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(54) Machine and method for making weakening cuts, particularly on container caps

Vorrichtung und Verfahren zum Formen von Schwächungseinschnitten, insbesondere auf Behälterkappen

Dispositif et procédé pour former des coupes affaiblissantes, en particulier pour capuchons de récipients

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Description

The present invention relates to a machine intended for mechanically and automatically making highly accurate weakening cuts on a cylindrical wall of a workpiece, particularly on plastics caps for containers such as bottles or the like. Weakening cuts of this kind serve for example for delimiting the zone constituting a tamper-proof band which is intended to be separated from the cap when the package is opened.

In the Applicant's Italian Patent 1,211,905 a composite tamper-proof closure cap is described, which has a moulded plastics side skirt part provided with a screw thread or other means for fastening the cap to the container. At the bottom of the side skirt a peripheral ring of reduced thickness is provided, in which is formed a tamper-proof band serving to make immediately visible any tampering with the package to which the cap has been applied, before the actual authorised opening of said package.

The tamper-proof band is fixed to the plastics side skirt by means of breakable bridges and is provided with a continuous flap turned over towards the interior of the cap and intended to engage a projection formed on the neck of the container, so that, when the cap is unscrewed, the breakable bridges are torn away and the tamper-proof band is separated from the side skirt of the cap.

This provides clear proof that an attempt has been made to open the package even before the top metal disc completing the cap has been actually separated from the mouth of the container.

A first method used hitherto for forming the weakening zone between the side skirt and the tamper-proof band consists in forming, during the process of moulding the cap, numerous bridges fastened to and connecting together the two parts of the cap. These bridges are separated from one another by generally rectangular gaps and are equally spaced over the circumference of the side skirt.

A second method consists in forming, during the process of moulding the cap, numerous protuberances on the inside wall of the side skirt so as to produce an increased wall thickness, since said protuberances extend radially towards the interior of the remaining part of the side skirt. In a subsequent operation a continuous circumferential cut of constant depth is then made in the cross-section of the skirt, cutting through the side skirt but leaving intact the protuberances previously formed. The intact protuberances thus form bridges between the side skirt in the upper part and the tamper-proof band in the lower part, said band thus being formed by circumferentially cutting through the ring of reduced thickness of the side skirt.

However, both these methods have the disadvantage of great inaccuracy in the formation of the bridges, thus making it difficult subsequently to open the package.

In the first method the inaccuracy is inherent to the method of moulding the plastics material, which does not make it possible to form equally spaced bridges of equal thickness in a simple and economical manner.

In the second method the operation of making the circumferential cut can be carried out with greater precision in an adequately economical manner; nevertheless, the inaccuracy and tolerances in the thickness of the parts moulded at high speed do not permit high precision in the formation of the bridges, in view of the fact that the protuberances are sometimes too thin to produce sufficiently strong bridges or are simply cut right through. On the other hand, the thickness of the side skirt is sometimes too great and the cut is therefore not sufficiently deep to form separate bridges.

Furthermore, from FR-A-2.393.736 a machine is known for making weakening cuts on a cylindrical wall of a workpiece and comprising a support surface of which at least a portion lies on a segment of a cylindrical generatrix, the cylindrical portion of the support surface being provided with cutting teeth generally at right angles to the support surface, the cutting teeth being disposed in alignment along the circumference of the cylindrical portion of the support surface, in a plane perpendicular to the axis of the cylindrical generatrix, the cutting teeth being separated from one another by gaps in between, the machine further comprising a holding device with a cylindrical body, the axis of the cylindrical body being parallel to the axis of the cylindrical generatrix, the cylindrical wall, in use, being held by the cylindrical body in forced contact with the cylindrical portion of the support surface, the cylindrical body being rotatable about its axis and having a circumferential groove lying in the same plane as in which the cutting teeth are disposed, the axis of the cylindrical body being capable of carrying out a relative rotation with regard to the axis of the cylindrical generatrix.

The main object of the present invention is therefore that of providing an improved machine for making weakening cuts on a cylindrical wall of a workpiece, capable of carrying out a weakening zone having great accuracy both in respect of the distance between the bridges and in respect of their thickness, thus improving on the uniformity of the strength of the breakable bridges.

Another object of the present invention is that of providing a cap with a weakening zone between the side skirt and the tamper-proof band by using such a simple and economical machine for making highly accurate weakening cuts on a cylindrical wall.

According to the present invention a machine for making weakening cuts on a cylindrical wall of a workpiece according to the preamble of claim 1 is characterised in that the cutting teeth are sharpened into acute cutting edges running substantially parallel to the support surface and facing, and in the course of the relative rotation between the cylindrical body and the support surface substantially centrally penetrating into, the groove of the cylindrical body, the width of the cutting

teeth being smaller than the width of the groove, the arrangement being such, that, in use, the cylindrical wall, while being held by the holding device, rolls without slipping on the cylindrical portion of the support surface, in the direction of alignment of the cutting teeth, the cutting teeth subsequently penetrating the cylindrical wall in close proximity to the cylindrical body while breakable bridges remain in place on the cylindrical wall in positions corresponding to the gaps.

According to another aspect of the present invention, a method of making weakening cuts on a cylindrical wall of a workpiece comprises the use of a machine as defined above.

The principal advantage obtained with the machine according to the present invention therefore consists in the considerable accuracy in the making of the cuts, both as regards their height and as regards their length, even when there are substantial differences in the thickness of the cylindrical wall.

Another advantage consists in the constancy and repeatability of the cuts in the presence of variable thicknesses of the material along the entire circumference of the cylindrical wall.

Yet another advantage consists in the fact that along the weakening line formed by the present machine there are no missing bridges and no zones where cuts have not been made.

The present invention will be further explained below and other advantages will emerge from the description of a practical embodiment of the machine for making weakening cuts on container caps, this description being given solely by way of example and without limitation, with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of the present machine;
Figure 2 is a partial view in section, with parts omitted, taken on the line II-II in Figure 1;
Figure 3 is a partial view in section, with parts omitted, taken on the line III-III in Figure 2; and
Figure 4 is a partial view in section, with parts omitted, taken on the line IV-IV in Figure 3.

Referring to the figures of the accompanying drawings, and in particular to Figures 1 and 2 thereof, it can be seen that the present machine for making weakening cuts on container caps comprises a main plate 10 fastened to the main frame of the machine and immovable relative to said main frame.

A main shaft 12 is also fastened to the machine frame and to the main plate 10, and a planet wheel carrier disc 14 (see Figure 2), driven by a mechanical drive device (not shown), rotates about said shaft.

The planet wheel carrier disc 14 supports rotatably numerous planet wheels 16, which are sixteen in number in the embodiment illustrated in the drawings, although this number can be increased or reduced in accordance with requirements dictated by the size of the machine.

The perimetral edge of the main plate 10 is given gear teeth at 18 (see Figure 2), and each planet wheel 16 carries gear teeth 20 meshing with the gear teeth 18 on the main plate 10. In this way the planet wheels 16 are turned about their axis when the planet wheel carrier disc 14 turns about the main shaft 12.

As is more clearly shown in Figure 1, the present machine also includes a cap admission station 22, a cutting station 24, and a station 26 for the discharge of said caps.

The caps 28 are continuously fed to the admission station 22 by means of a chute 30, at the end of which they wait to be picked up by the head of the planet wheels 16 during the rotation, in the clockwise direction with reference to Figure 1, of the planet wheel carrier disc 14 and thus to be carried through the cutting station 24 where, as will be more fully described further on, the profiled cut forming the tamper-proof band is made.

After passing through the cutting station 24, the caps 28 leave the machine at the discharge station 26, where they are taken off by electromagnetic devices, if they have metallic parts, or by suction devices if they are made of plastics material, or by any other of the many devices which are known to those skilled in the art and are suitable for the purpose.

The cutting station 24 has a blade carrier device 32 provided, at the inlet zone of the cutting station 24, with an inclined approach surface 34 and, in the central zone of the cutting station 24, with a blade 36 intended for making the actual cut, as will be more fully described further on.

Reference will now be made to Figures 3 and 4, in which the cutting station 24 is shown together with a cap 28 on which a cut is being made in order to define the tamper-proof band in relation to the side skirt of said cap.

The blade carrier device 32 is of sandwich construction and receives in its interior the actual blade 36, together with electrical resistors 38 for heating said blade in order to obtain a better cut.

On its side facing the cap 28 (see Figure 4) the blade 36 is so shaped as to have a top surface 40 having a cylindrical conformation intended to form a support for the cap ring during the cutting operation, while at the bottom said blade is provided with numerous cutting teeth 42 in alignment with one another along the blade 36. As can be better seen in Figure 3, the cutting teeth 42 are separated from one another by gaps 44.

As can be more clearly seen in Figure 4, each planet wheel 16 has a baseplate 46, on which the cap 28 is supported during the cutting operation, and also a cylindrical body 48 which holds the cap 28 against the blade 36 during the cutting operation. Above the cylindrical body 48 each planet wheel 16 ends in a frusto-conical head 50 intended to facilitate the picking-up of the cap 28 in the admission station 22 and its positioning on the planet wheel 16.

A hood 52 fastened to the main plate 10 contributes towards the vertical positioning of the caps 28.

The cylindrical body 48 of the planet wheel 16 is provided with vertical channels forming a rack and has a groove 54 in line with the cutting teeth 42 and a groove 56 in which a fastening flap 58 of the tamper-proof band of the cap 28 is received during the cutting operation, in order to avoid damage to it.

The cap 28, which is shown in Figure 4 in the position which it occupies while the cut is being made, comprises itself in known manner a side skirt 60, which in its interior is provided with screw threads or other engaging means intended to match similar engaging means formed on the neck of the container.

The cap 28 also comprises a disc-like top part 62, generally made of metal but sometimes also of plastics material, which is intended to close the mouth of the container in conjunction with a sealing ring 64.

The bottom part of the side skirt 60 of the cap 28 ends in a ring 66 of reduced thickness, which is provided with the previously mentioned fastening flap 58 and is intended to form the tamper-proof band after the operation of making the weakening cut with the aid of the present machine.

It should then be noted that the surface 40, forming part of a cylinder, of the blade 36 corresponds to the same ideal cylinder to which the generatrix of the toothing 18 of the main plate 10 corresponds, as can more clearly be seen in Figure 2.

During operation, the planet wheel carrier disc 14 is rotated in the clockwise direction, referring to Figure 1, about the main shaft 12, and each planet wheel 16 turns about its own axis in the clockwise direction, referring to Figure 1, because of the coupling of the gear teeth 20 thereof to the gear teeth 18 attached to the main plate 10.

When each planet wheel 16 arrives at the admission station 22, the latter picks up and carries with it the first cap 28 waiting on the chute 30.

In the following movement, the cap 28 is positioned by the action of centrifugal force and by the action of the approach surface 34, so as to remain held by an interference fit between the cylindrical support surface 40 of the blade 36 and the channelled surface of the cylindrical body 48 of the planet wheel 16.

Since, as already stated, the generatrix of the gear teeth 18 corresponds to the cylinder to which the cylindrical support surface 40 corresponds, and since the presence of the rack-like channels on the cylindrical body 48 and their interference fit with the plastic material of the cap 28 prevent slipping between the cap 28 and the cylindrical body 48 of the planet wheel 16, the effect is that the cap 28 is made to roll on the cylindrical support surface 40 without any possibility of slipping.

As the side skirt 60 of the cap 28, which, as has been seen, rolls without slip on the cylindrical support surface 40, encounters each cutting tooth 42, the latter makes a cut in the ring 66 of reduced thickness, as best seen in Figure 4, while in positions facing the gaps 44 a connecting bridge between the side skirt and the tamper-proof band is left intact in the ring 66.

The presence of the electrical resistors 38, the supply of current to which is controlled by an appropriate temperature-sensitive regulation device (not shown), enables the temperature of the blade 36 to be raised so as to achieve perfect separation of the plastics material in the zone affected by the cutting.

After the cap 28 has made a complete revolution about its own axis, rolling without slipping on the cylindrical support surface 40 of the blade 36, the cap encounters on the blade 36 a zone devoid of cutting teeth and at the end the planet wheel 16 reaches the discharge station 26, where the cap 28 is taken off from the present machine, as already stated, to be passed on for further processing.

From the foregoing it is therefore obvious that with the present machine a method is carried out which consists essentially of the operations of: providing for the cap ring 66 a support surface 40 equipped with cutting teeth 42 generally at right angles to said surface, which are aligned and separated by gaps 44; and causing the side skirt 60 of a cap 28 to roll, in a reciprocal relative movement without slipping, in forced contact with the support surface 40, in such a manner that the cutting teeth 42 penetrate into said side skirt along a circumference lying in a plane at right angles to the axis of the cap, the arrangement being such that, at the end of one complete rotation about the side skirt of the cap, in positions corresponding to the gaps 44 between the cutting teeth 42, numerous bridges remain in place on the side skirt 60 of the cap 28, their number being equal to the number of the gaps 44, said bridges separably connecting the side skirt to the tamper-proof band.

Since caps of various diameters are produced, it is desirable that the present machine should be easily adaptable to operate with caps of different diameters. For this purpose, with the present machine it is only necessary to change the blade 36 as a whole, replacing it with a new blade having a number of cutting teeth 42 and gaps 44 appropriate for the new diameter of the cap with which it is desired to operate. It is in fact obvious that the length of the portion provided with teeth 42 on the blade 36 must always correspond to the outside circumference of the cap on which the cut is to be made, in order to avoid superimposed cuts.

Analogously, the number of gaps 44 must correspond to the desired number of bridges, and this in turn will depend on the diameter of the cap being processed.

It will therefore be noted how the major part of the present machine, such as the main plate, the planet wheel carrier disc, the planet wheels and their connection means, can be used for working with caps of any diameter, since they hold the cap only in the zone in which the cut is being made, irrespective of the diameter of said cap.

It is in addition possible to provide a device which will hold the cap 28 fast and will move the blade 36 around its side surface. This substantially corresponds

to reversing the functions of the blade 36 and planet wheel 16 in relation to the cap 28 being processed, by holding the axis of the wheel still and moving the blade, obviously without departing from the scope of the invention as defined by the claims.

Although for the sake of convenience the cylindrical body 48 of the planet wheel 16 has been stated to be channelled in order to obtain an interference fit between said planet wheel 16 and the blade 36, it is entirely obvious that the rack-like channelling can be formed on the blade 36 or on both these members.

Furthermore, the rack-like channelling may be replaced by any similar expedient producing corrugations on the surface of the various members in order to assist engagement and prevent the slipping of the cap, while it is also obvious that an expedient of this kind can be dispensed with if the friction between the plastics material, or other material of which the cap is made, and the materials of which the blade 36 and the cylindrical body 48 of the planet wheel 16 are made is sufficient to prevent slipping between the surfaces coupled together by force.

Moreover, although reference has been made throughout to container caps as the objects processed by the machine of the present invention, it is clear that the same machine can be used for making weakening cuts on any objects made of any materials.

Although only a preferred embodiment of the machine for making weakening cuts has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the machine construction without departing from the scope of the invention as defined by the appended claims.

Claims

1. Machine for making weakening cuts on a cylindrical wall (28) of a workpiece and comprising a support surface (40) of which at least a portion lies on a segment of a cylindrical generatrix, the cylindrical portion of the support surface (40) being provided with cutting teeth (42) generally at right angles to the support surface (40), the cutting teeth (42) being disposed in alignment along the circumference of the cylindrical portion of the support surface (40), in a plane perpendicular to the axis of the cylindrical generatrix, the cutting teeth (42) being separated from one another by gaps (44) in between, the machine further comprising a holding device (48) with a cylindrical body, the axis of the cylindrical body (48) being parallel to the axis of the cylindrical generatrix, the cylindrical wall (28), in use, being held by the cylindrical body (48) in forced contact with the cylindrical portion of the support surface (40), the cylindrical body (48) being rotatable about its axis and having a circumferential groove (54) lying in the same plane as in which the cutting teeth (42) are disposed, the axis of the cylindrical body (48) being capable of carrying out a relative rotation with regard to the axis of the cylindrical generatrix, the machine being characterised in that the cutting teeth (42) are sharpened into acute cutting edges running substantially parallel to the support surface (40) and facing, and in the course of the relative rotation between the cylindrical body (48) and the support surface (40) substantially centrally penetrating into, the groove (54) of the cylindrical body (48), the width of the cutting teeth (42) being smaller than the width of the groove (54), the arrangement being such, that, in use, the cylindrical wall (28), while being held by the holding device (48), rolls without slipping on the cylindrical portion of the support surface (40), in the direction of alignment of the cutting teeth (42), the cutting teeth (42) subsequently penetrating the cylindrical wall (28) in close proximity to the cylindrical body (48) while breakable bridges remain in place on the cylindrical wall (28) in positions corresponding to the gaps (44).

2. Machine according to claim 1, characterised in that said support surface (40) is provided with parts forming on said wall corrugations, adapted to convert the forced contact between said wall (28) and the support surface (40) into an engagement by interference fit.

3. Machine according to Claim 2, characterised in that said corrugating parts consist of rack-like channelling.

4. Machine according to any one of the preceding claims, characterised in that said holding device (48) for said wall (28), is provided with parts forming corrugations on its outer surface and adapted to convert the forced contact between it and the wall into an engagement by interference fit.

5. Machine according to Claim 4, characterised in that said corrugating parts consist of rack-like channelling.

6. Machine according to Claim 1, characterised in that said support surface is fastened to a main plate (10) and said cylindrical body (48) is mounted for rotation on a planet wheel carrier disc (14) rotating coaxially with said main plate (10).

7. Machine according to Claim 6, characterised in that main gear teeth (18) are provided coaxially with said support surface (40) and attached to said main plate (10), and said cylindrical body (48) is attached to secondary gear teeth (20) meshing with said main gear teeth (18).

8. Machine according to Claim 7, characterised in that the radius of the generatrix of said main gear teeth

(18) is equal to the radius of the cylinder to which the support surface (40) corresponds.

9. Machine according to any of Claims 6 to 8, characterised in that numerous cylindrical bodies (48) are provided, which in succession engage said support surface (40).

10. Method of making weakening cuts on a cylindrical wall of a workpiece, comprising the use of a machine according any one of the preceding claims.

Patentansprüche

1. Vorrichtung zum Formen von Schwächungseinschnitten auf einer zylindrischen Wand (28) eines Werkstücks, mit den folgenden Merkmalen: es ist eine Prägeoberfläche (40) vorgesehen, von der wenigstens ein Teil auf einem Segment einer zylindrischen Erzeugenden liegt, wobei der zylindrische Abschnitt der Trägeroberfläche (40) mit Schneidzähnen (42) versehen ist, die allgemein rechtwinklig zur Trägeroberfläche (40) liegen und längs des Umfangs des zylindrischen Abschnitts der Trägeroberfläche (40) in einer Ebene senkrecht zur Achse der zylindrischen Erzeugenden ausgerichtet sind, und wobei die Schneidzähne (42) voneinander durch Zwischenräume (44) dazwischen getrennt sind; die Vorrichtung weist außerdem eine Haltevorrichtung (48) mit einem zylindrischen Körper auf, dessen Achse parallel zur Achse der zylindrischen Erzeugenden liegt; die zylindrische Wand (28) wird im Betrieb durch den zylindrischen Körper (48) in Zwangsberührung mit dem zylindrischen Abschnitt der Trägeroberfläche (40) gehalten; der zylindrische Körper (48) ist um seine Achse drehbar und besitzt eine Umfangsnut (56), die in der gleichen Ebene liegt wie die Schneidzähne (42); die Achse des zylindrischen Körpers (48) kann eine Relativdrehung in bezug auf die Achse der zylindrischen Erzeugenden durchführen; wobei die Vorrichtung
dadurch gekennzeichnet ist, daß die Schneidzähne (42) zu scharfen Schneidrändern geschärft sind, die im wesentlichen parallel zur Trägeroberfläche (40) verlaufen und auf diese hin weisen und im Lauf der relativen Drehung zwischen dem zylindrischen Körper (48) und der Trägeroberfläche (40) im wesentlichen zentral in die Nut (54) des zylindrischen Körpers (48) eindringen, wobei die Breite der Schneidzähne (42) kleiner ist als die Breite der Nut (54), und daß die Anordnung derart getroffen ist, daß im Betrieb die zylindrische Wand (28), während sie von der Haltevorrichtung (48) erfaßt ist, auf dem zylindrischen Teil der Trägeroberfläche (40) schlupffrei in Richtung der ausgerichteten Schneidzähne (42) abrollt, wobei die Schneidzähne (42) aufeinanderfolgend in die zylindrische Wand (28) in unmittelbarer Nähe des zylindrischen Körpers (48) eindringen, während aufbrechbare Brücken an der Stelle der zylindrischen Wand (28) an Stellen verbleiben, die den Zwischenräumen (44) entsprechen.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß die Trägeroberfläche (40) mit Teilen versehen ist, die auf der Wand Wellungen bilden, um die Reibungsberührung zwischen der Wand (28) und der Trägeroberfläche (40) in einen Festsitz umzuwandeln.

3. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet, daß die Wellungen aus zahnartigen Kanälen bestehen.

4. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß die Haltevorrichtung (48) für die Wand (28) mit Teilen versehen ist, die Wellungen an der äußeren Oberfläche bilden, um die Reibungsberührung zwischen dieser Oberfläche und der Wand in einen Festsitz umzuwandeln.

5. Vorrichtung nach Anspruch 4,
dadurch gekennzeichnet, daß die Wellungen zahnartige Kanäle aufweisen.

6. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß die Trägeroberfläche an einer Hauptplatte (10) festgelegt ist, und daß der zylindrische Körper (48) drehbar auf einer Planetenradträgerscheibe (14) gelagert ist, die sich koaxial zur Hauptplatte (10) dreht.

7. Vorrichtung nach Anspruch 6,
dadurch gekennzeichnet, daß die Hauptgetriebezähne (18) koaxial zu der Trägeroberfläche (40) angeordnet und an der Hauptplatte (10) befestigt sind, und daß der zylindrische Körper (40) eine sekundäre Verzahnung (20) aufweist, die mit der Hauptverzahnung (18) kämmt.

8. Vorrichtung nach Anspruch 7,
dadurch gekennzeichnet, daß der Radius der Erzeugenden der Hauptgetriebezähne (18) gleich ist dem Radius des Zylinders, dem die Trägeroberfläche (40) entspricht.

9. Vorrichtung nach einem der Ansprüche 6 bis 8,
dadurch gekennzeichnet, daß zahlreiche zylindrische Körper (48) vorgesehen sind, die aufeinanderfolgend an der Trägeroberfläche (40) angreifen.

10. Verfahren zur Herstellung von Schwächungseinschnitten auf der zylindrischen Wand eines Werkstücks, welches die Benutzung einer Vorrichtung

gemäß einem der vorhergehenden Ansprüche umfaßt.

Revendications

1. Machine pour réaliser des découpes de fragilisation sur une paroi cylindrique (28) d'une pièce à usiner et comprenant une surface de support (40) dont au moins une portion repose sur un segment d'une génératrice cylindrique, la portion cylindrique de la surface de support (40) étant dotée de dents de découpe (42) généralement perpendiculaires à la surface de support (40), les dents de découpe (42) étant alignées le long de la circonférence de la portion cylindrique de la surface de support (40), dans un plan perpendiculaire à l'axe de la génératrice cylindrique, les dents de découpe (42) étant séparées les unes des autres par des espaces (44) entre elles, la machine comprenant en outre un dispositif de maintien (48) avec un corps cylindrique, l'axe du corps cylindrique (48) étant parallèle à l'axe de la génératrice cylindrique, la paroi cylindrique (28), à l'utilisation, étant maintenue par le corps cylindrique (48) en contact forcé avec la portion cylindrique de la surface de support (40), le corps cylindrique (48) pouvant tourner sur son axe et comportant une gorge circonférentielle (54) se situant dans le même plan que le plan dans lequel les dents de découpe (42) sont disposées, l'axe du corps cylindrique (48) étant adapté à une rotation relative par rapport à l'axe de la génératrice cylindrique, la machine étant caractérisée en ce que les dents de découpe (42) sont taillées en arêtes de coupe vives s'étendant sensiblement parallèlement à la surface de support (40) et se faisant face, et au cours de la rotation relative entre le corps cylindrique (48) et la surface de support (40), pénétrant sensiblement centralement dans la gorge (54) du corps cylindrique (48), la largeur des dents de découpe (42) étant inférieure à la largeur de la gorge (54), l'agencement étant tel que, à l'utilisation, la paroi cylindrique (28), tout étant maintenue par le dispositif de maintien (48), roule sans glisser sur la portion cylindrique de la surface de support (40), dans la direction d'alignement des dents de découpe (42), les dents de découpe (42) pénétrant ensuite dans la paroi cylindrique (28) tout près du corps cylindrique (48) tandis que les ponts de rupture demeurent en place sur la paroi cylindrique (28) en des positions correspondant aux espaces (44).

2. Machine selon la revendication 1, caractérisée en ce que ladite surface de support (40) est dotée de parties formant sur ladite paroi des nervures, adaptées à transformer le contact forcé entre ladite paroi (28) et la surface de support (40) en un engagement par ajustement serré.

3. Machine selon la revendication 2, caractérisée en ce que lesdites parties à nervures consistent en canaux en crémaillère.

4. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que ledit dispositif de maintien (48) pour ladite paroi (28) est doté de parties formant des nervures sur sa surface externe et adaptées à transformer le contact forcé entre le dispositif de maintien et la paroi en un engagement par ajustement serré.

5. Machine selon la revendication 4, caractérisée en ce que lesdites parties à nervures consistent en canaux en crémaillère.

6. Machine selon la revendication 1, caractérisée en ce que ladite surface de support est fixée à une plaque principale (10) et ledit corps cylindrique (48) est monté à rotation sur un disque porte-satellites (14) tournant co-axialement avec ladite plaque principale (10).

7. Machine selon la revendication 6, caractérisée en ce que des dents d'engrenage principales (18) sont prévues co-axialement avec ladite surface de support (40) et fixées à ladite plaque principale (10), et ledit corps cylindrique (48) est fixé à des dents d'engrenage secondaires (16) s'engrenant avec lesdites dents d'engrenage principales (18).

8. Machine selon la revendication 7, caractérisée en ce que le rayon de la génératrice desdites dents d'engrenage principales (18) est égal au rayon du cylindre auquel la surface de support (40) correspond.

9. Machine selon l'une quelconque des revendications 6 à 8, caractérisée en ce que de nombreux corps cylindriques (48) sont prévus, qui engagent successivement ladite surface de support (40).

10. Procédé pour réaliser des découpes de fragilisation sur une paroi cylindrique d'une pièce à usiner, comprenant l'utilisation d'une machine selon l'une quelconque des revendications précédentes.

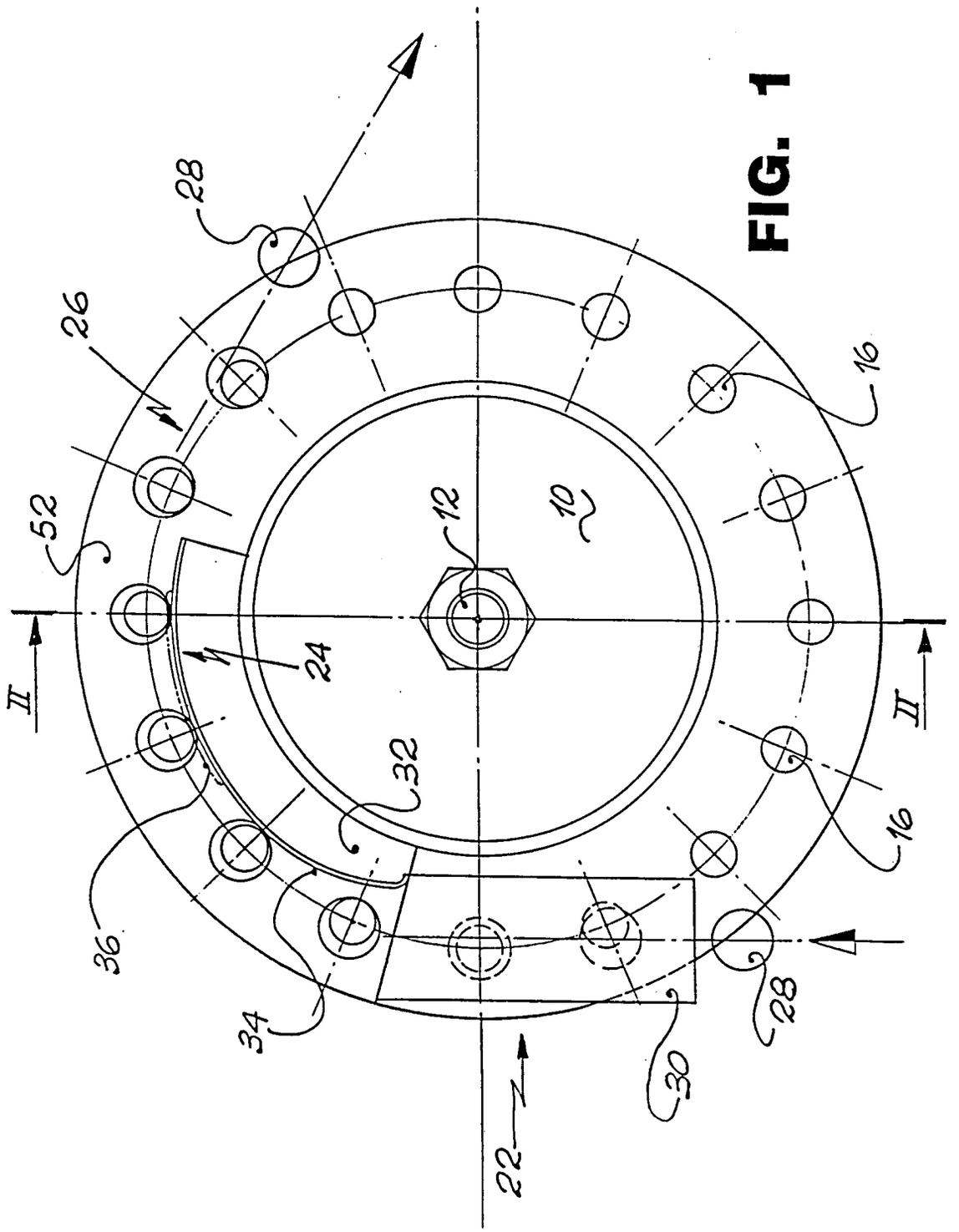

FIG. 1

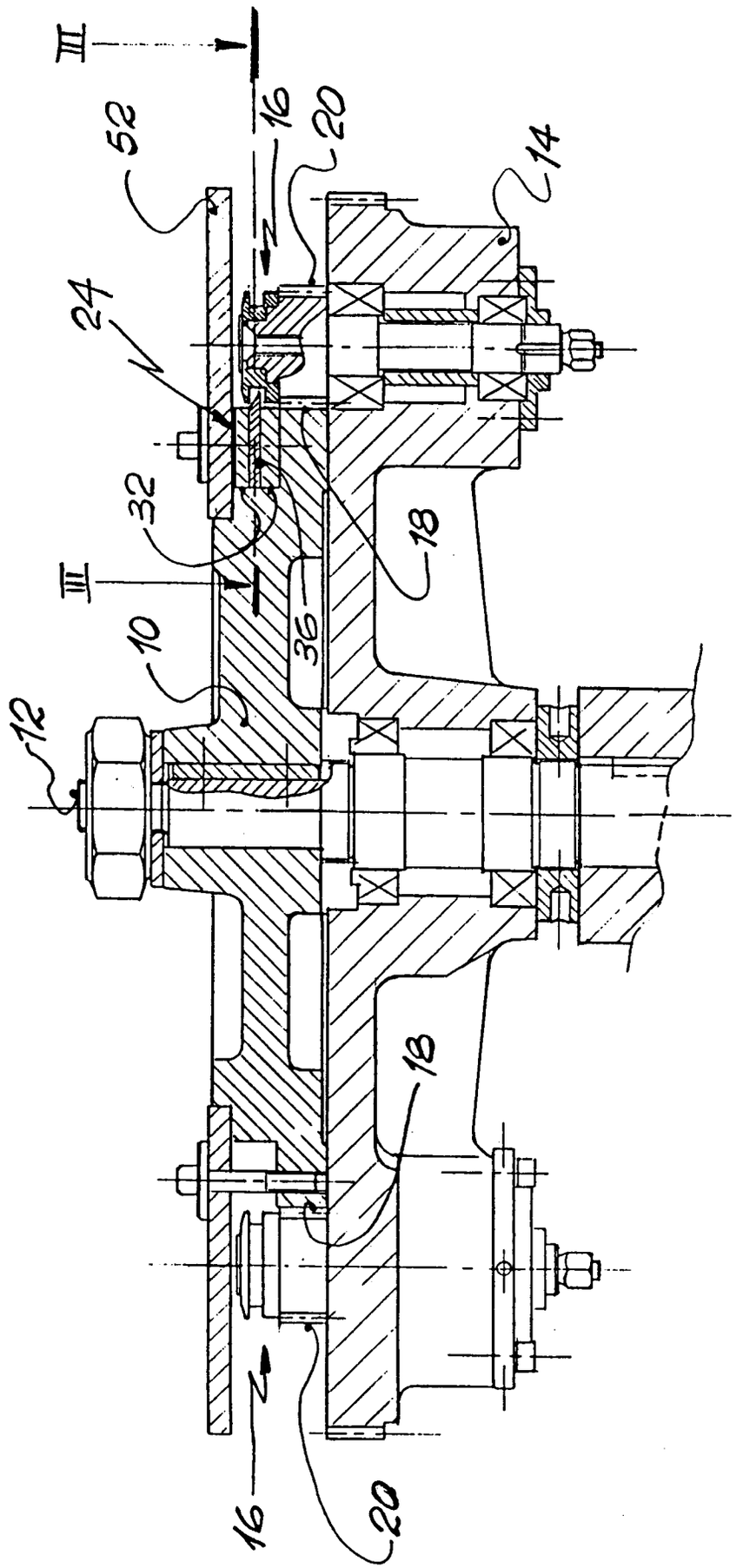

FIG. 2

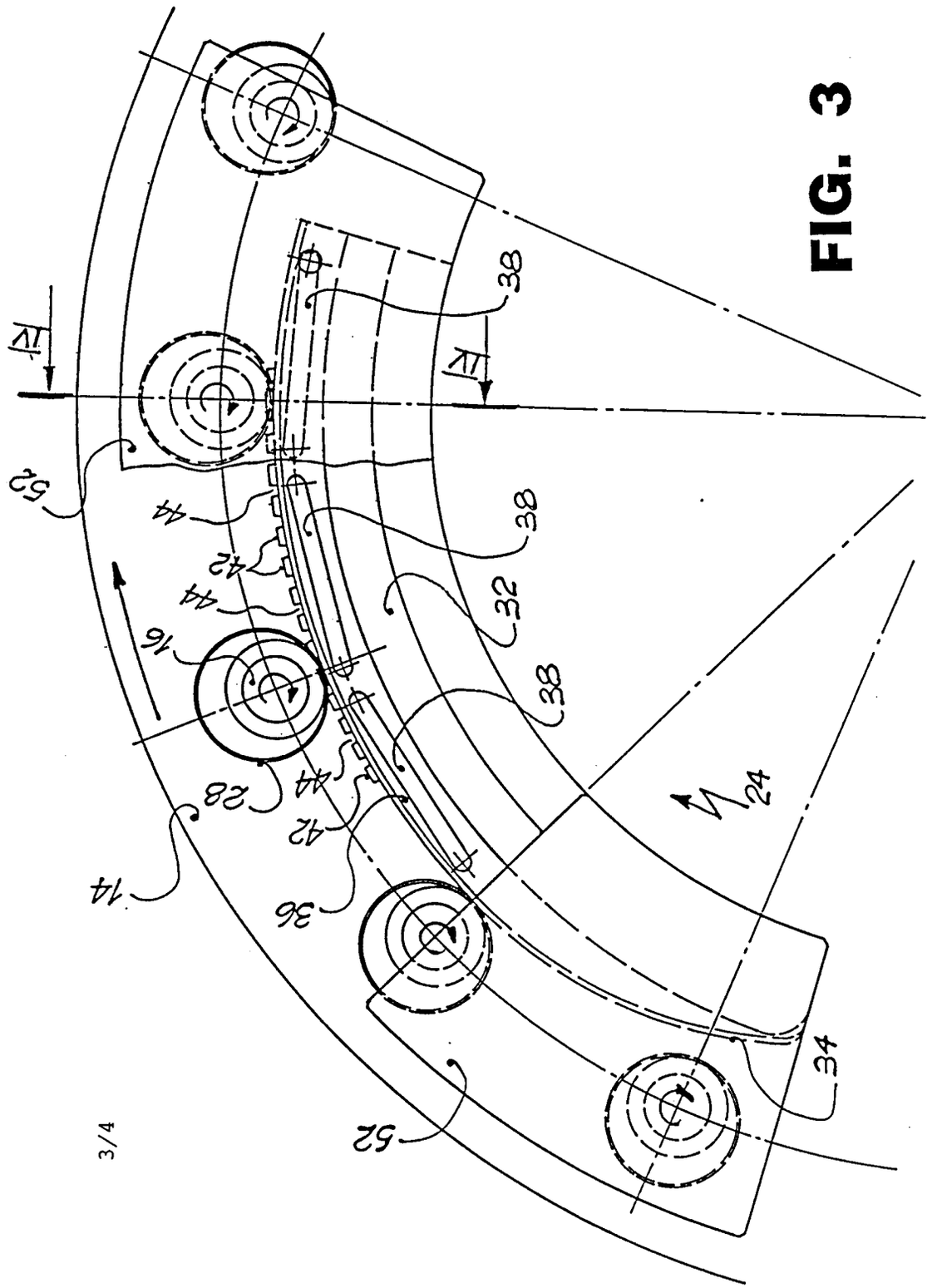

FIG. 3

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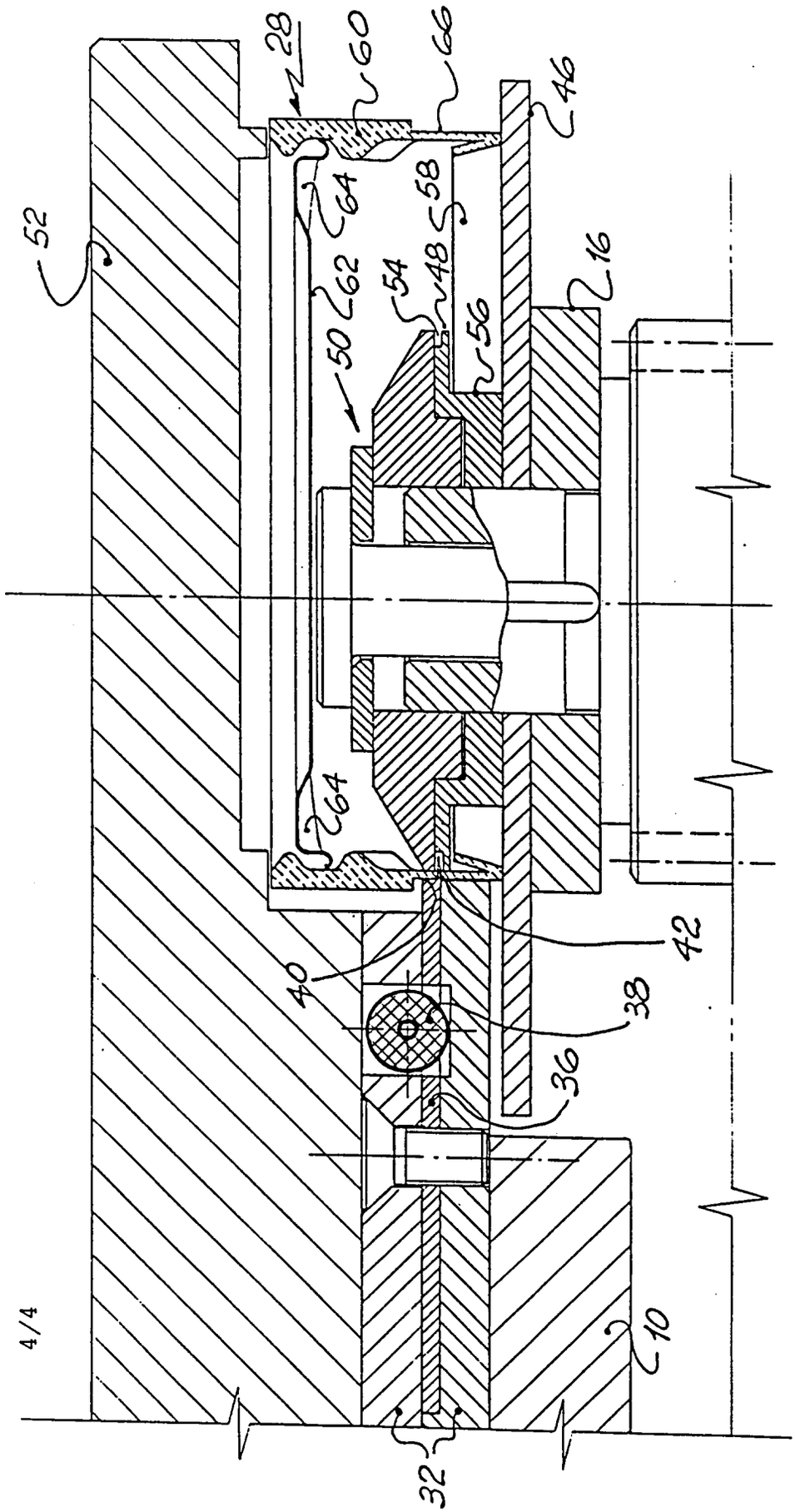

FIG. 4