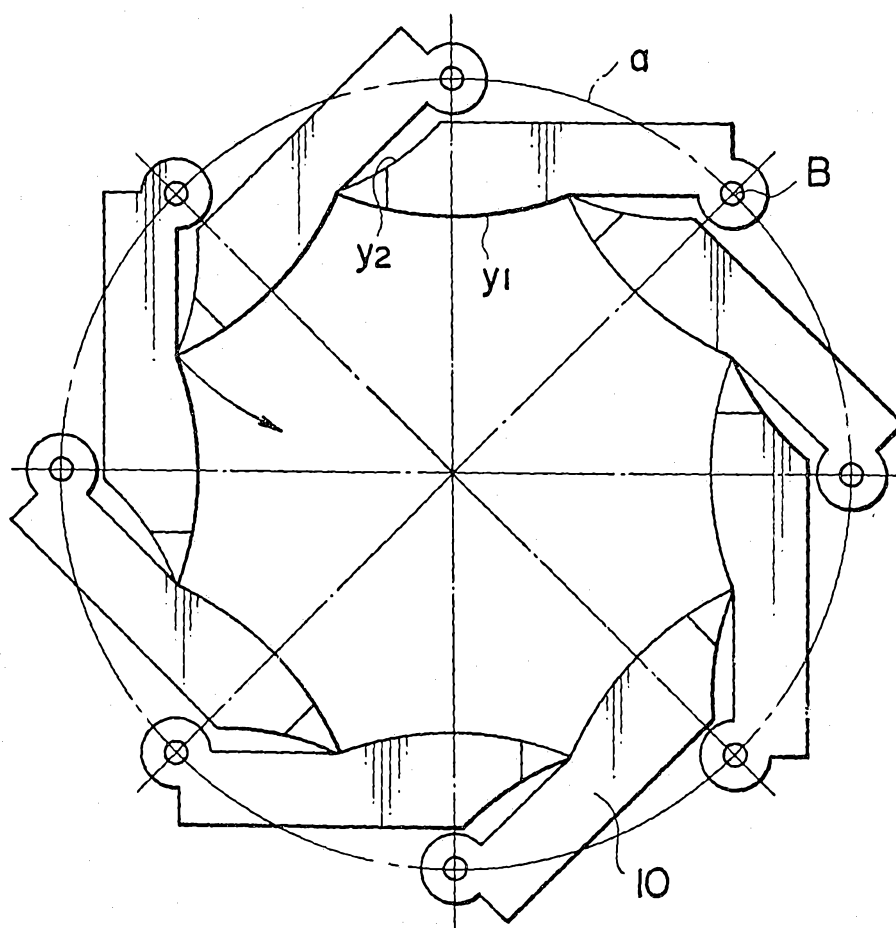


FIG. 2



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FIG. 3



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FIG. 4

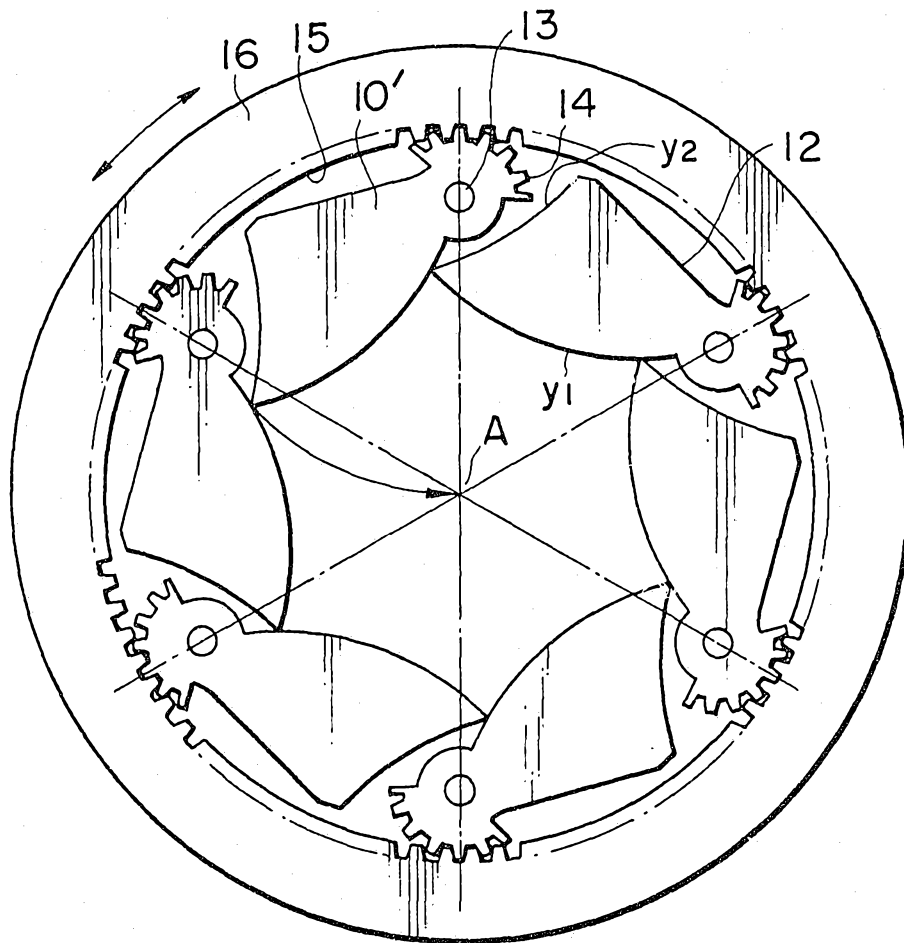


FIG. 5

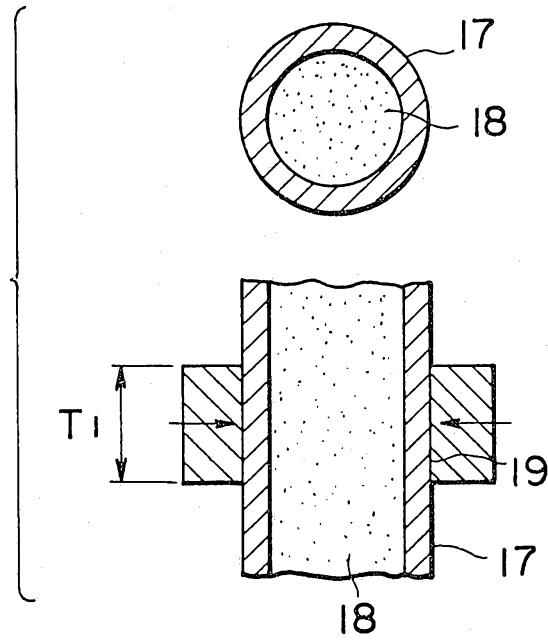


FIG. 6

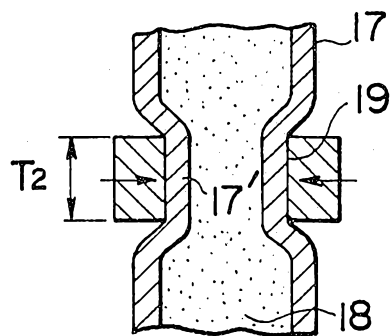


FIG. 7

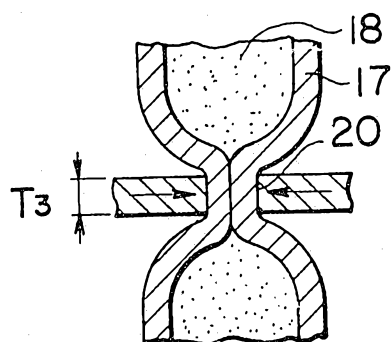


FIG. 8

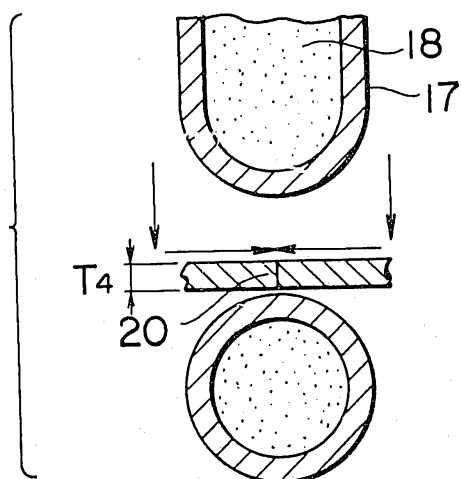


FIG. 9

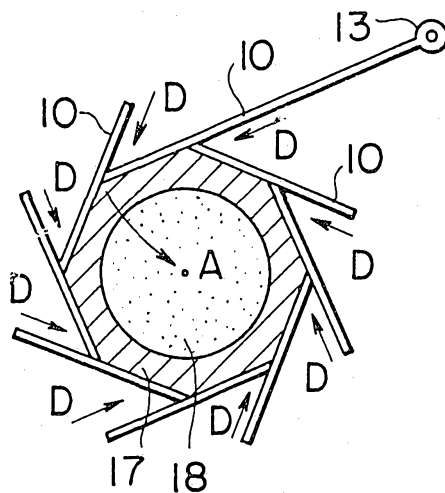


FIG. 10

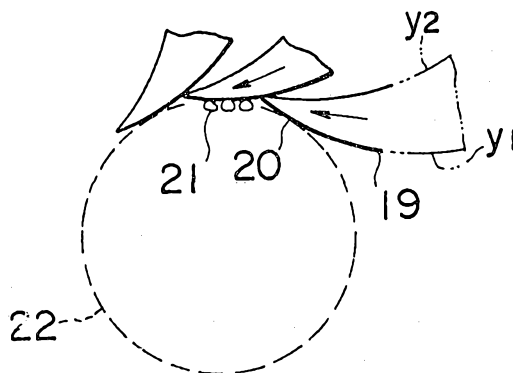


FIG. 11

