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(54) **MINERAL SIZERS.**

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Description

The present invention relates to a mineral breaker.

It is known from US Patent 3240436 to provide a breaker having a rotatable breaker drum including a plurality of breaker teeth projecting radially from the drum and further including a plurality of opposed breaker teeth positioned so that on rotation of the drum mineral lumps to be broken are gripped between the leading face of the teeth on the drum and a pair of said opposed breaker teeth to thereby break the mineral lump gripped therebetween by a snapping action.

Heretofore, such mineral breakers have been limited to use in breaking relatively large lumps of soft mineral or small lumps of harder mineral. This limitation has primarily been due to the maximum size of tooth permitted for withstanding the loadings experienced and also resisting abrasive wear.

The present invention aims to produce a mineral breaker of the above type wherein a breaker tooth construction is provided which enables the breaker to handle relatively large lumps of a hard mineral.

According to the present invention there is provided a mineral breaker having at least one breaker drum (15) including a plurality of breaker teeth (20) projecting radially from the drum and further including a plurality of opposed breaker teeth positioned so that on rotation of the drum mineral lumps to be broken are gripped between the leading face of the teeth of the drum and a pair of said opposed breaker teeth to thereby break the mineral lump gripped therebetween by a snapping action, characterised in that the breaker teeth (20) mounted on the breaker drum each comprise a main tooth body (34) in the form of a projection projecting from the drum and a sheath (40) removably mounted on the tooth body, the sheath including a hollow tooth formation (45) which defines the external shape of the tooth and which includes a pocket which is seated on and fully envelopes the tooth body, the shape of the tooth body and the pocket being complementary so that when the sheath is seated on the tooth body the leading (150) and trailing faces (53) of the tooth body and the respective facing internal walls of the pocket are in face contact with one another so that loadings applied to the tooth during said snapping action are transmitted through the sheath and onto the main tooth body.

Various aspects of the present invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a part perspective view of a mineral sizer according to one aspect of the present invention;

Figure 2 is an end view, partly in section, of the sizer shown in Figure 1;

Figure 3 is a side view of the sizer shown in Figure 1;

Figure 4 is a longitudinal section through the sizer shown in Figures 1 to 3 wherein the sizer teeth are arranged in lines parallel to the axis of rotation of the drums;

Figure 5 is an exploded perspective view of a tooth sheath and support according to another aspect of the present invention;

Figure 6 is a diagrammatic end view of the sizer drums shown in Figure 2;

Figure 7 is a diagrammatic view of the sizer drums shown in Figure 2;

Figure 8 is a similar view to Figure 4 showing an alternative embodiment according to the present invention;

Figure 9 shows a support ring for forming part of a breaker drum in a mineral sizer according to another embodiment of the present invention;

Figure 10 shows a section along line X—X in Figure 9;

Figure 11 shows a support ring similar to the support ring shown in Figure 9 but of reduced diameter;

Figure 12 is a front view of a tooth cap for fitting onto the support rings of Figures 9 to 11;

Figure 13 is a side view of tooth cap of Figure 12;

Figure 14 is a plan view of the tooth cap of Figure 12;

Figure 15 is a section along line VII—VII in Figure 14;

Figure 16 is a section along line VIII—VIII in Figure 14;

Figure 17 is a side view of a further tooth sheath construction according to the present invention;

Figure 18 is a section along line A—A in Figure 17;

Figure 19 is an end view as seen in the direction of arrow B in Figure 17;

Figure 20 is a side view of a further tooth sheath construction according to the present invention;

Figure 21 is a plan view taken along arrow C in Figure 20;

Figure 22 is a section view taken along line BB—BB in Figure 21 and showing the sheath seated on a corresponding support ring; and

Figure 23 is a part perspective view of a mineral sizer including drum assemblies made up of tooth sheaths and support rings illustrated in Figures 20—22.

Referring initially to Figures 1 to 4 and 7 the sizer 10 includes a housing 11 having sides 12 and end walls 14. The housing 11 is conveniently fabricated from steel plate panels which are bolted and welded together.

Rotatably mounted to extend between the end walls 14 are a pair of breaker drum assemblies 15 each of which is geared at one end to the other so that they are driven from a common drive 18 to be rotated in opposite directions. In the embodiment illustrated in Figure 1 the drums are rotated so as to direct material between them. The gear connection between the drums also serves to set the rotary positions of the drums relative to one another.

Each drum assembly 15 is provided with circumferentially extending groups 19 of breaker teeth 20, the groups 19 being spaced axially along the drum assembly 15. The axial spacing of groups 19 on one drum assembly is staggered to that on the other drum assembly so the teeth 20 in a group 19 on one drum assembly pass between an adjacent pair of groups 19 on the other drum assembly.

As seen by reference to Figures 1 and 7, the teeth 20 are also preferably arranged to define a series of discrete helical formations 21 which are spaced circumferentially about each drum assembly 15. The helical formations 21 as shown in Figures 1 and 7 extend along the axes of each drum in a different sense, i.e. for the left hand drum as seen in Figure 1 the helical formations 21 extend away from the nearest end wall 14 in an anti-clockwise sense and for the right hand drum the helical formations 21 extend in a clockwise sense. Preferably each helical formation 21 in extending along its respective drum passes through an arc of about 90°.

The shape of teeth 20 and their relative positions and size are such that during use, two types of breaking action are present, viz a primary breaking action on larger pieces of mineral whereat the mineral is gripped between opposing leading faces 46 of teeth on opposite drums and a secondary breaking action wherein mineral is trapped between the rear edges 47 of teeth and the leading face 46 of another tooth. Preferably the arc through which each helical formation passes is such as to ensure that a secondary breaking action occurs.

Additionally the spacing between the drums is chosen so that when the tips of teeth on one drum sweep past the trough defined between groups 19 of teeth on the other drum there is sufficient clearance so that compaction of material is avoided. Accordingly by a suitable choice of spacing it is possible for fine material to quickly pass through the sizer without compaction, thus leaving the sizer to break down larger pieces of material either by the primary and/or secondary breaking action.

The shape of teeth 20 are designed bearing in mind the hardness and tensile strength of the mineral to be broken. Preferably the teeth are designed to provide as much bite as possible for the primary type of breaking action for the diameter of the drum assembly so as to positively grip large pieces of material. Accordingly the ratio of height of teeth relative to drum diameter is normally large. For example, the tooth height to diameter of drum ratio can be 1:4. In this respect, the cross-sectional extent of a bite region 70 for primary breaking is illustrated in Figure 6, the depth of the region 70 is defined by the trailing edge 47 of one tooth and the leading edge 46 of a succeeding tooth; and the length of the region 70 is defined between the leading face 46 of one tooth and the leading face 46′ of an opposed tooth on the opposite drum. In the embodiment of Figure 6, the trailing edge 47 which is slightly curved, but which may be straight if desired, is chosen to be approximately tangential to the drum diameter and the leading face 46 is chosen to be approximately located radially relative to the drum. The grip region between teeth on the same group may be varied to alter the size of the grip region by either altering the size of tooth or by altering the number of teeth in each group 19, the maximum grip region being achieved when the point of intersection of face 46 is on or behind (in the direction of rotation of the drum) the location whereat the trailing edge of the preceding tooth merges into the periphery of the drum.

When the teeth are arranged to form helical formations 21 as shown in Figures 1 and 7 the grip region varies in width longitudinally of the drums as illustrated in Figure 7. Accordingly a large piece of material 80 (shown in broken lines) undergoes a succession of primary breaking actions and due to the helical formations 21 the large piece of material 80 is exposed to twisting forces and is urged to move axially along the drums. These actions on a large piece of material result in the piece being successively exposed to positive primary breaking actions and cause it to dance on the drums and do not allow it to settle on them. A similar action is imposed during secondary breaking. Thus problems associated with pieces of mineral settling on the drums and becoming grooved by the rotating teeth are avoided.

A further advantage resulting from the actions imposed on a large piece of material by the helical formations is that the large piece is positively moved along the axes of the drums thereby permitting smaller pieces to pass downwardly thereby and pass through the mineral breaker. Accordingly the mineral breaker is able to handle an in-fill of mineral which contains a large variation in size such as mineral obtained in open-cast quarrying which contains small particulate material as well as large lumps of mineral.

It will be appreciated that the teeth impose tensile breaking forces onto the mineral and so positively breaks the material with minimal production of fines. Additionally since each tooth passes between groups of teeth on the opposite drum positive sizing of mineral occurs since the maximum size of mineral passing through the sizer is determined by the space between the trailing edge 47 of one tooth and the leading face 46 of a succeeding tooth and the distance between adjacent groups 19 of teeth. Therefore if the in-fill material contains only large pieces of mineral the mineral on leaving the sizer will contain no pieces over a predetermined size and will contain a small quantity of fines.

It is also envisaged that the breaker drums may be inclined to the horizontal and arranged so that large pieces of mineral are made to climb up the incline by the helical formations. Due to the agitation of the large piece of mineral it is likely to fall down the incline and is accordingly repeatedly moved along the drums until it has been broken down sufficiently to be broken by the secondary breaking action.

As shown schematically in Figure 7, the mineral sizer according to the present invention is normally located above a takeaway conveyor *TC* so that the axes of the drums are generally parallel to the direction of travel of the conveyor *TC*. By setting the sizer so that the spacing between the drums is generally located above the longitudinal axis of the conveyor material being deposited by the sizer onto the conveyor *TC* is arranged centrally thereon. This is advantageous as it minimises spillage.

Referring now to the specific construction of the mineral sizer shown in Figure 1, each drum assembly 15 is shown in longitudinal section in Figure 4 and includes a stepped shaft 25 on which is keyed a support sleeve 26 made up of three support sleeve portions 26*a*, *b* and *c*. The centre sleeve 26*b* is of larger internal diameter so that it can be easily slid over most of the shaft 25 during assembly and disassembly. The sleeve portions 26*a*, *b* and *c* are fixedly secured to one another by weld lines 26*d* so as to form an integral sleeve 26 running the majority of the length of the shaft 25.

A series of annular support rings 28 are mounted on each sleeve 26 and are secured to one another and also to sleeve 26 by weld lines 30. Each ring 28 has a series of teeth support projections 34 integrally formed therewith which are spaced circumferentially about its periphery. Each ring 28 is conveniently formed from a cast metal.

Accordingly, the rotational position of each ring 28 may be easily set during assembly to align or stagger the teeth support projections 34 of adjacent rings 28 by rotating the rings 28 on sleeve 26 and then fixedly securing them in that position. In Figures 4, the projections 34 on adjacent rings 28 have been set so that the projections form longitudinally extending rows which are substantially parallel to the axis of rotation of the drum assembly 15 in contrast to the arrangement in Figure 1 wherein adjacent rings 28 have been set so that the projections 34 form the longitudinally extending helical formations 21.

In Figure 8 an alternative construction is illustrated wherein the annular support rings 28 are each keyed or splined directly onto the shaft 25. Each ring 28 is therefore only in abutment with its neighbour and the assembly of rings 28 are prevented from axial movement by virtue of a shoulder 25*x* and a removable collar 25*z*. Accordingly should the shaft or a ring become damaged during use, the shaft and ring assembly may be disassembled for replacement of the damaged component. It will be appreciated that each ring may be easily angularly offset to its neighbour to provide the desired helical formation 21, the amount of offsetting being determined in steps dictated by the pitch of the splines.

A further alternative is to cast the series of annular support rings and shaft integrally with one another.

A tooth sheath 40 is secured to each projection 34 via a bolt 41, or other similar means such as a sprung spigot, which is located in pockets 42 in the sheath and are thus protected from damage during use. When all sheaths are in position they collectively form a cover over adjacent rings 28 so that the rings are protected from wear by mineral being sized.

Each sheath 40 has an annular base portion 43 which follows the contour of ring 28 and a hollow tooth portion 45 integrally connected to the base portion 43. The tooth portion 45 has an internal pocket which is of a complementary shape to a projection 34 so when the tooth portion is seated upon a projection, loads imparted onto the tooth portion 45 during use are transmitted onto the projection 34.

In this respect, during use each tooth is exposed to two main sources of loadings; firstly a loading on its leading face 46 resulting from a primary or secondary breaking action and secondly a loading on its trailing edge 47 resulting from a secondary breaking action. The shape of projection 34 and that of tooth portion 45 is chosen so that when the tooth is exposed to the first type of loading the face 46 transmits the loading onto the leading face 150 of projection 34 and is encouraged to move in a generally radially inward direction so that the sheath 40 is pressed onto the projection 34 and peripheral surface of ring 28. The shape of the trailing edge 47 and of the complementary surface 53 of projection 34 are chosen to provide a wedge effect to restrain movement of the sheath 40 in a generally circumferential direction about ring 28, the wedge effect serving also to transmit loadings on the trailing edge 47 onto the complementary surface 53. Accordingly loadings arising from breakage of mineral are transmitted on to the rings 28 and so bolts 41 are not exposed to loadings and merely act to retain its associated sheath on a projection 34.

As seen in Figure 2 a rebate 60 is preferably provided at the base of each face 46 to receive a marginal end portion of the annular base portion 43 of the preceding sheath 40. If desired the base of each tooth and the base portion 43 of each preceding sheath 40 may be joined together by welding to thereby form a more rigid annular cover for each ring 28.

It will be appreciated that during use, portions of each sheath 40 will wear away and that eventually the sheaths 40 will have to be replaced. This is easily and quickly done with the present sizer by removal of bolts 41 (and, if appropriate removal of weld) and so refurnishment of the sizer teeth may be quickly achieved on site by personnel without the need of heavy lifting gear. Additionally, the inner surfaces of the side walls and end walls may be lined with steel plate which act as wear plates 50, 51 respectively to protect the side and end walls from abrasive wear. The wear plates are removably secured in position so that they can be replaced periodically after excessive wear has occurred.

A row of teeth 62 are provided to extend longitudinally along each side wall to intermesh with teeth 20 to prevent material passing between the side wall and adjacent drum assembly. The teeth 62 are conveniently secured to wear plates 50 by welding.

An alternative ring and tooth construction is illustrated with reference to Figures 9—16 wherein similar parts are designated by similar reference numerals.

In Figures 9 and 11 there are shown two alternative support rings 28 which are intended to be keyed directly to a shaft as in the Figure 8 embodiment and which are of different external diameter but are intended to receive the same dimensioned tooth sheath 130.

Each support ring 28 shown in Figures 9 and 11 is provided with a series of teeth support projections 34 which are integrally cast with the support ring.

The tooth cap 130 illustrated in Figures 12 to 16 is cast from a suitable wear resistant material and its external shape is designed so as to be symmetrical about section lines VII—VII and VIII—VIII respectively. The terminal end of each cap 130 terminates in the form of a ridge 136 which extends in the direction of rotation of the drum. By varying the length of the ridge 136 the strength of the tip of the tooth can be adjusted. The cap 130 has an internal pocket or recess 131 for receiving a projection 34, the recess 131 having a shape complementary to the shape of projection 34 so that loadings are transmitted onto the projection 34.

As seen in Figures 9 to 11 each projection 15 has a pair of recesses 118 (only one of which is visible in Figures 9 and 11) and the internal recess 131 of each cap 130 has inwardly projecting flanges 132 of complementary shapes to recesses 118 so that the flanges 132 and recesses 118 co-operate to positively key the tooth caps 130 in position. The caps 130 and projections 34 each have co-operating bores 134 passing therethrough to enable a bolt to be passed through for preventing removal of the cap from an associated projection.

By altering the diameter of the support rings but retaining the same shape of projection 34 it is possible to use the same size of caps 130 for different diameters of breaker drums. This is illustrated by comparison between Figures 9 and 11 wherein the bottom edge of each tooth cap 130 is of the same radius of curvature as the diameter of ring 28 in Figure 11 whereas in Figure 9 the radius of curvature of the ring 28 is greater. Accordingly, in order to accommodate caps 130 on ring 28 shown in Figure 9, complementary curved support surfaces 139 are provided separated by ridges 138.

A further alternative of a tooth sheath is illustrated in Figures 17, 18 and 19 wherein the tooth sheaths 40 on a given support ring 28, in addition to being connected to a respective projection 34 by a bolt 41, the tooth sheaths are also connected to one another by a connection formation 200 which is itself preferably tooth shaped. Accordingly, at one circumferential end of each sheath 40 is provided first part 201 of the formation 200 and at the other circumferential end with a second part 202 of the formation 200. The first part 201 is generally tooth shaped having a leading face 203 and trailing face 204. The first part 201 is provided with a centrally located recess 206 into which the second part 202 of a preceding sheath 40 projects. Both the first part 201 and second part 202 are provided with through bores 208 which align when adjacent sheaths are positioned on a ring 28 and through which a bolt (not shown) is passed in order to secure co-operating parts 201, 202 together. The provision of connection formations 200 stabilises the annulus of connected sheaths 40 extending about a given ring 28 and serves to reduce chatter between the sheaths 40 and ring 28 during use. In view of the stabilising effect it has been found possible to provide the teeth 20 with a leading face 46 which has a positive rake as is clearly illustrated in Figure 17.

A further alternative shape of tooth 20 and corresponding projection 34 is illustrated in Figures 20 to 23 wherein the tooth 20 is in the form of a pick having a generally cylindrical body. In this embodiment the sheaths 40 are secured onto a given ring 28 by being connected to one another by connection formations 200 only.

It is to be appreciated that drums assembled from any of the tooth sheath constructions described above are preferably arranged so that the teeth form helical formations 21. By way of further example reference is made to Figure 23 which is a view similar to Figure 1 and in which each drum includes a series of sheaths as shown in Figures 20—22 arranged to define helical formations 21. It is however also possible in certain applications for the teeth 20 to be arranged in rows extending generally parallel to the axis of the drum. It is also envisaged that the helical formations 21 on both drums may extend about their respective axes in the same sense. In such a situation large pieces of mineral deposited on the drums will be acted upon by the helical formations on one drum to move in one axial direction and be acted upon by the helical formations on the opposite drum to be moved in the opposite axial direction. Such movement results in an agitation of the large pieces of mineral deposited on the drums and so assist gripping of the mineral by the teeth. A further alternative is for one drum to have a helical formation and the other drum to have teeth aligned in rows arranged parallel to the axis of the drum.

It is also envisaged that the drums may be rotated in opposite directions so that material deposited thereon is moved toward the side walls of the sizer for breaking. Additionally it is also envisaged that a sizer having a single breaker drum may be provided in which the teeth on the drum co-operates with a side wall of the sizer housing and/or static teeth mounted thereon for breakage of mineral.

Reference is hereby made to our co-pending European patent application no. 85109073.8 (publication no. 0167178) which has been divided out of this application.

Claims

1. A mineral breaker having at least one breaker drum (15) including a plurality of breaker teeth (20) projecting radially from the drum and further including a plurality of opposed breaker teeth positioned so that on rotation of the drum mineral lumps to be broken are gripped between the leading face of the teeth of the drum and a pair of said opposed breaker teeth to thereby break the mineral lump gripped therebetween by a snapping action, characterised in that the breaker teeth (20) mounted on the breaker drum each comprise a main tooth body (34) in the form of a projection projecting from the drum and a sheath (40) removably mounted on the tooth body, the sheath including a hollow tooth formation (45) which defines the external shape of the tooth and which includes a pocket which is seated on and fully envelopes the tooth body, the shape of the tooth body and the pocket being complementary so that when the sheath is seated on the tooth body the leading (150) and trailing faces (53) of the tooth body and the respective facing internal walls of the pocket are in face contact with one another so that loadings applied to the tooth during said snapping action are transmitted through the sheath and onto the main tooth body.

2. A mineral breaker according to Claim 1 characterised in that the teeth (20) are arranged in circumferentially extending groups (79) spaced axially along the drum, the main tooth body of each tooth in a given group being integral with a common annulus (28).

3. A mineral breaker according to Claim 2 characterised in that the leading face (46) of each tooth projects generally radially from the drum and the trailing edge (47) of each tooth extending generally tangentially from the drum.

4. A mineral breaker according to Claim 2 or 3 characterised in that the tooth sheaths of a given group are connected to one another when mounted on said annulus.

5. A mineral breaker according to Claim 4 characterised in that each tooth sheath of a given group is provided at one circumferential end with a first part (201) of a connection formation (200) and at the opposite circumferential end with a second cooperating part (202) of said connection formation.

6. A mineral breaker according to Claim 5 characterised in that said connection formation (200) is tooth-shaped.

7. A mineral breaker according to any of Claims 2 to 6 characterised in that each sheath includes an annular base portion (43) which follows the contour of the annulus on which the sheath is mounted so that the external surface of the annulus is covered when all the sheaths are mounted on the tooth bodies on the annulus.

8. A mineral breaker according to any of Claims 2 to 7 including first and second breaker drums (15) placed side-by-side, each having breaker teeth projecting radially therefrom, said teeth on each drum being arranged in circumferentially extending groups, said groups of teeth on said first drum being located between adjacent groups of teeth on said second drum, the teeth on at least one of said drums being arranged to define a discrete helical formation (21).

9. A mineral breaker according to Claim 8 characterised in that said teeth on both said first and second drums are arranged in discrete helical formations (21).

10. A mineral breaker according to Claim 9, characterised in that said first and second drums are arranged to rotate in opposite directions, said helical formations on said first drum being arranged in an opposite sense to said helical formations on said second drum so that said helical formations cooperate in tending to move large pieces of mineral deposited thereon in a single axial direction.

11. A mineral breaker according to Claim 10 characterised in that the rotational positions of said first and second drums are arranged so that during rotation each helical formation on said first drum projects into the space between adjacent helical formations on said second drum.

12. A mineral breaker according to Claim 9 wherein said first and second drums are arranged to rotate in opposite directions, said helical formations on said first drum being arranged in the same sense as said helical formations on said second drum so that said helical formations on said first drum tend to move large pieces of mineral deposited thereon in a direction opposite to that which said helical formations on said second drum tend to move pieces of mineral.

13. A mineral breaker according to any of Claims 8 to 12 characterised in that a belt conveyor is positioned beneath said breaker drums, the direction of travel of said conveyor being substantially parallel to the axes of said breaker drums.

Patentansprüche

1. Mineralbrecher mit wenigstens einer Brechertrommel (15), die eine Vielzahl von Brechzähnen (20), die radial von der Trommel abstehen, und ferner eine Vielzahl gegenüberstehender Brecherzähne aufweist, die so angeordnet sind, daß bei Drehung der Trommel zu zerbrechende Mineralbrocken zwischen der vorderen Fläche der Zähne der Trommel und einem Paar der erwähnten gegenüberstehenden Brechzähne erfaßt werden, so daß der dazwischen erfaßte Mineralbrocken durch einen plötzlichen Brechvorgang zerbrochen wird, dadurch gekennzeichnet, daß die Brechzähne (20), die auf der Brechertrommel angeordnet sind, jeweils einen Hauptzahnkörper (34) in Form eines von der Trommel abstehenden Vorsprungs und einen lösbar auf dem Zahnkörper angeordneten Mantel (40) aufweisen, daß der Mantel eine hohle Zahnform (45) aufweist, die die äußere Form des Zahns begrenzt und eine Tasche aufweist, die auf dem Zahnkörper sitzt und diesen vollständig einhüllt, und daß die Form des Zahnkörpers und der Tasche komplementär sind, so

daß, wenn der Mantel auf dem Zahnkörper sitzt, die vordere (150) und die hintere Fläche (53) des Zahnkörpers und die einander zugekehrten inneren Wände der Tasche miteinander in Flächenberührung stehen, so daß während des Brechvorgangs auf den Zahn ausgeübte Belastungen über den Mantel auf den Hauptzahnkörper übertragen werden.

2. Mineralbrecher nach Anspruch 1, dadurch gekennzeichnet, daß die Zähne (20) in sich in Umfangsrichtung erstreckenden Gruppen (19) angeordnet sind, die axial längs der Trommel auseinanderliegen, wobei der Hauptzahnkörper jedes Zahns in einer bestimmten Gruppe einteilig mit einem gemeinsamen Ring (28) ausgebildet ist.

3. Mineralbrecher nach Anspruch 2, dadurch gekennzeichnet, daß die vordere Fläche (46) jedes Zahns weitgehend radial von der Trommel absteht und die hintere Kante (47) jedes Zahns sich weitgehend tangential von der Trommel weg erstreckt.

4. Mineralbrecher nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß die Zahnmäntel einer bestimmten Gruppe miteinander verbunden sind, wenn sie auf dem erwähnten Ring angeordnet sind.

5. Mineralbrecher nach Anspruch 4, dadurch gekennzeichnet, daß jeder Zahnmantel einer bestimmten Gruppe an dem einen Umfangsende mit einem ersten Teil (201) einer Verbindungseinrichtung (200) und an dem gegenüberliegenden Umfangsende mit einem zweiten zusammenwirkenden Teil (202) der erwähnten Verbindungseinrichtung versehen ist.

6. Mineralbrecher nach Anspruch 5, dadurch gekennzeichnet, daß die Verbindungseinrichtung (200) zahnförmig ist.

7. Mineralbrecher nach einem der Ansprüche 2 bis 6, dadurch gekennzeichnet, daß jeder Mantel einen ringförmigen Bodenteil (43) aufweist, der der Kontur des Rings folgt, auf dem der Mantel angeordnet ist, so daß die äußere Fläche des Rings abgedeckt ist, wenn alle Mäntel auf den Zahnkörpern des Rings angeordnet sind.

8. Mineralbrecher nach einem der Ansprüche 2 bis 7 mit einer ersten und einer zweiten Brechertrommel (15), die nebeneinander angeordnet sind und jeweils radial davon abstehende Brechzähne aufweisen, wobei die erwähnten Zähne auf jeder Trommel in sich in Umfangsrichtung erstreckenden Gruppen angeordnet sind, die erwähnten Zahngruppen auf der erwähnten ersten Trommel zwischen benachbarten Gruppen der Zähne auf der erwähnten zweiten Trommel angeordnet sind und die Zähne auf wenigstens der einen der erwähnten Trommeln so angeordnet sind, daß sie eine getrennte schraubenlinienartige Formation (21) bilden.

9. Mineralbrecher nach Anspruch 8, dadurch gekennzeichnet, daß die erwähnten Zähne sowohl auf der erwähnten ersten als auch auf der erwähnten zweiten Trommel in getrennten schraubenlinienartigen Formationen (21) angeordnet sind.

10. Mineralbrecher nach Anspruch 9, dadurch gekennzeichnet, daß die erwähnte erste und zweite Trommel in entgegengesetzten Richtungen drehbar und die erwähnten schraubenlinienartigen Formationen auf der erwähnten ersten Trommel gegensinnig zu den erwähnten schraubenlinienartigen Formationen auf der erwähnten zweiten Trommel angeordnet sind, so daß die erwähnten schraubenlinienartigen Formationen dahingehend zusammenwirken, daß große Mineralstücke, die darauf angeordnet werden, in einer einzigen Axialrichtung verschoben werden.

11. Mineralbrecher nach Anspruch 10, dadurch gekennzeichnet, daß die Drehwinkellagen der erwähnten ersten und zweiten Trommel so gewählt sind, daß während der Drehung jede schraubenlinienartige Formation auf der erwähnten ersten Trommel in den Zwischenraum zwischen benachbarten schraubenlinienartigen Formationen auf der erwähnten zweiten Trommel ragt.

12. Mineralbrecher nach Anspruch 9, bei dem dei erwähnte erste und zweite Trommel in entgegengesetzten Richtungen drehbar gelagert und die erwähnten schraubenlinienartigen Formation auf der erwähnten ersten Trommel im gleichen Sinne wie die erwähnten schraubenlinienartigen Formationen auf der erwähnten zweiten Trommel angeordnet sind, so daß die erwähnten schraubenlinienartigen Formationen auf der erwähnten ersten Trommel bestrebt sind, große Mineralstücke, die darauf angeordnet werden, in entgegengesetzter Richtung zu der zu verschieben, in der die erwähnten schraubenlinienartigen Formationen auf der erwähnten zweiten Trommel bestrebt sind, die Mineralstücke zu verschieben.

13. Mineralbrecher nach einem der Ansprüche 8 bis 12, dadurch gekennzeichnet, daß ein Riemenförderer unter den erwähnten Brechertrommeln angeordnet ist, dessen Förderrichtung weitgehend parallel zu den Achsen der erwähnten Brechertrommeln verläuft.

Revendications

1. Concasseur de minerai ayant au moins un tambour concasseur (15) comprenant une pluralité de dents de concassage (20) faisant saillie radialement sur le tambour, et comprenant en outre une pluralité de dents de concassage opposées, positionnées de telle manière que lors de la rotation du tambour les morceaux de minerai à concasser sont serrés entre la face antérieure des dents du tambour et une paire des dites dents de concassage opposées de manière à concasser le morceau de minerai serré entre ces dents par une action de cisaillement, caractérisé en ce que les dents de concassage (20) montées sur le tambour concasseur comprennent chacune un corps principal de dent (34) en forme de saillant en saillie sur le tambour et une gaine (40) montée de manière amovible sur le corps de dent, la gaine comprenant une formation creause de dent (45)

qui épouse la forme externe de la dent et qui comprend une poche qui repose sur le corps de dent en l'enveloppant complètement, la forme du corps de dent et celle de la poche étant complémentaires de telle sorte que quand la gaine repose sur le corps de dent, la face antérieure (150) et la face postérieure (53) du corps de dent et les parois internes respectives de la poche leur faisant face sont qu contact l'une de l'autre, de telle manière que les efforts s'exerçant sur la dent au cours de ladite action de cisaillement soient transmis par la gaine au corps principal de la dent.

2. Concasseur de mineral selon la revendication 1, caractérisé en ce que les dents (20) sont disposées en groupes (79) s'étendant circonférentiellement, espacés axialement le long du tambour, le corps principal de dent de chaque dent dans un groupe donné faisant partie intégrale d'un anneau commun (28).

3. Concasseur de minerai selon la revendication 2, caractérisé en ce que la face antérieure (46) de chaque dent fait saillie en général radialement sur le tambour, le bord postérieur (47) de chaque dent s'étendant en général tangentiellement à partir du tambour.

4. Concasseur de minerai selon la revendication 2 ou 3, caractérisé en ce que les gaines des dents d'un groupe donné sont reliées l'une à l'autre en étant montées sur ledit anneau.

5. Concasseur de minerai selon la revendication 4, caractérisé en ce que chaque gaine de dent d'un groupe donné est munie sur une extrémité circonférentielle d'une première partie (201) d'une formation de jonction (200) et, sur l'autre extrémité circonférentielle, d'une deuxième partie coopérante (202) de ladite formation de jonction.

6. Concasseur de minerai selon la revendication 5, caractérisé en ce que ladite formation de jonction (200) est en forme de dent.

7. Concasseur de minerai selon l'une quelconque des revendications 2 à 6, caractérisé en ce que chaque gaine comprend une partie de base annulaire (43) qui épouse le contour de l'anneau sur lequel la gaine est montée, de telle sorte que la surface externe de l'anneau soit recouverte quand toutes les gaines sont montées sur les corps de dents sur l'anneau.

8. Concasseur de minerai selon l'une quelconque des revendications 2 à 7 comprenant un premier et une deuxième tambour concasseur (15) disposés côté-à-côté, chacun ayant des dents de concassage faisant saillie radialement sur lui, lesdites dents sur chaque tambour étant disposées en groupes s'étendant circonférentiellement, lesdits groupes de dents sur ledit premier tambour étant situés entre des groupes de dentes adjacents sur ledit deuxième tambour, les dents sur au moins un des dits tambours étant disposées de manière à définir une formation hélicoïdale distincte (21).

9. Concasseur de minerai selon la revendication 8, caractérisé en ce que lesdites dents sur chacun desdits premier et deuxième tambours sont disposées en formations hélicoïdales distinctes (21).

10. Concasseur de minerai selon la revendication 9, caractérisé en ce que lesdits premier et deuxième tambours sont agencés de manière à tourner en sens opposés, lesdites formations hélicoïdales sur ledit premier tambour étant disposées en un sens opposé à celui desdites formations hélicoïdales sur ledit deuxième tambour, de telle sorte que lesdites formations hélicoïdales coopèrent en tendant à mouvoir dans une seule direction axiale les gros morceaux de minerai déposés sur celles-ci.

11. Concasseur de minerai selon la revendication 10, caractérisé en ce que les positions rotationnelles desdits premier et deuxième tambours sont disposées de telle sorte que pendant la rotation chaque formation hélicoïdale sur ledit premier tambour fait saillie dans l'espace entre des formations hélicoïdales adjacentes sur ledit deuxième tambour.

12. Concasseur de minerai selon la revendication 9, dans lequel lesdits premier et deuxième tambours sont agencés de manière à tourner en sens opposés, lesdites formations hélicoïdales sur ledit premier tambour étant disposées dans le même sens que lesdites formations hélicoïdales sur ledit deuxième tambour de telle sorte que lesdites formations hélicoïdales sur ledit premier tambour tendent à mouvoir les gros morceaux de minerai déposés sur celles-ci dans un sens opposé à celui dans lequel lesdites formations hélicoïdales sur ledit deuxième tambour tendent à mouvoir les morceaux de minerai.

13. Concasseur de minerai selon l'une quelconque des revendications 8 à 12, caractérisé en ce qu'un transporteur à courroie est disposé sous lesdits tambours concasseurs, le sens de circulation dudit transporteur étant pratiquement parallèle aux axes desdits tambours concasseurs.

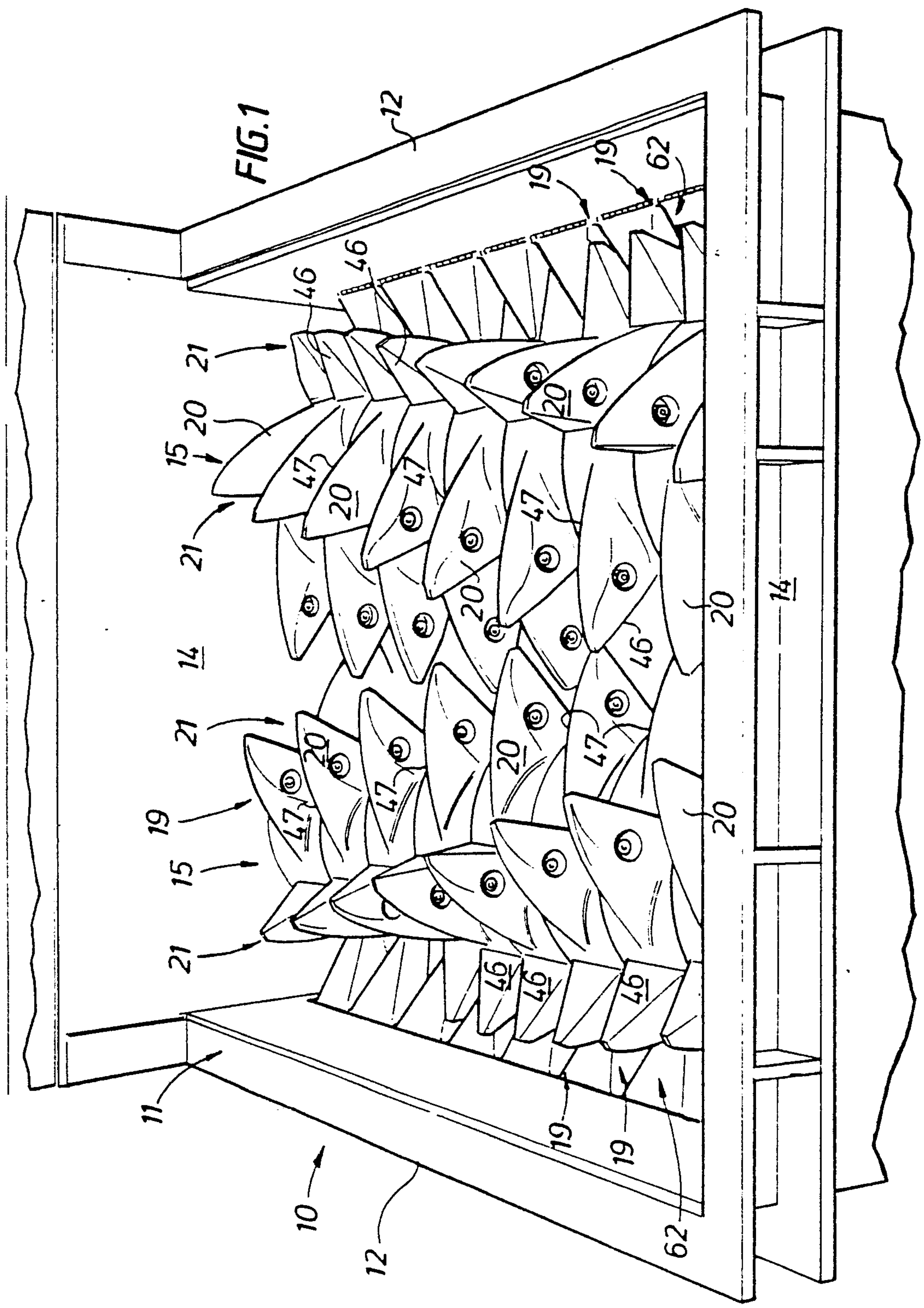
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FIG.1

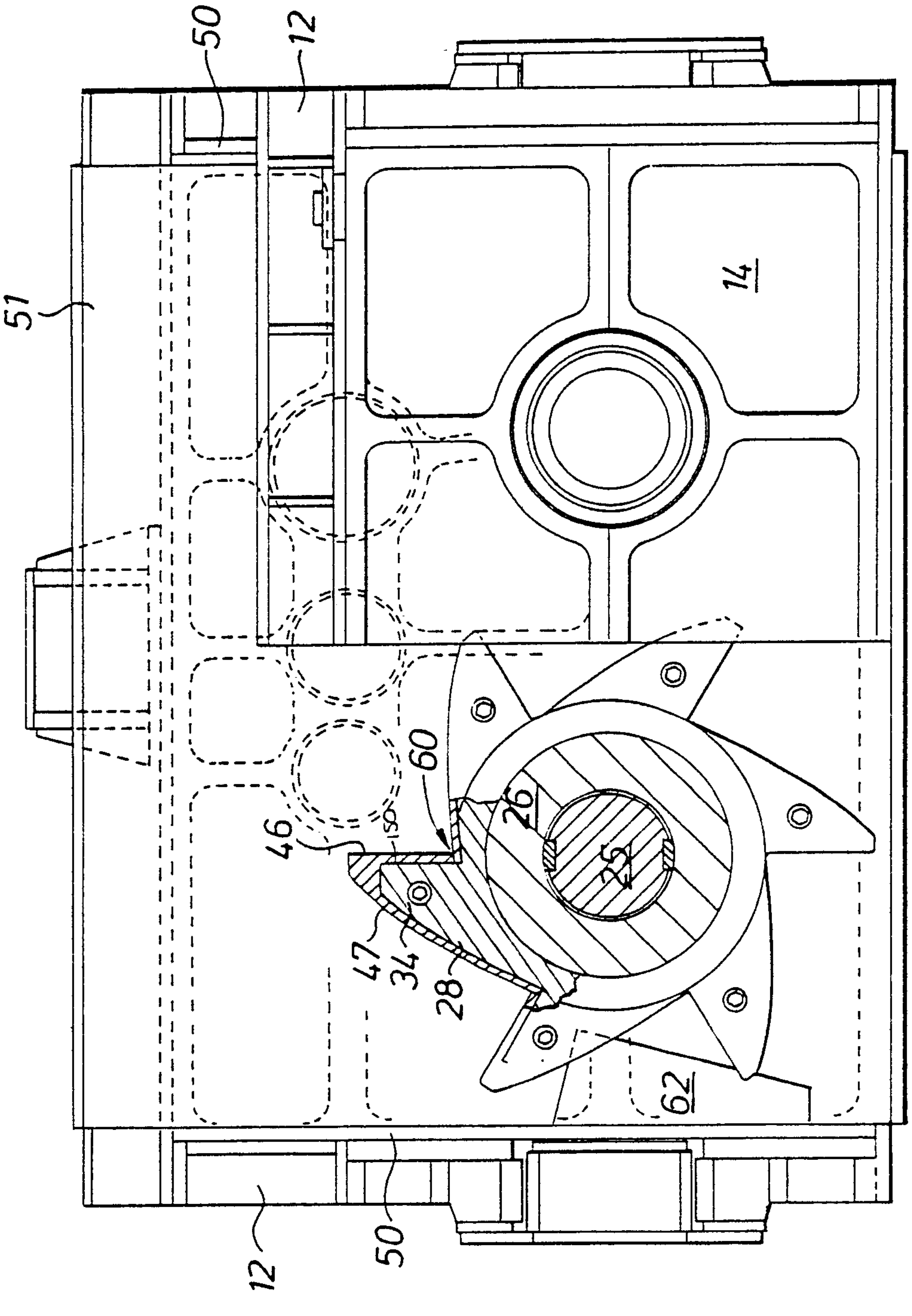


FIG.2

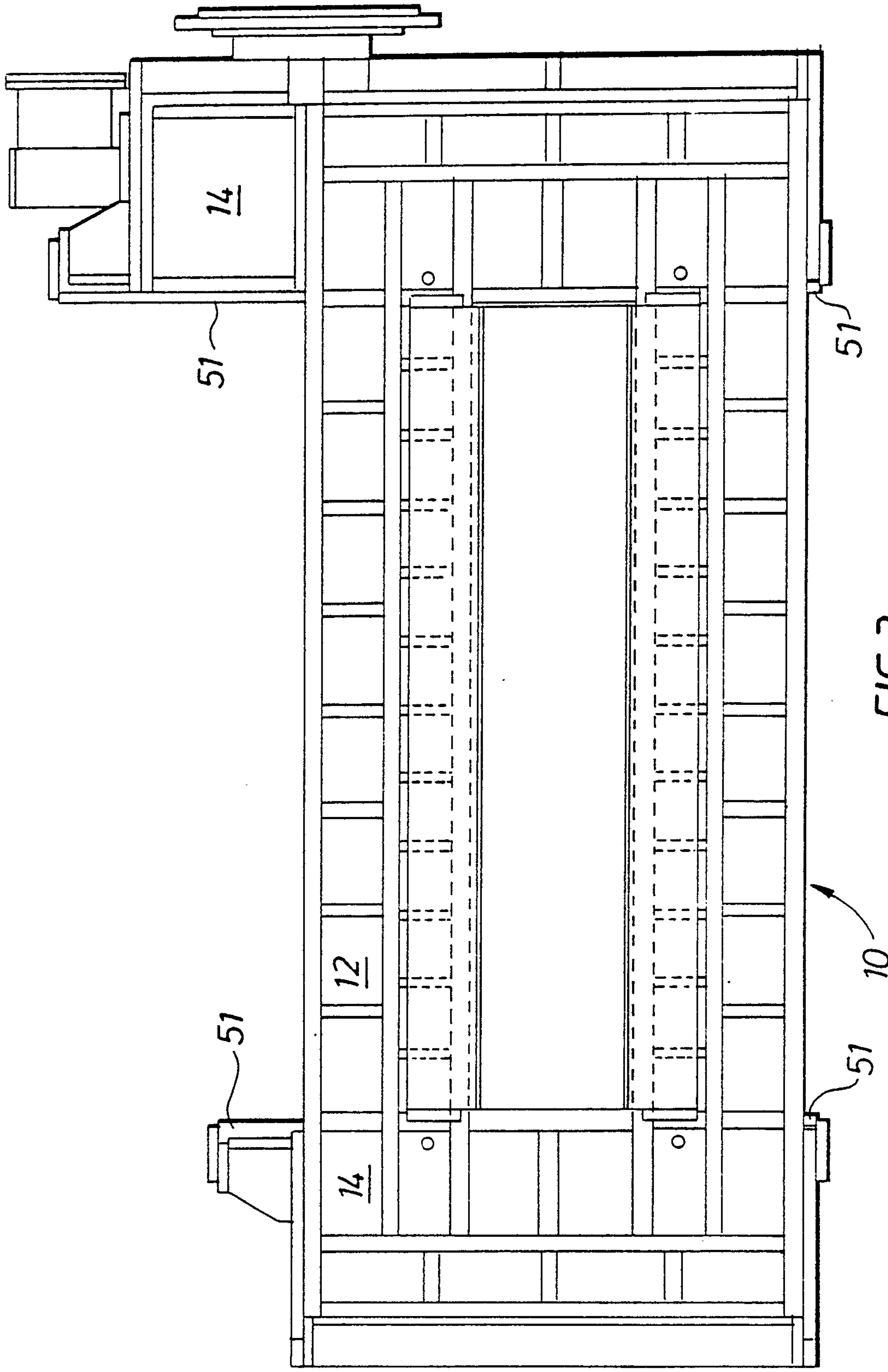


FIG. 3

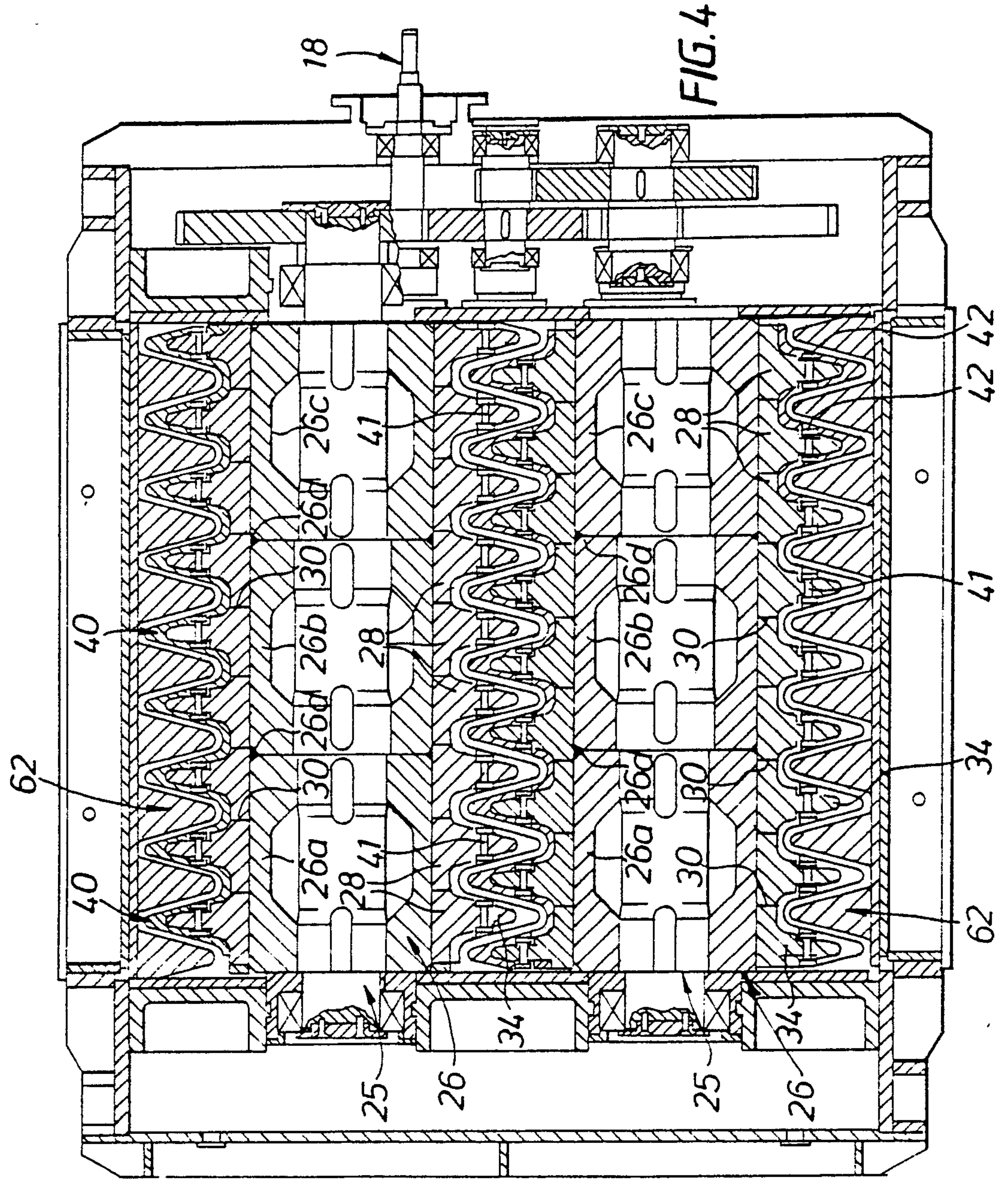
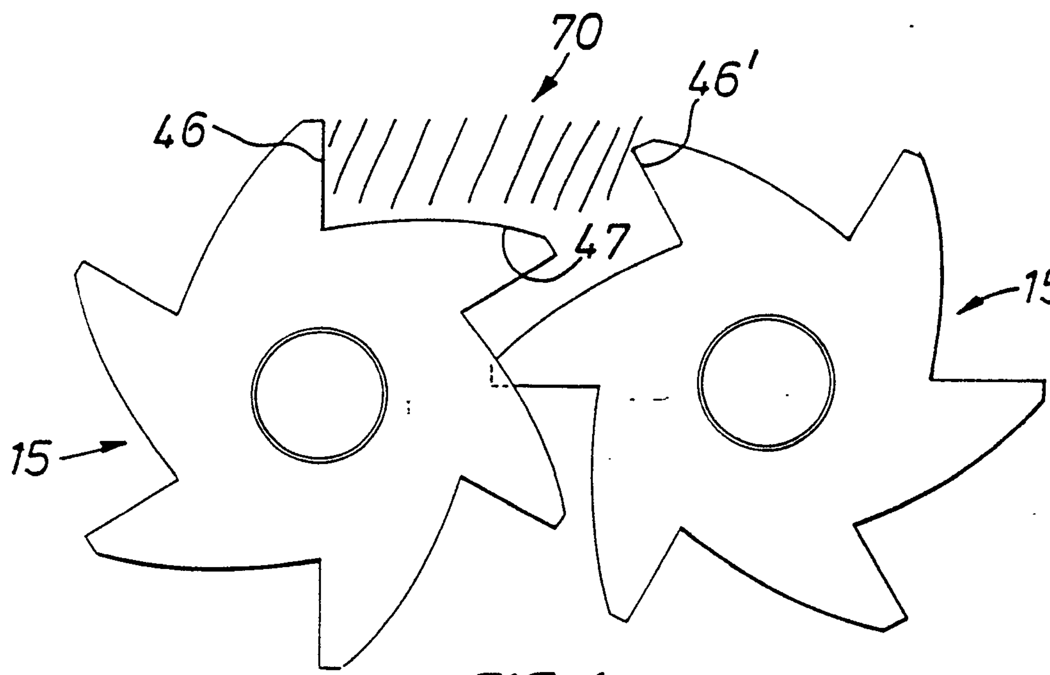


FIG.4



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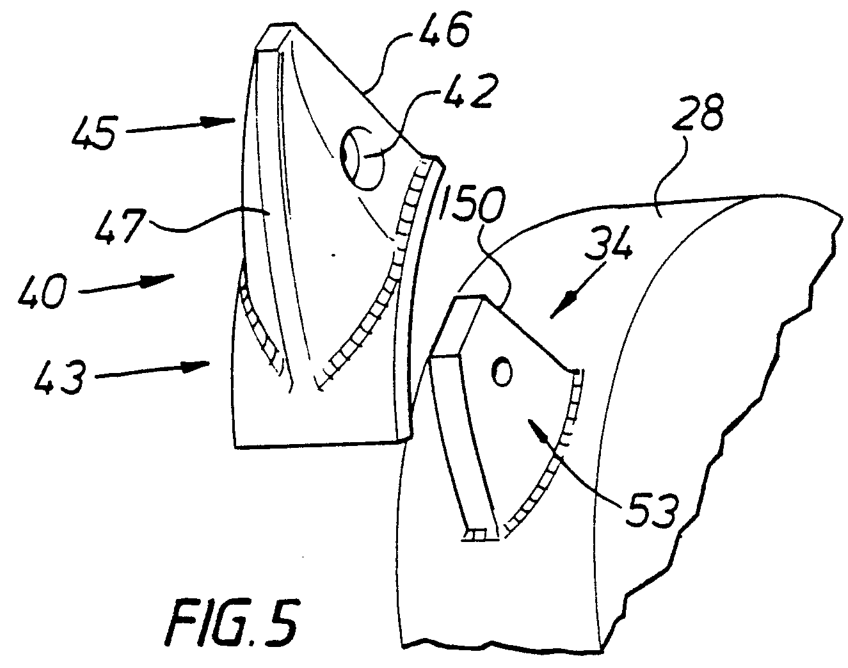
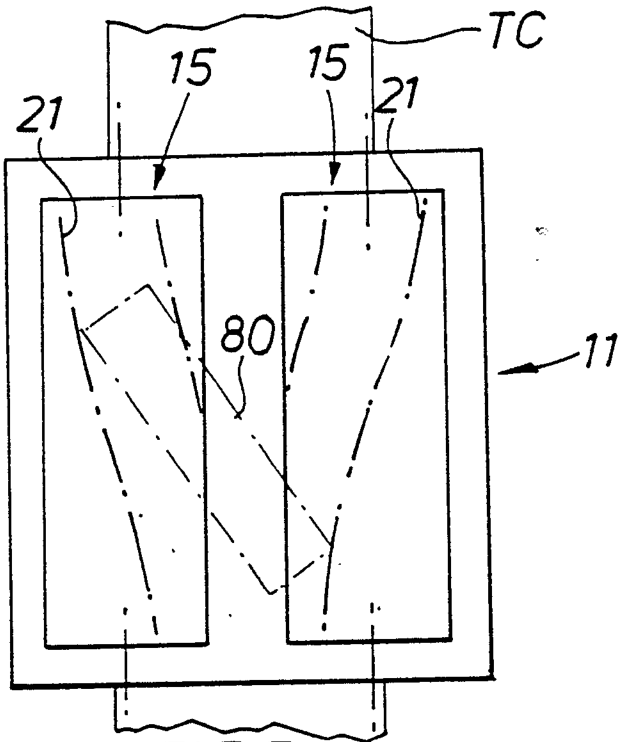


FIG. 5



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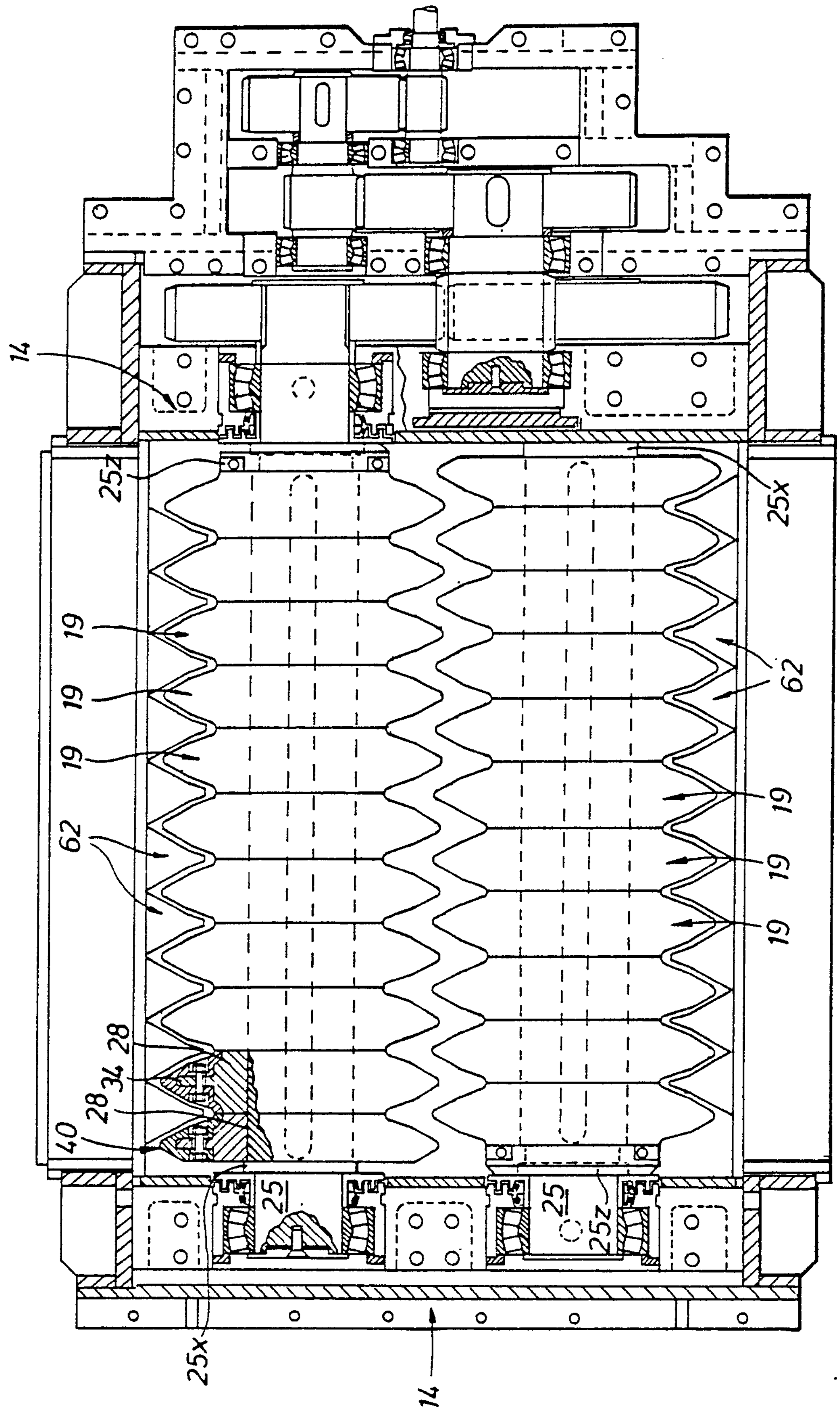

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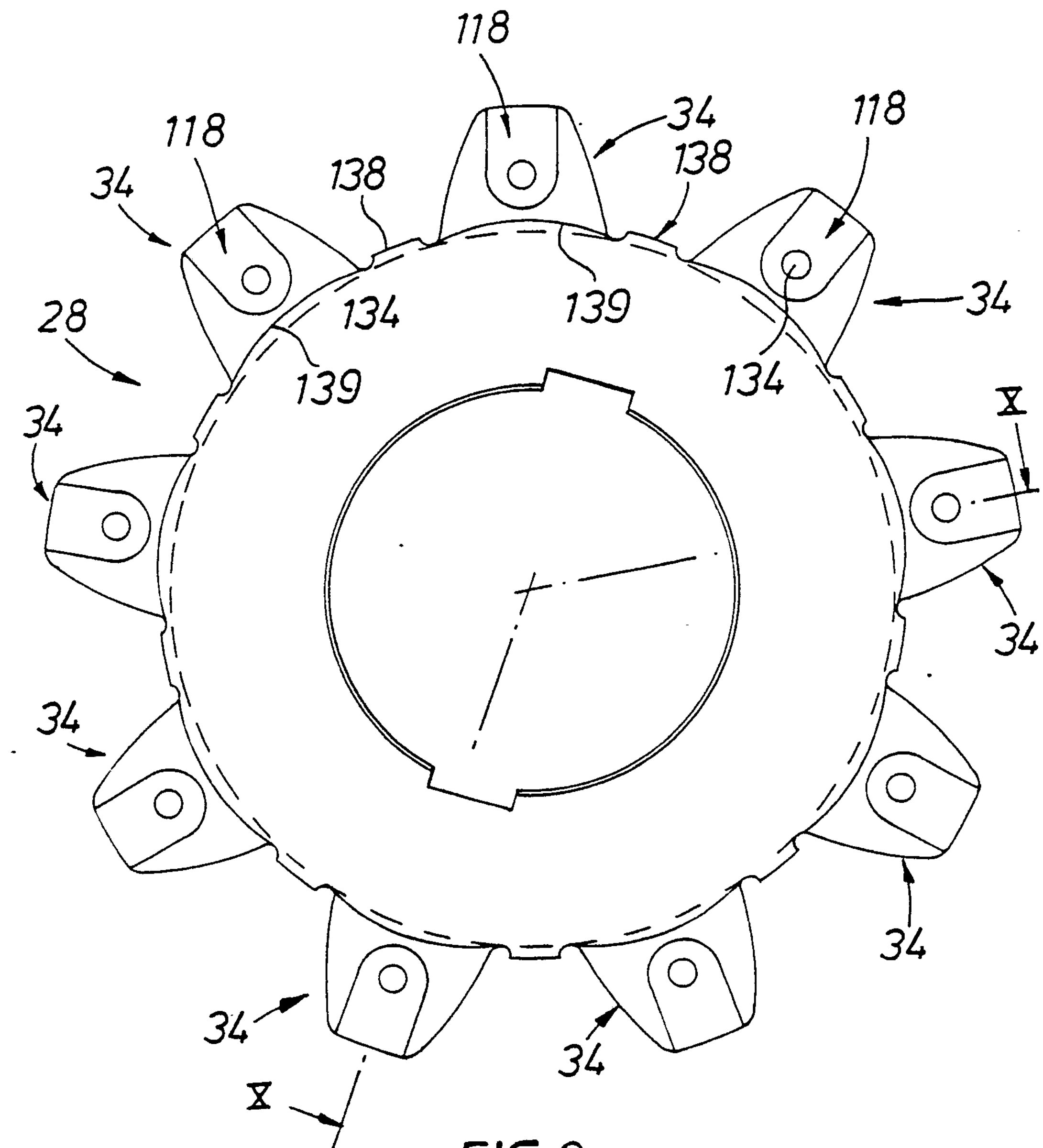

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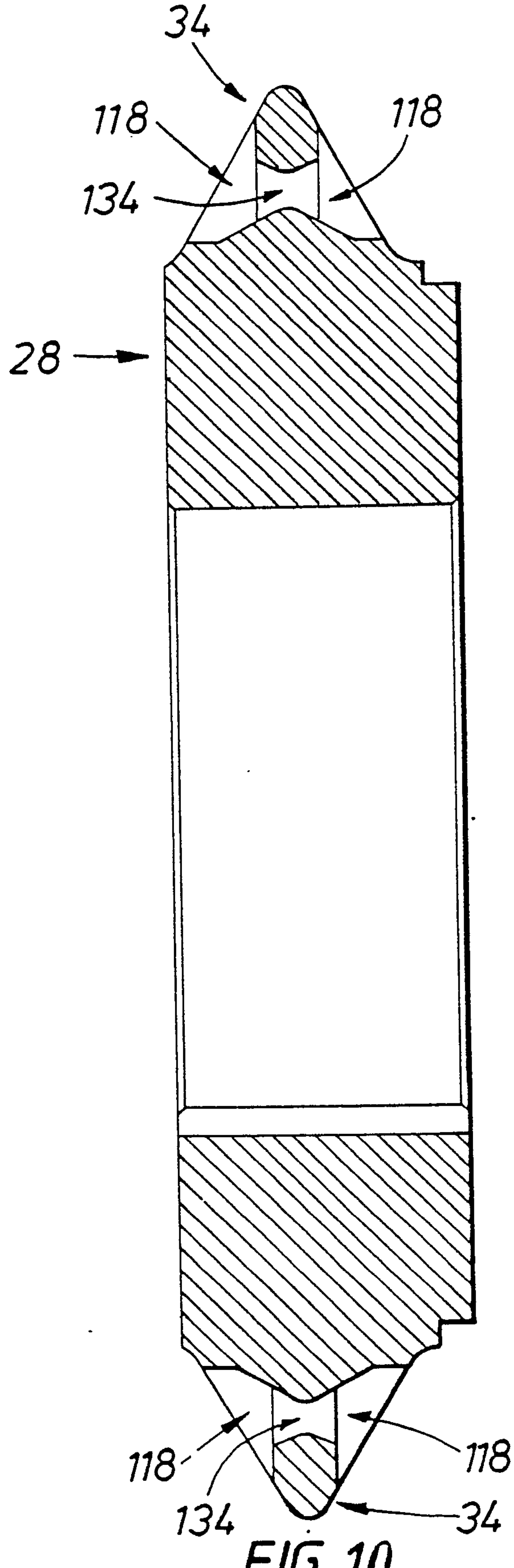

FIG. 10

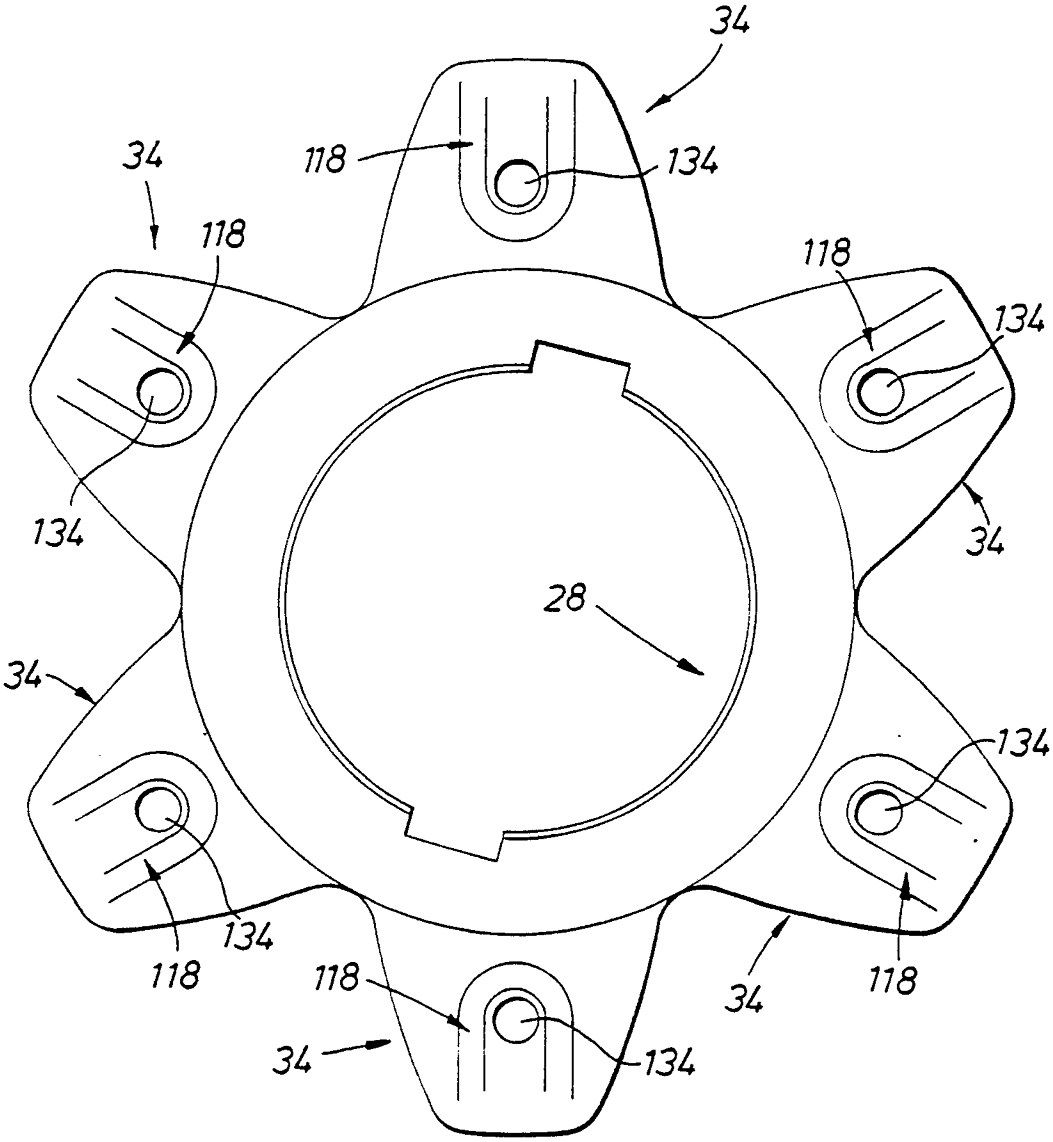
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FIG. 11

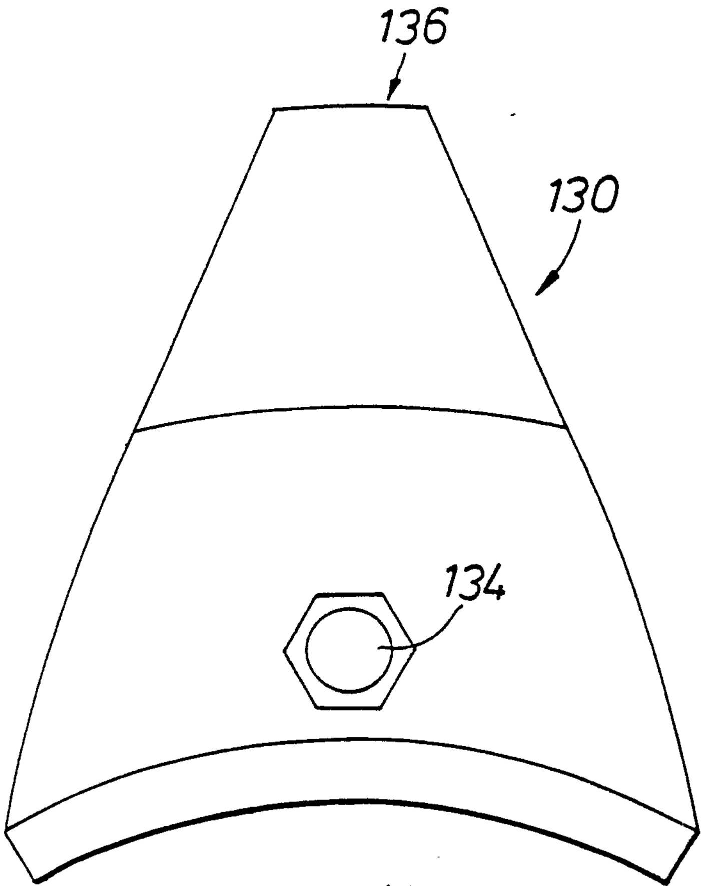


FIG. 13

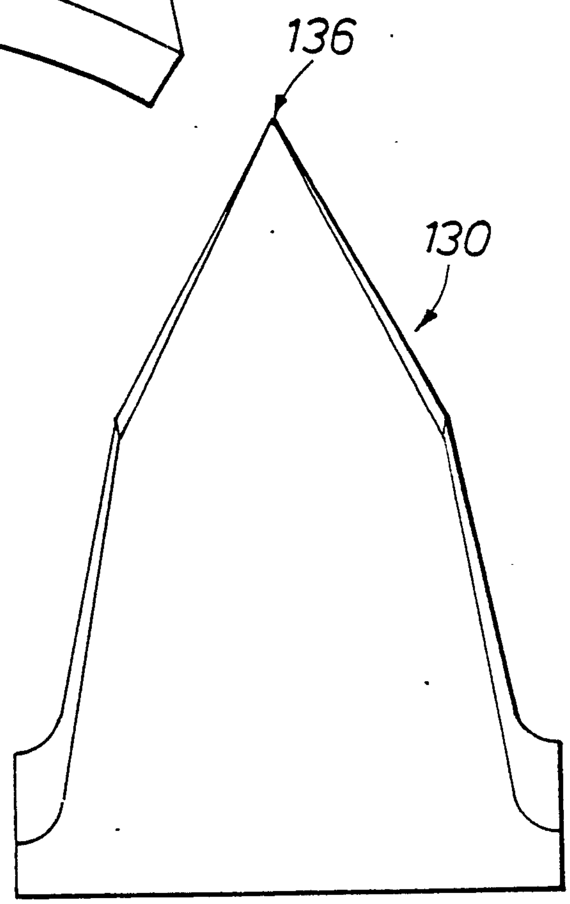


FIG. 12

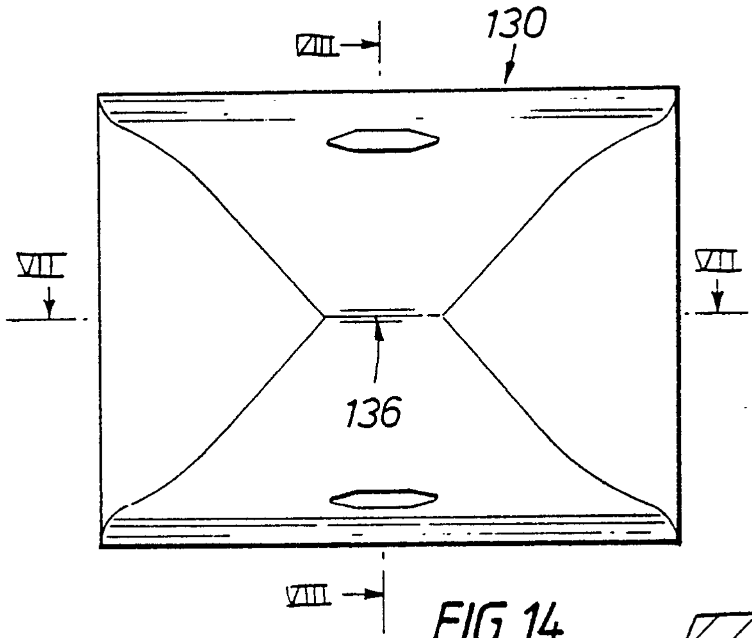
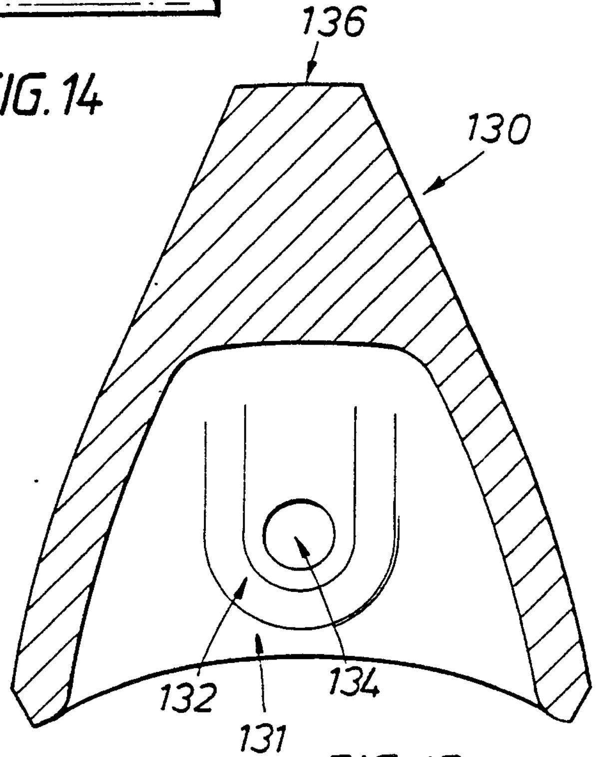


FIG. 14



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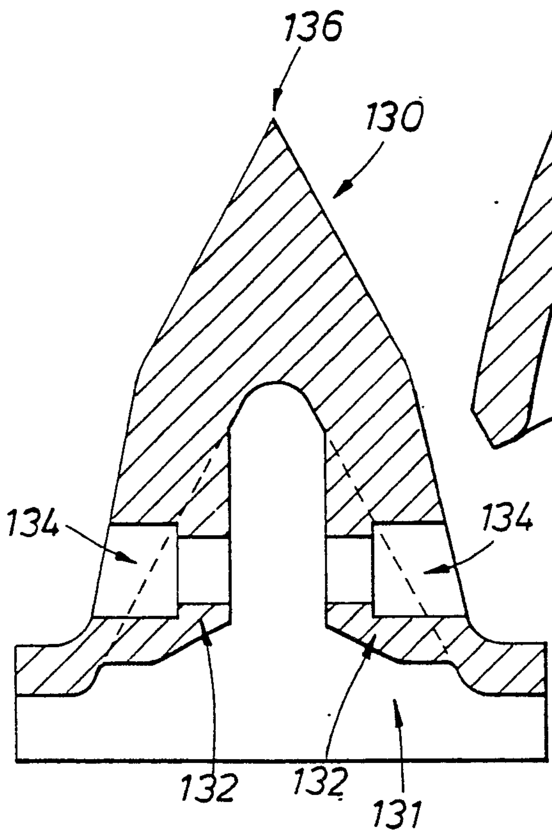


FIG. 16

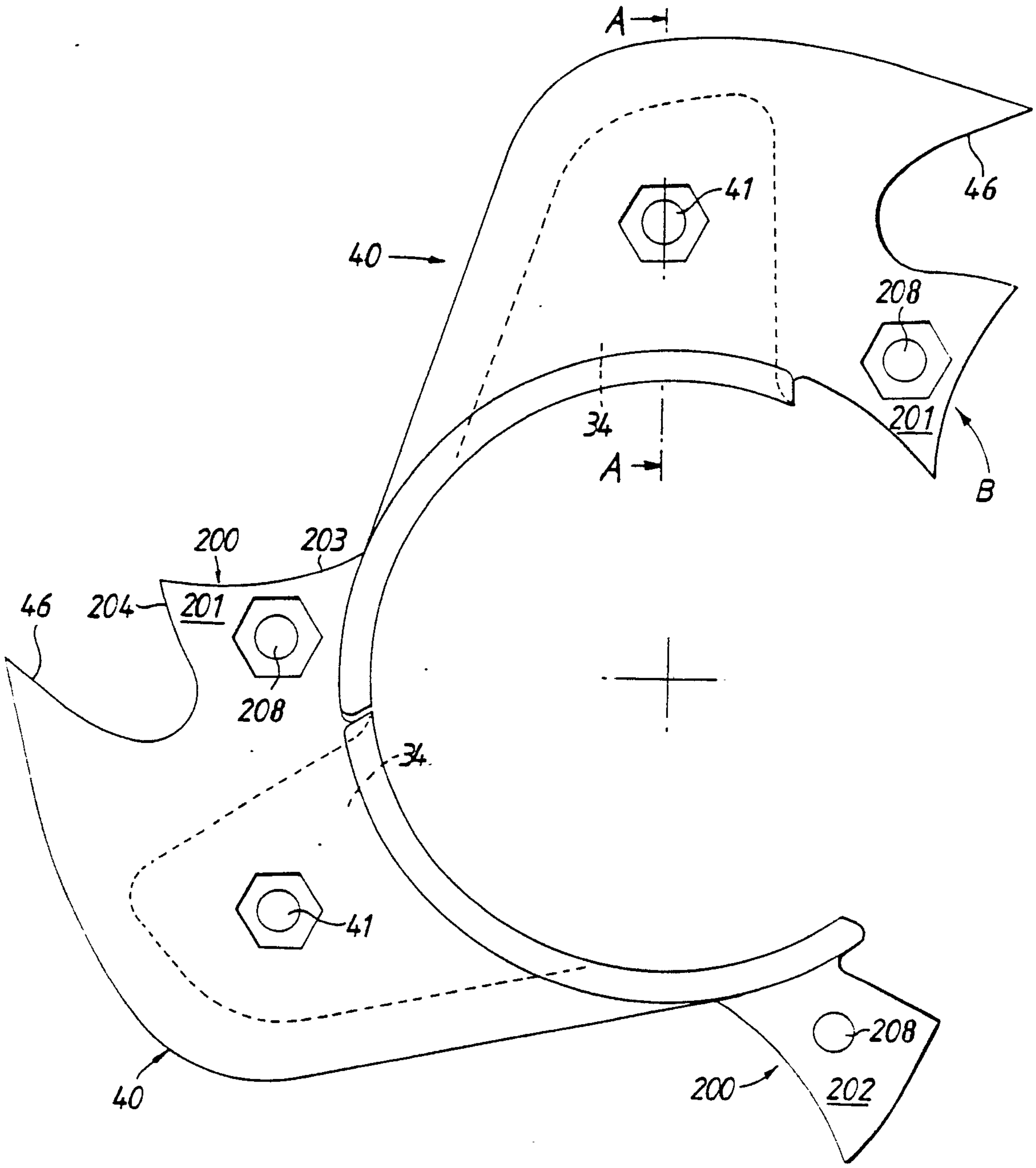


FIG 17

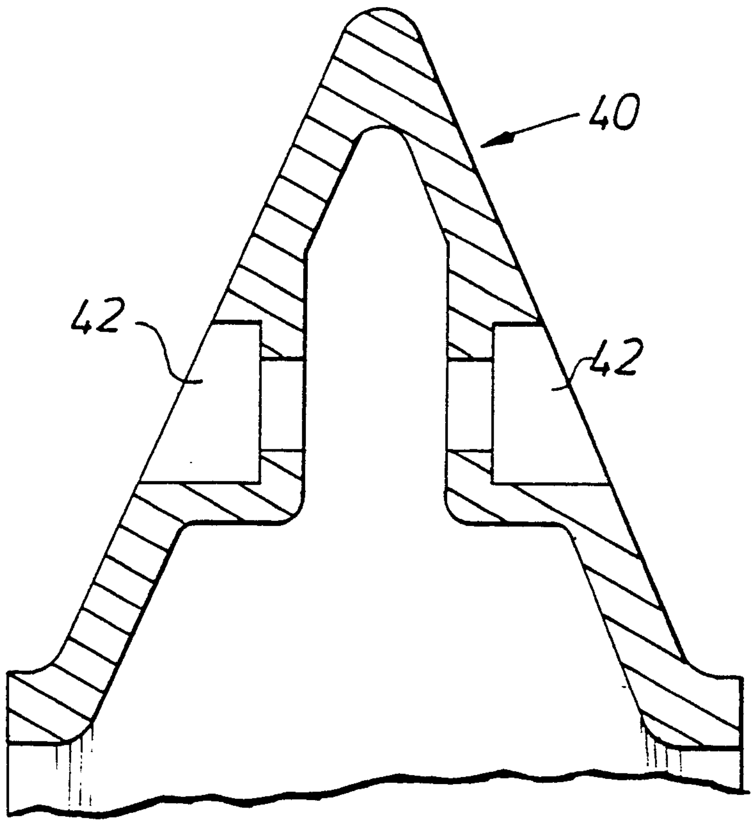
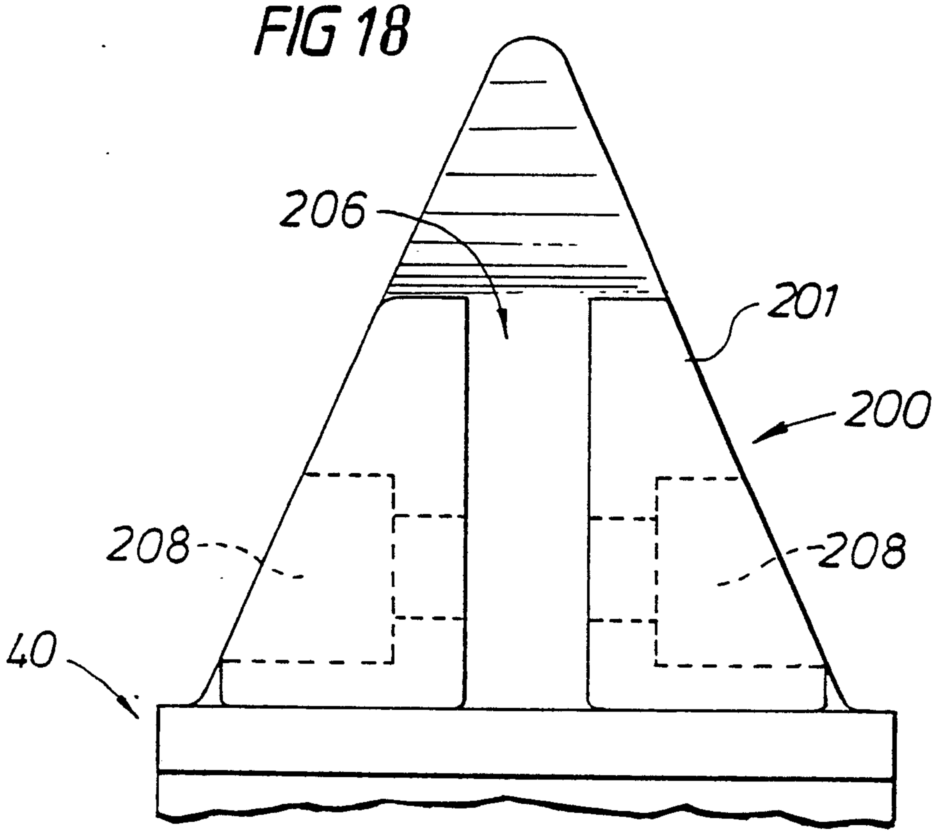


FIG 18



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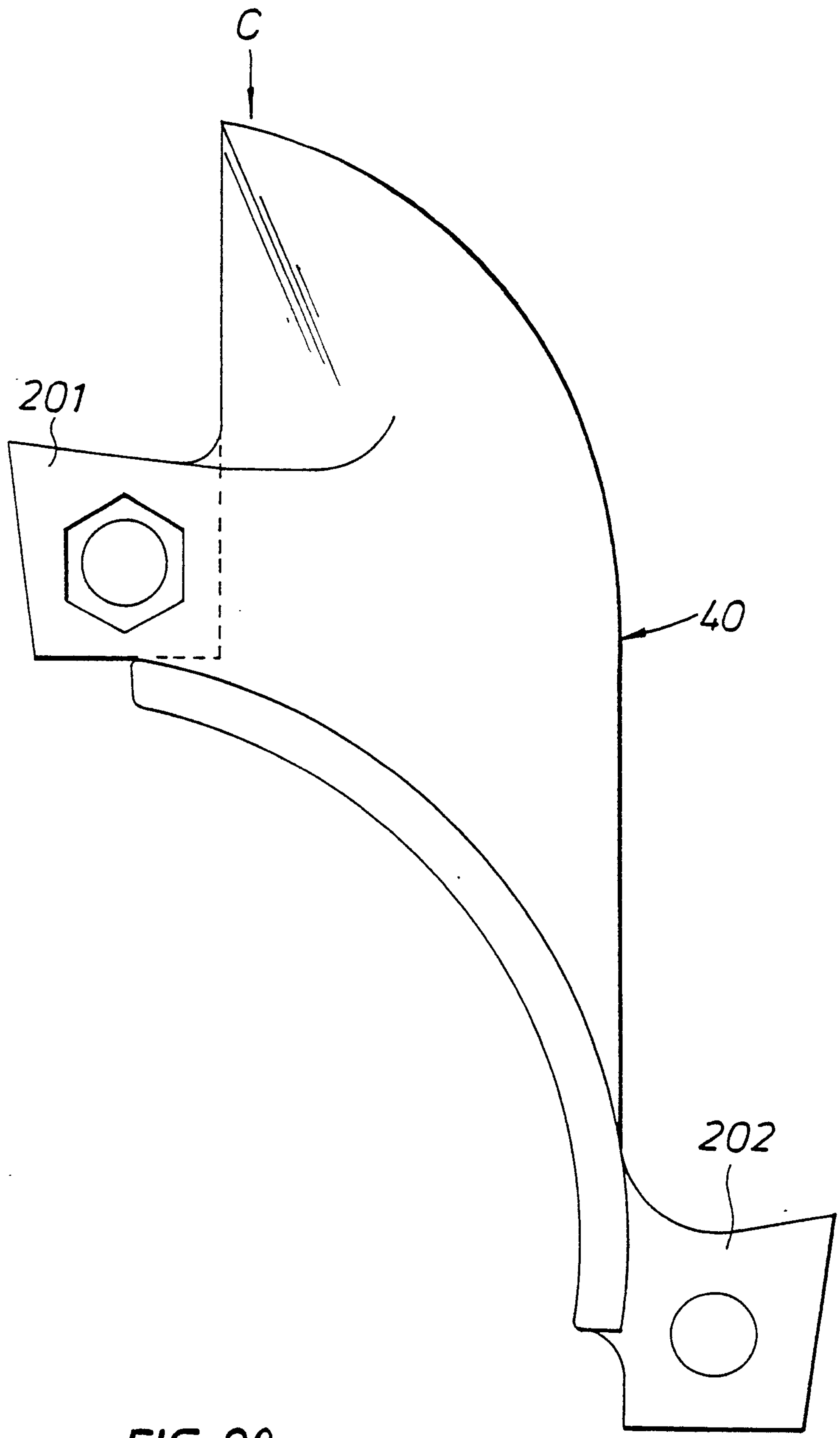

FIG. 20

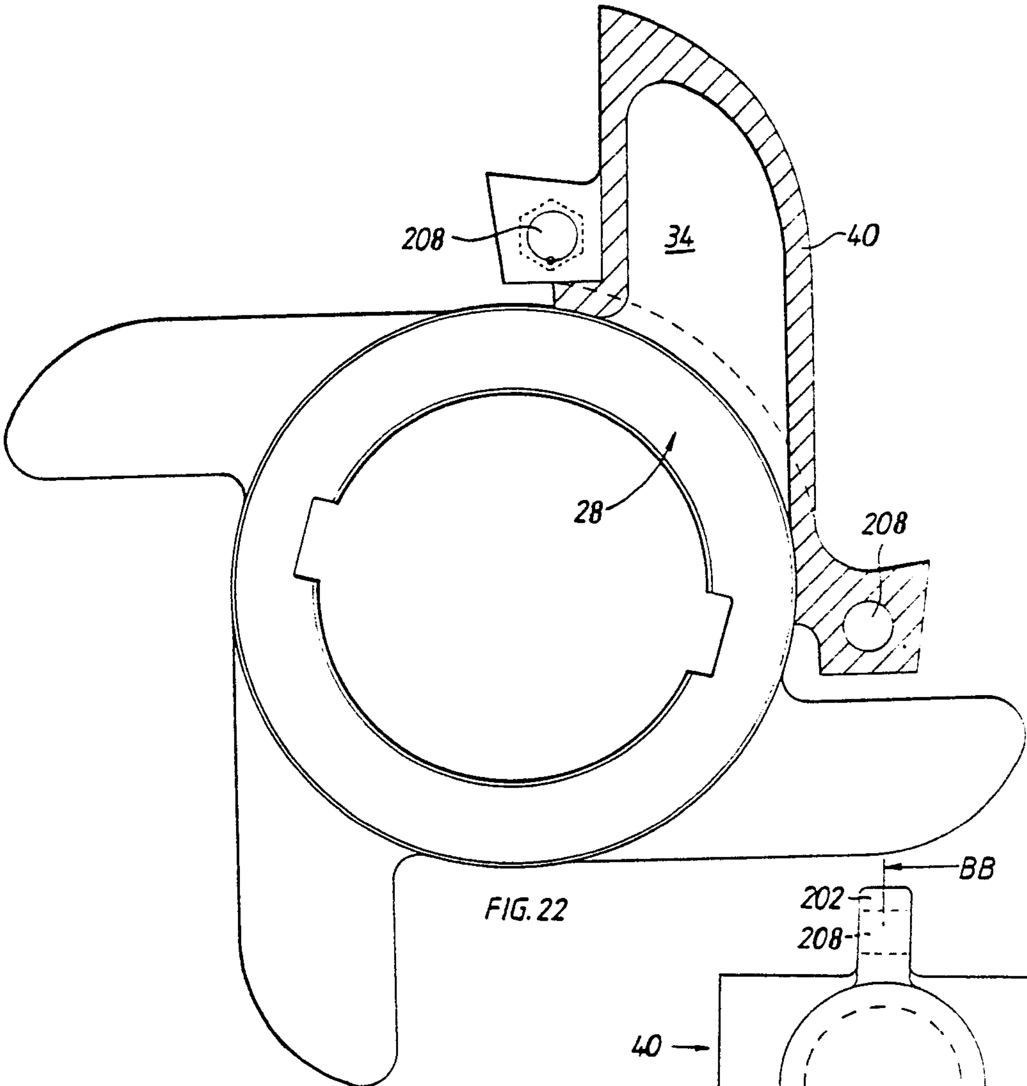

FIG. 22

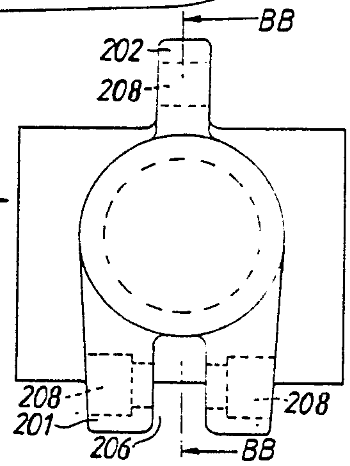

FIG. 21

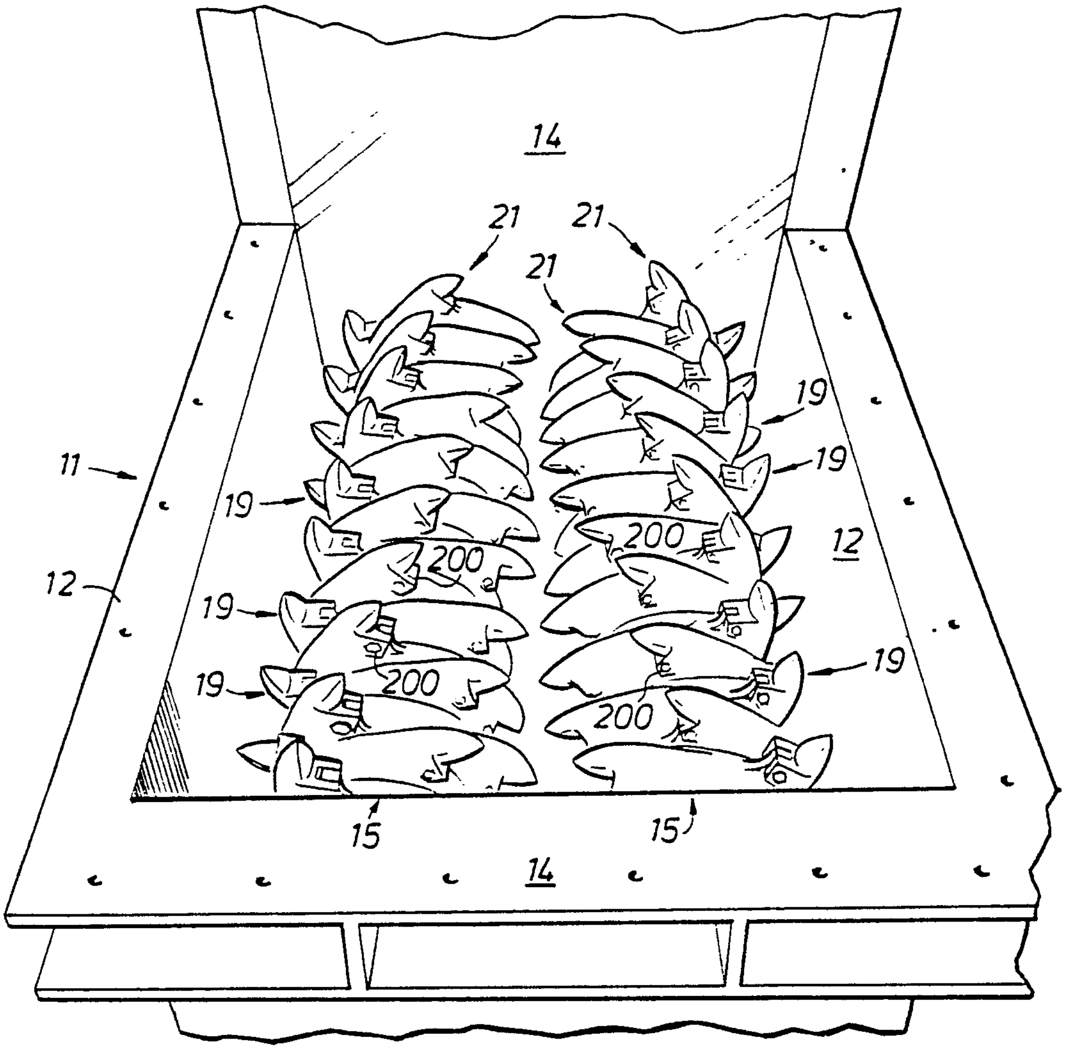

FIG. 23