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72 **TOLLHUPP, Michel**

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TITLE OF INVENTION

72 **DEVICES FOR MARKING GAMING CHIPS AND PAD PRINTING INSTALLATIONS INCORPORATING SAME**

57 Abstract (not more than 150 words) and figure of the drawings to which the abstract refers, are attached.

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ABSTRACT

The invention concerns a device (30) for marking gaming chips (10) comprising an axial support (32) with an end surface (29) designed to carry the chip. The device (30) for use in pad printing, is associated with vacuum suction means (58) to maintain the chip (10) firmly pressed on the pressing ring (41) of the support (32) after the sealing silicone elastomer disc has been flattened under the action of the vacuum. The support (32) comprises a vacuum chamber (33) emerging through an opening (31) on the end surface (29) at the centre of the disc (40) and a multiple valve (50) controlling insulation of the chamber (33) or its being communicated either with the vacuum suction means (58) or with outside air.

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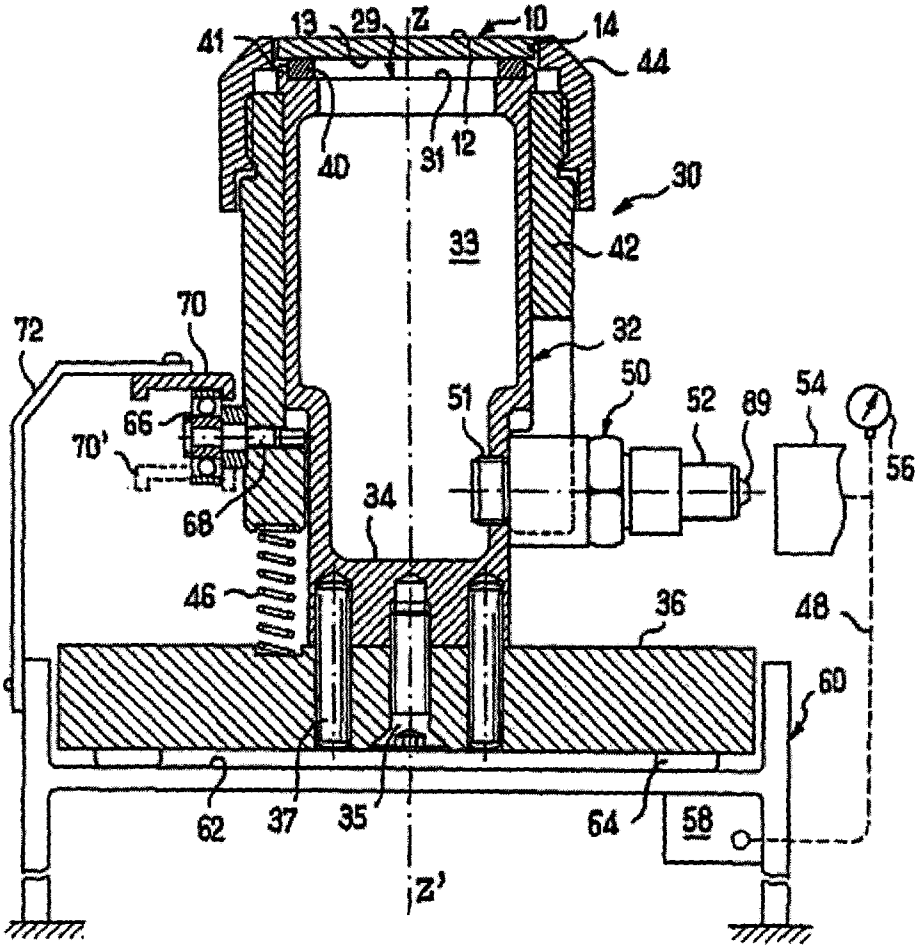


TOKEN HOLDING DEVICES AND PAD PRINTING INSTALLATIONS INCORPORATING SAID DEVICES

TECHNICAL FIELD

The present invention relates to the marking of chips or tokens for gaming tables having the general shape of a disk, or of objects of similar shape, by pad printing, and more particularly, the holding of chips or tokens during the pad-printing operations. Gambling chips, also called casino chips, should be understood to mean any element which can be used in a gambling hall, especially on the gaming tables, and representing a nominal value which may or may not be predetermined. Generally, these chips are manufactured from a rigid and scratch-resistant plastic.

Chips for a gaming table are, almost systematically, given a decoration by marking on their faces and/or sides, this decoration, depending on the eventual uses of the chips, ranging from the simplest to the most complex. In particular, patent FR 2 730 392 in the name of the Applicant describes the use of pad printing for marking the surface of the faces and/or the sides of chips (as opposed to volume marking using multi-shot injection molding of variously colored plastics).

PRIOR ART

The application WO 98/43816, published in the name of the Applicant, describes a method of marking by pad printing making it possible to mark the faces and the perpendicular side of a chip with considerable accuracy and especially to mark one face and the side of the chip simultaneously. In addition, application WO 98/43816 describes a pad-printing plant using a holding or placement device for the chip comprising an

axial support with an end face intended to carry the chip, the holding or placement device being combined with vacuum suction means operating in the steady state for keeping the chip pressed directly or indirectly on the support. For the following part of this document the wording "vacuum suction means" and/or "vacuum suction" should be understood in their broadest sense and cover inter alia any arrangement adapted to create an air partial vacuum or an under-pressure within a line or chamber by air suction and/or by any analogous arrangement such as vacuum pump and other vacuum source.

This known type of pad printing plant is in general satisfactory, but it is sometimes limited when holding chips under vacuum in the more tricky cases, for example:

- pad printing on chips with "granite-like" faces provided with a relief consisting of small pyramids less than one millimeter in height;
- four-color pad printing which requires the perfect and continuous centering of a chip during the four successive marking operations; or
- pad printing a side which requires highly accurate axial positioning of the chip with respect to the pad.

In addition, the use of permanent vacuum suction in high-yield pad-printing plants capable of marking several chips simultaneously requires assemblies which are often complex in terms of air suction lines and of powerful vacuum suction means increasing the costs of these plants.

SUMMARY OF THE INVENTION

As a result of the aforementioned, there is a need for a new holding device for a chip or a token which improves the vacuum holding of the chips so as to

remove or substantially reduce the limitations and other drawbacks presented above and which, in some cases, makes it possible to further simplify the pad-printing plants.

To this end, according to a first version of the invention, a first version of the invention provides a holding device for a chip, token or tile, especially one which can be used in pad printing, comprising an axial support with an end face intended to carry said chip, the device being designed to be combined with vacuum suction means for keeping the chip pressed directly or indirectly on the support, characterized in that the support comprises a vacuum chamber emerging via a central opening onto the end face and an annular elastomeric seal intended to cooperate with one face of the chip and placed on said end face around said opening, and means forming a multiple valve controlling the isolation of the chamber, with or without physical disconnection between the said holding device and the said vacuum suction means, or putting the chamber in communication either with the vacuum suction means or with the open air.

The use of an elastomeric seal between the chip and the support limits the leakage (and the vacuum requirement). Furthermore, the peripheral placement of the seal very substantially increases the effective surface area of the sealed portion of the chip and consequently the vacuum holding force acting thereon resulting from the pressure differential acting on the opposed faces of the chip (atmospheric air pressure on one side and partial vacuum on the other side). Thus, when the chamber is isolated from the vacuum suction by closure of the multiple valve at the vacuum admission side of the chamber, it is possible to maintain an operational vacuum (capable of keeping the chip firmly on its support) for about one hour. The isolation

between the chamber and the vacuum source makes it possible to get a better control and use of the vacuum resource, especially the power and the flow rates of the vacuum pump, and to physically disconnect the holding device from the vacuum suction. This possibility of disconnection permits to simplify very substantially the vacuum circuits within the context of a high-rate multi-station pad-printing plant. In practice, it is possible to have only one or two stations for placing and removing chips (equipped with vacuum suction) past which the holding devices move.

According to a first variant of the invention, the annular seal is made from an elastomeric material chosen from synthetic or natural rubbers, polyurethanes and silicones.

According to another variant of the invention, the annular seal consists of a washer with flat faces. Thus the use of a washer with flat faces makes it possible, on the one hand, to provide good sealing with chips whose faces have a slight relief (for example chips with "granite-like" faces), and on the other hand, to already provide the chip with good seating for the pad-printing of the chip faces.

Advantageously, the annular seal is placed close to the periphery of the end face of the support in order to increase as much as possible the effective vacuum bearing area and consequently the force for holding the chip due to the vacuum.

According to yet another variant of the invention, the end face of the support comprises a stiff peripheral supporting ring placed radially outside the annular seal and intended to act as a fixed bearing surface for the chip, said seal protruding slightly in an axial direction outside the ring when at rest in order to

provide vacuum-tight sealing at the face of the chip. Thus, the peripheral supporting ring lying in a plane perpendicular to the axis of the support provides perfect seating and a constant axial position with respect to the pad-printing pad, which enables side pad-printing with very high accuracy, including in multicolor.

According to another variant of the invention, the support carries, on the perimeter of its end face, means for centering the chip, which means can be retracted axially and project beyond the supporting ring in the extended position. Advantageously, the centering means consist of a centering collar secured to a sleeve sliding over the axial support, elastic means tensioning the collar toward its extended position.

It should be noted that keeping an operational vacuum in the vacuum chamber for a fairly long period of time enables early retraction of the centering ring (the combination of retracting the centering ring with the descent of the pads having become superfluous) and also simplifies the mechanical means used.

According to a variant of the invention, the means forming a multiple valve consist of a three-way valve capable of isolating the vacuum chamber or of connecting said chamber either to the vacuum suction means or to the open air.

According to another variant of the invention, the means forming a multiple valve consist of a connection assembly with two nonreturn valves (or no-return valves or one-way valves) comprising two separable end pieces, one connection and isolation end piece with a nonreturn valve designed to be connected to the vacuum chamber and one suction end piece with a nonreturn valve

designed to be connected to the vacuum suction means, the two nonreturn valves being mounted face to face in order to butt against each other in a double opening position when the two end pieces are connected.

Advantageously, the support is mounted on a stand which can be moved over a frame placed in front of at least one pad-printing station comprising an ink pad moved coaxially with said chip in combination with a flat inking plate.

Of course, the invention is not limited to gambling chips, tokens and tiles but relates to any type of chip or tile, especially parking tokens, any sort of payment tokens, passes, etc.

The invention also relates to novel pad-printing plants using holding devices for a chip according to the invention, but also to all other plants making it possible to work on objects with a substantially flat face which have to be securely held by vacuum suction, such as for example etching or printing plants and the like.

In particular, the invention provides a pad-printing plant of the type comprising at least one pad-printing station comprising an ink pad moved coaxially to said chip in combination with a flat inking plate and at least one holding device according to the invention presented above, characterized in that it comprises vacuum suction means and at least one holding device mounted on a transfer track provided on the frame.

Advantageously, the pad-printing plant comprises, in the vicinity of the frame, at least one chip placement/removal station comprising a suction end piece connected to the vacuum suction means.

A second version of the invention also provides a holding device for a chip, token or tile, which can in particular be used for pad printing, comprising an axial support with an end face intended to carry said chip, the device being designed to be combined with vacuum suction means emerging on said end face in order to keep the chip pressed directly or indirectly on the support, characterized in that the said support includes a vacuum chamber defining a channel and adapted to be connected to said vacuum suction means and emerging via a central opening onto the end face and an annular elastomeric seal intended to cooperate with one face of the chip and placed on said end face around said opening, said end face of the support comprising a stiff peripheral ring intended to act as a fixed bearing surface for the chip, the said annular elastomeric seal being placed inside the ring adjacent to the ring, said seal protruding slightly in an axial direction outside the ring when at rest in order to provide vacuum-tight sealing at the face of the chip in contact with the seal.

This type of holding device is well suited for side pad-printing. This is because the peripheral supporting ring lying in a plane perpendicular to the axis of the support provides perfect seating and a constant axial position with respect to the pad-printing pad, which makes it possible to carry out the side pad-printing with very great accuracy, including in multicolor.

According to the use requirements, the holding device according to the second version optionally incorporates some of the optional features of the first version of the invention already presented beforehand. More specifically:

- the annular seal is made from an elastomeric material chosen from synthetic or natural rubbers, polyurethanes and silicones; and/or

- the annular seal consists of a washer with flat faces; and/or

- the support carries, on the perimeter of its end face, means for centering the chip, which means can be retracted axially and project beyond the supporting ring in the extended position; and optionally

- said centering means consist of a centering collar secured to a sleeve sliding over the axial support, elastic means tensioning the collar toward its extended position.

Similarly, the holding device according to the second version of the invention can be integrated into a new pad-printing plant according to the invention wherein the support is mounted on a stand which can be moved over a frame placed in front of at least one pad-printing station comprising an ink pad moved coaxially to said chip in combination with a flat inking plate.

Other features and advantages of the present invention will become apparent on reading the following description with reference to the appended drawings.

BRIEF PRESENTATION OF THE DRAWINGS

- Figure 1 represents a view in axial section of a holding device according to the invention;
- Figures 2a and 2b represent two schematic views partially in section showing the respective positions of the chip and of the chip support of the holding device of Figure 1 corresponding respectively at rest

in the absence of a vacuum (Figure 2a) and after evacuation of the vacuum chamber (Figure 2b);

- Figure 3 represents the outline diagram of a pad-printing plant incorporating the holding device of Figure 1;
- Figures 4a and 4b represent an operation of marking the side of a gambling chip with a perpendicular side by pad printing by means of the plant illustrated in Figure 3; and
- Figures 5a, 5b and 5c represent a connection with two end pieces which is used in the holding device of Figure 1, Figures 5a and 5b respectively illustrating, in partial section, the two disconnected end pieces and Figure 5c illustrating, in longitudinal section, both end pieces when connected.

PREFERRED EMBODIMENT OF THE INVENTION

Figure 1 represents a sectional view of a holding device 30 for a plastic chip or token 10 and designed, by way of non limiting example, to be incorporated in a pad-printing plant in order to mark, with an ink and/or varnish decoration, the faces and the perpendicular side of the disk-shaped chip 10 with circular parallel faces. The holding or placement device 30 according to the invention, which will be described in detail below, has the main functions of acting as a horizontal bearing surface for the chip 10 and of holding the latter in place, centered on the axis ZZ' of the pad 134, for the duration of the pad-printing operations.

By way of non limiting example, the disk-shaped chip 10 with parallel faces, used on gaming tables, has a diameter of 40 mm for a thickness or side height of about 3.3 mm, it being pointed out that in some cases, the edges have a very slight chamfer (of about 0.1 mm).

Similarly, the faces of the chip may be "granite-like" on request by the user casinos.

Of course, without departing from the scope of the invention, the gambling chip or token is replaced by an object of similar shape made from a material capable of receiving a decoration by pad printing or by other known printing methods.

The operation of marking, by pad printing, the side of a gambling chip with a perpendicular side, together with one of the faces of the chip if desired, is capable of being implemented by various types of devices, machines or plants. By way of non limiting example, Figure 3 illustrates the principle of such a pad-printing plant according to the invention allowing the simultaneous marking of one of the faces and of the side of a disk-shaped gambling chip or of an object of similar shape.

With considering Figure 3, the reference 30 represents very schematically the chip holding device according to the invention of Figure 1. An ink pad 134 is mounted on a vertical frame 131 so that it can be moved in vertical reciprocating motion. The vertical frame 131 is combined with the frame 60 carrying the holding device so as to align, on the same axis ZZ', the axis of the pad 134 (and of its head 136) with the axis of the holding device 30 carrying the chip (the axis ZZ' then passing through the center of the chip 10). The pad 134 has an axially symmetrical deformable head 136 of axis ZZ' made of synthetic material (for example a synthetic silicone rubber having a Shore A hardness of about 6), in this case with a conical end 138. As will be seen later, the deformable head 136 is designed to bed down on the face 12 and the edge 16 of the chip 10 while the perpendicular side 14 is being marked. A plate holder 140, carrying a flat ink plate 111, which

incorporates for example the image of a side decoration, is capable of reciprocating motion between the position vertically beneath the pad 134 (position 140) and the position vertically beneath an ink reservoir 142 (position 140'). The pad-printing operation proper is carried out in the following manner. After inking the plate 111 (position 140'), the plate holder is moved into the position 140 coaxial with the pad 134 so as to place a ring-shaped zone of the plate 111 carrying a decoration image, coaxially with the pad 134. A first downward vertical movement of the pad 134 allows the ink to be picked up simply by applying pressure. After the pad 134 has been raised and the plate holder retracted (back to the position 140'), the pad 134 undergoes a second downward vertical movement in order to deposit the ink by pressing firstly on the face 12 of the chip 10 and then, by further deformation of the head of the pad 136, on the side 14. Marking with a monochrome (final or intermediate) decoration is thus achieved. In the case of multicolor printing, the final decoration is formed by a complementarity and/or superposition of monochrome decorations, each of these intermediate decorations being etched on separate plates. In the case of multicolor marking, either several movable plate holders or a series of monochrome pad-printing units associated with a movable chip holder support are used. In general, the ink plates are etched to a depth of between 18 and 20 μm. Moreover, the various types of inks and/or varnishes suitable for pad printing can be used, especially UV-visible inks for discrete marking (for example in the case of chip identification numbers and/or codings).

With regard to the formation of decoration images for the faces and/or for the side on the ink plates, [especially the decoration image of the side according to the general principle of preparing plates by folding

up the decoration over a reference plane such as the face of the chip and radial contraction of the intermediate decoration] and regarding the details of pad-printing operations, the reader may refer to the publication WO 98/43816.

Returning to Figure 1, the holding device 30 for the chip 10 comprises a rigid axial support 32 made of metal having substantially the shape of a hollow cylinder of axis ZZ' defining a chamber 33 and having a central opening 31 in its upper end face 29 and the thick base 34 of which is rigidly fastened to a metal stand 36 by means of an assembly of screws 35 and pins 37. At the level of the upper end face 29, the cylindrical wall of the support is thickened in order to terminate in an annular enlarged portion 38 with a step (see also the details on Figures 2a and 2b) provided:

- with an inner shoulder 39 intended to accommodate an annular seal 40, in this case a washer made of an elastomer with parallel faces and whose thickness H at rest (in the absence of a vacuum) is slightly greater than the axial height of the shoulder 39 (see Figure 2a),
- with a stiff peripheral supporting ring 41 lying in a plane perpendicular to the axis ZZ' and intended to accommodate, rigidly supported, the lower face 13 of the chip after compressing the washer 40 under the effect of the force due to the vacuum acting on the chip 10 (see Figure 2b), and
- on the outer periphery, an outer shoulder 43 intended to act as an end stop for a sleeve 42 carrying a collar 44 for centering the chip on the holding device 30 and sliding axially over the support 32, the sleeve and the ring mounted coaxially along the axis ZZ' being stressed in the extreme extension position represented in Figure 1 by three helical springs 46 distributed around the perimeter of the base of the sleeve 42 (a

single one of which is visible in Figure 1). The collar 44, which can be interchanged by screwing on the sleeve 42, has an internal diameter corresponding to the diameter of the chip 10 (to within the clearance of the chip) and is positioned axially as a continuation of the ring 41 so as to produce a housing for the chip (the chip 10 via its lower face 13 bearing, when at rest in the absence of a vacuum, on the upper face of the elastomeric washer 40 protruding slightly outside the ring 41 as illustrated in Figures 1 and 2a). The ring 44 is retractable by pressing downward, in Figure 1, a ball bearing 66 (mounted so as to rotate freely on a horizontal spindle 68 fastened to the sleeve 42) by mechanically bearing on a rail 70 fastened to the frame 60 by brackets 72.

The inside of the hollow cylinder of the support 32 defines the chamber 33, called vacuum chamber, defining a passageway for vacuum (practically for the air suction towards the suction means) and capable of being connected by means forming a multiple valve 50 to a vacuum line (in dotted lines) 48 leading to a vacuum pump. The means forming a multiple valve 50 comprise a vacuum admission through socket 51 mounted through the wall of the cylindrical support 32 and an "anti-leak" pneumatic connection assembly with two nonreturn valves comprising two separable end pieces 52 and 54, one connection and isolation end piece 52 with a nonreturn valve 81 connected to the vacuum chamber 33 via the socket 51 and one suction end piece 54 with a nonreturn valve 82 connected to the vacuum suction line 48. As illustrated in Figures 5a and 5b, each of the bodies 83 and 84 of the end pieces 52 and 54 of cylindrical shape are traversed by a bore of axis XX' 85 and 86, the two nonreturn valves 81 and 82 being mounted face to face in the closed position when the two end pieces are disconnected. The end piece 52 has a small-diameter head 87 which is capable of sliding, while the end

pieces 52 and 54 are being connected, in a portion 88, substantially with the same diameter, of the bore 86 up to a stop position (illustrated in Figure 5c) between the face 97 of the head 87 and the shoulder 98 of the bore 86 and in which the valve heads 89 and 90, normally projecting outside the face 97 and the shoulder 98 when the end pieces 52 and 54 are disconnected (see Figures 5a and 5b), butt against each other in a double opening position when the two end pieces 52 and 54 are connected (the springs 91 and 92 being compressed in order to free the annular seals 93 and 94 from their seatings 95 and 96 formed by small shoulders in the bores 85 and 86). To summarize, when the end pieces 52 and 54 are connected, as illustrated in Figure 5c, the two bores 85 and 86 are free to communicate and the vacuum chamber 33 connected to the vacuum suction line 48 equipped with a manometer 56 and leading to a vacuum pump 58. On the other hand, when the two end pieces 52 and 54 are disconnected, as illustrated in Figures 5a and 5b, the two valves 81 and 82 occupy their closed positions, with the result that the vacuum chamber 33 remains isolated from the vacuum pump and from the open air and that vacuum is maintained in the chamber 33 closed by the chip 10. Therefore the closure of any communication with the chamber 33 at the level of the admission socket 51 corresponds to the status of isolation for the chamber 33. Finally, when the operator wishes to free the chip by allowing open air into the chamber, it is enough for him to slightly depress, in an axial direction, the valve 81 in the bore 85 by pressing manually or in an automated manner on the head 89 toward the left in Figure 1.

The pump 58 is suitably fastened to the frame 60 carrying a transfer track 62, on which a plurality of holding devices 30, carrying chips to be pad printed move, the stands 36 being equipped with runners. Each

holding device 30 can be moved past the pad-printing station of Figure 3 by accurately moving its stand 36 on the transfer track 62 so as to align the axis of the holding device and hence the center of the chip 10 with the axis ZZ' of the pad 136. Moreover, the rail 70, on which the bearing 66 rolls, continuously follows the track 62 with a height which varies with respect to the track between the high position illustrated by 70 in Figure 1, corresponding to the withdrawal of the ring 44 (a withdrawal needed to center the chip when positioning or turning over the chip) and the low position illustrated in dotted lines by 70' corresponding to the retraction of the ring 44 (the retraction needed during the operation of pad printing the side of the chip).

It should be noted that, without departing from the scope of the invention, a variant of the holding device 30 has, in place of the end pieces 52 and 54, a three-way valve (not shown) capable of isolating the vacuum chamber 33 by closure of the line leading to the chamber or of connecting the chamber 33, either to the vacuum suction means 58, or venting orifice. In another variant (not shown) it is also possible to place an air intake valve through the wall of the cylindrical support 32 of the vacuum chamber 33.

With regard to the annular seal 40, this may be made from an elastomer chosen from synthetic or natural rubbers, polyurethanes and silicones. In the embodiment described here, a silicone seal was chosen with a hardness of about 6 in the Shore A scale (substantially the same hardness as that of the head of the pad 138). From the shape viewpoint, an O-ring seal with a circular cross section could be suitable. However it is often preferable to use washers of various thicknesses with flat faces in order to improve sealing with the chip (especially when the flatness of the faces of the

chip is imperfect or "granite-like"). It is this solution which was chosen in the holding device 30 illustrated in Figures 1, 2a and 2b describing a preferred embodiment of the invention.

As represented in Figure 2a, the thickness "H" of the washer 40 is chosen to go beyond the shoulder 39, when at rest, by a height "h" of about one millimeter. When the vacuum is produced in the chamber 33, the washer 40 is compressed down to the face 13 of the chip bearing on the ring 41, as shown in Figure 2b. The exact choice of the value h to within one tenth of a millimeter is determined so as to allow sealing with the chip and to allow the chip 10 to bear on the ring 41 and to obtain a bearing force due to the vacuum which is much greater than the reaction force of the washer 40 in the compressed state. In practice, by way of non limiting example, for a chip with a "granite-like" face with a diameter of forty millimeters, a silicone washer 40 is used, whose dimensions at rest are 35 and 30 mm for the external and internal diameters and whose thickness "H"= 4 mm with an outside excess "h"= 0.7 mm and an effective vacuum bearing area of about 10 cm^2.

One of the advantages afforded by the holding device 30 according to the invention is to be able to isolate the vacuum chamber 33 by closing the multiple valve 50 once the required partial vacuum level (for example 50%) is reached, in this instance by disconnecting the holding device 30 from the vacuum suction line 48 by simply separating the end pieces 52 and 54. By choosing a minimum internal volume of a few tens of cm^3 for the vacuum chamber 33, tests have shown that it was possible to preserve an operational vacuum for keeping the chip 10 firmly on the holding device for a duration of more than one hour. In practice, "h" is chosen as the excess height which allows the longest time of preserving the vacuum, the other parameters of the

system being kept the same. Depending on the desired vacuum preservation time in the pad-printing plant used (a time which varies *inter alia* on the number of pad-printing stations, the internal volume of the vacuum chambers and the number of holding devices 30 used), it is possible to reduce to the highest accuracy the percentage of vacuum needed in the vacuum chambers 33, and consequently the power installed for the vacuum pump.

In practice, a plurality of holding devices 30 are placed on the transfer track 62, most often forming a loop. At least one station for placing/removing chips (two stations if it is desired to turn over the chips in order to mark the other face) is provided on the loop, stations for which the rail 70 and the centering collar 44 of the chip are in the high position. The operator places the chip 10 in the opening of the collar bearing on the elastomer washer 40 (Figure 2a), the chip then being centered with respect to the vertical axis ZZ' of the holding device. The operator then connects the two end pieces 52 and 54 and creates a vacuum in the chamber 33. Within a few seconds, the washer 40 is compressed and the chip 10 bears firmly on the ring 41 (Figure 2b). The operator disconnects the two end pieces 52, 54 and isolates the vacuum chamber 33 (it being possible to carry out this operation manually or in an automated manner). The device 30 may then be moved toward the first pad-printing station facing a portion of rail 70' in the low position (in fact the rail controlling the collar 44 is always in the low position along the loop of the track 62 except for locations corresponding to the placement/removal stations), the collar 44 then being retracted and the side 14 of the chip 10 available for being marked together with the first face 12 of the chip.

As can be seen in Figures 4a and 4b, the chip is centered on the axis ZZ' of the pad by positioning the stand 36 so as to align the axis of the pad 134 with the axis of the holding device 30. This centering operation prior to the actual marking (or in the initial marking phase) is important to position the chip 10 properly with respect to the pad 134, especially in the present case, so that the edge 16 corresponds properly with its image inked on the conical end 138 of the pad 134. After the plane of the face 12 is exceeded by the conical end 138 (the face possibly being completely marked), the head 138 of the pad 134 is deformed along the side 14 thereby bedding down onto the edge 16 (the latter being clean enough to prevent undesirable sliding from the face 12 at the edge) until the side 14 is completely inked when the end 138 (which is conical at rest) of the deformable head 136 of the pad 134 is compressed (with the rim of the head 136 going slightly beyond the plane of the edge 17 of the lower face 13 of the chip 10). The pressing force created by the vacuum on the chip 10 is large enough to prevent it from sliding sideways during the marking and/or from lifting while retracting the pad 134. The stand 36 is then moved to the next pad-printing station until the end of marking the decoration which may be on the face only, on the side only or on the face plus side. Optionally, the chip 10 then moves past a placement/removal station where the chip is turned over with venting of the chamber 33, turning over of the chip, evacuating the chamber 33, isolating the chamber 33 and movement toward the pad-printing stations allocated to the other face 13 of the chip, are carried out. Failing that, the chip 10 returns in front of the original placement/removal station for venting and removal of the chip.

In the first embodiment of the invention described here, the holding device 30 and the associated pad-

printing plant incorporate the largest number of technical features (elastomeric washer with parallel faces, supporting ring, isolation of the vacuum chamber) intended to comply with the most difficult conditions of use (side marking, "granite-like" faces, optimization of the vacuum resource, intermittent supply of the vacuum chamber, etc.). However, the invention also relates to simplified versions of the holding device 30 illustrated in Figure 1.

In a first variant of the invention not shown and intended to be used under less rigorous conditions (for example for marking the faces alone), the holding device remains very close to the device 30 described above: only the supporting ring 41 is dispensed with, the lower part of the elastomer washer being placed in a groove made in the widened portion 38 in place of the shoulder 39 and the face of the chip being axially positioned during pad printing by crushing the elastomer washer.

In yet another variant of the invention not shown the holding device conforms to the device 30 except for the means forming a multiple valve, which are replaced by a fixed and permanent connection between the vacuum chamber and the vacuum suction, the quality of the sealing at the chip allowing the pad-printing operation to be carried out correctly but with a slightly more expensive plant.

In this variant the holding device for a chip, token or tile, which can in particular be used for pad printing, comprising the axial support 32 with an end face 29 intended to carry said chip 10, the device being designed to be combined with vacuum suction means opening onto the said end face in order to keep the chip pressed directly or indirectly on the support, is characterized in that said end face 29 of the support

comprises the stiff peripheral ring 41 intended to act as a fixed bearing surface for the chip 10 and the said annular elastomeric seal 40 being placed inside the ring adjacent to the ring and placed around the mouth of the vacuum suction (in this case the central opening 31), said seal 40 protruding slightly in an axial direction outside the ring 41 when at rest in order to provide vacuum-tight sealing at the face 13 of the chip 10 in contact with the seal 40.

"Comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps or components or groups thereof.

The claims which follow are to be considered an integral part of the present disclosure. Reference numbers (directed to the drawings) shown in the claims serve to facilitate the correlation of integers of the claims with illustrated features of the preferred embodiment(s), but are not intended to restrict in any way the language of the claims to what is shown in the drawings, unless the contrary is clearly apparent from the context.

CLAIMS:

1. Holding device (30) for a chip (10), token or tile, comprising an axial support (32) with an end face (29) intended to carry said chip, said device (30) being designed to be combined with vacuum suction means (58) for keeping the chip (10) pressed directly or indirectly on the support (32), wherein the support (32) comprises a vacuum chamber (33) emerging via a central opening (31) onto the end face (29) and an annular elastomeric seal (40) intended to cooperate with one face (13) of the chip and placed on said end face (29) around said opening (31), and means forming a multiple valve (50) controlling the isolation of the chamber (33), with or without physical disconnection between the said holding device (30) and the said vacuum suction means (58), or putting the chamber (33) in communication either with the vacuum suction means (58) or with the open air.

2. Holding device (30) according to Claim 1, which can be used in pad printing.

3. Holding device according to Claims 1 or 2, wherein the annular seal (40) is made from an elastomeric material chosen from synthetic or natural rubbers, polyurethanes and silicones.

4. Holding device according to any one of Claims 1 to 3, wherein the annular seal (40) consists of a washer with flat faces.

5. Holding device according to any one of the preceding claims, wherein the annular seal (40) is placed substantially in a peripheral position of the end face (29) of the support (32).

6. Holding device according to any one of the preceding claims, wherein the end face (29) of the support (32) comprises a stiff peripheral supporting

ring (41) placed radially outside the annular seal (40) and intended to act as a fixed bearing surface for the chip (10), said seal (40) protruding slightly in an axial direction outside the ring (41) when at rest in order to provide vacuum-tight sealing at the face (13) of the chip in contact with the seal.

7. Holding device according to any one of the preceding claims, wherein said support (32) carries, on the perimeter of its end face (29), means (42, 44) for centering the chip, which means can be retracted axially and project beyond the supporting ring (41) in the extended position.

8. Holding device according to Claim 7, wherein said centering means consist of a centering collar (44) secured to a sleeve (42) sliding over the axial support (32), elastic means (46) tensioning the collar (44) toward its extended position.

9. Holding device according to any one of Claims 1 to 8, wherein said means forming a multiple valve (50) consist of a three-way valve capable of isolating the vacuum chamber (33) or of connecting said chamber (33) either to the vacuum suction means (58) or to the open air.

10. Holding device according to any one of Claims 1 to 9, wherein said means forming a multiple valve (50) consist of a connection assembly with two nonreturn valves comprising two separable end pieces (52, 54), one connection and isolation end piece (52) with a nonreturn valve (81) designed to be connected to the vacuum chamber (33) and one suction end piece (54) with a nonreturn valve (82) designed to be connected to the vacuum suction means (58), the two nonreturn valves (81, 82) being mounted face to face in order to butt

against each other in a double opening position when the two end pieces (52, 54) are connected.

11. Holding device according to any one of the preceding claims, wherein the support (32) is mounted on a stand (36) which can be moved over a frame (60) placed in front of at least one pad-printing station comprising an ink pad (134) moved coaxially with said chip (10) in combination with a flat inking plate (111).

12. Pad-printing plant of the type comprising at least one pad-printing station comprising an ink pad (134) moved coaxially to said chip (10) in combination with a flat ink plate (111) and at least one holding device (30) according to Claim 11, wherein it comprises vacuum suction means (58) and at least one holding device (30) mounted on a transfer track (62) provided on the frame (60).

13. Pad-printing plant according to Claim 12 equipped with at least one holding device (30) according to Claims 10 and 11 taken in combination, which comprises, in the vicinity of the frame (60), at least one chip placement/removal station comprising a suction end piece (54) connected to the vacuum suction means (58).

14. Holding device (30) for a chip (10), token or tile, comprising an axial support (32) with an end face (29) intended to carry said chip (10), the device being designed to be combined with vacuum suction means (58) in order to keep the chip (10) pressed directly or indirectly on the support (32), wherein the said support (32) includes a vacuum chamber (33) defining a channel and adapted to be connected to said vacuum suction means and emerging via a central opening

(31) onto the end face (29) and an annular elastomeric seal (40) intended to cooperate with one face (13) of the chip and placed on said end face (29) around said opening, said end face (29) of the support comprising a stiff peripheral ring (41) intended to act as a fixed bearing surface for the chip (10), the said annular elastomeric seal (40) being placed inside the ring (41) adjacent to the ring (41), said seal (40) protruding slightly in an axial direction outside the ring (41) when at rest in order to provide vacuum-tight sealing at the face (13) of the chip (10) in contact with the seal.

15. Holding device (30) according to Claim 14, which can be used in pad printing.

16. Holding device according to Claims 14 or 15, wherein the seal (40) is made from an elastomeric material chosen from synthetic or natural rubbers, polyurethanes and silicones.

17. Holding device according to any one of Claims 14 to 16, wherein the seal (40) consists of a washer with flat faces.

18. Holding device according to any one of Claims 14 to 17, wherein said support (32) carries, in the vicinity of its end face, means (42, 44) for centering the chip, which project in the extended position beyond the supporting ring (41) and which can be retracted axially.

19. Holding device according to Claim 18, wherein the centering means consist of a centering collar (44) secured to a sleeve (42) sliding over the axial support and elastic means (46) tensioning the collar toward its extended position.

20. Holding device according to any one of Claims 14 to 19, wherein the support (32) is mounted on a stand (36) which can be moved over a frame (60)

placed in front of at least one pad-printing station comprising an ink pad (134) moved coaxially to said chip (10) in combination with a flat inking plate (111).

21. Pad-printing plant of the type comprising at least one pad-printing station comprising an ink pad (134) moved coaxially to said chip (10) in combination with a flat inking plate and at least one holding device (30) according to Claim 20, which comprises vacuum suction means (58) and at least one placement/removal device mounted on a transfer track (62) provided on the frame (60).

22. Holding device (30) including any new and inventive integer or combination of integers, substantially as herein described.

23. Holding device (30) according to the invention, as hereinbefore generally described.

24. Holding device (30) as specifically described with reference to or as illustrated in the accompanying drawings.

25. Pad-printing plant including any new and inventive integer or combination of integers, substantially as herein described.

26. Pad-printing plant according to the invention, as hereinbefore generally described.

27. Pad-printing plant as specifically described with reference to or as illustrated in the accompanying drawings.

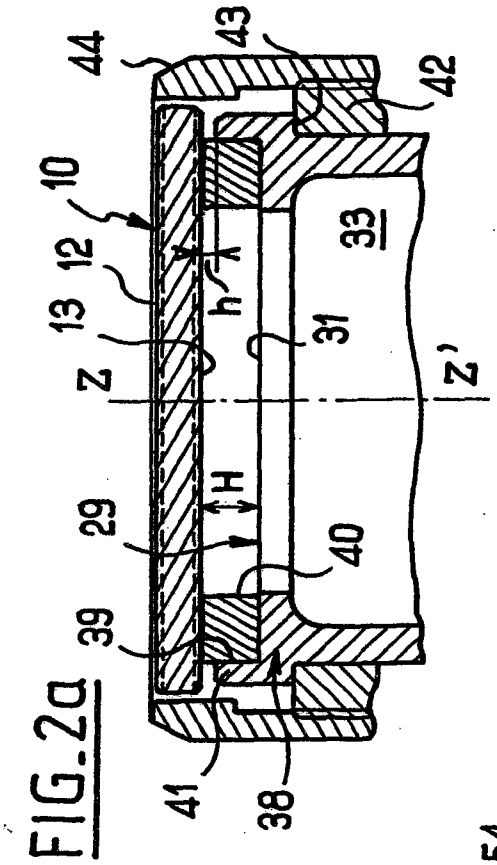


FIG.2a

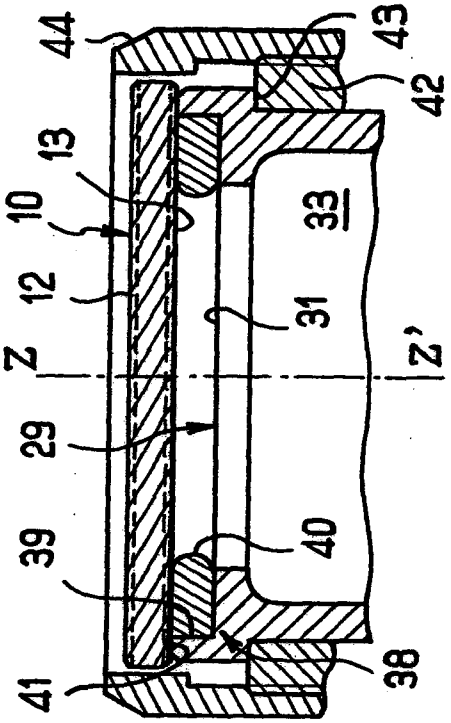


FIG.2b

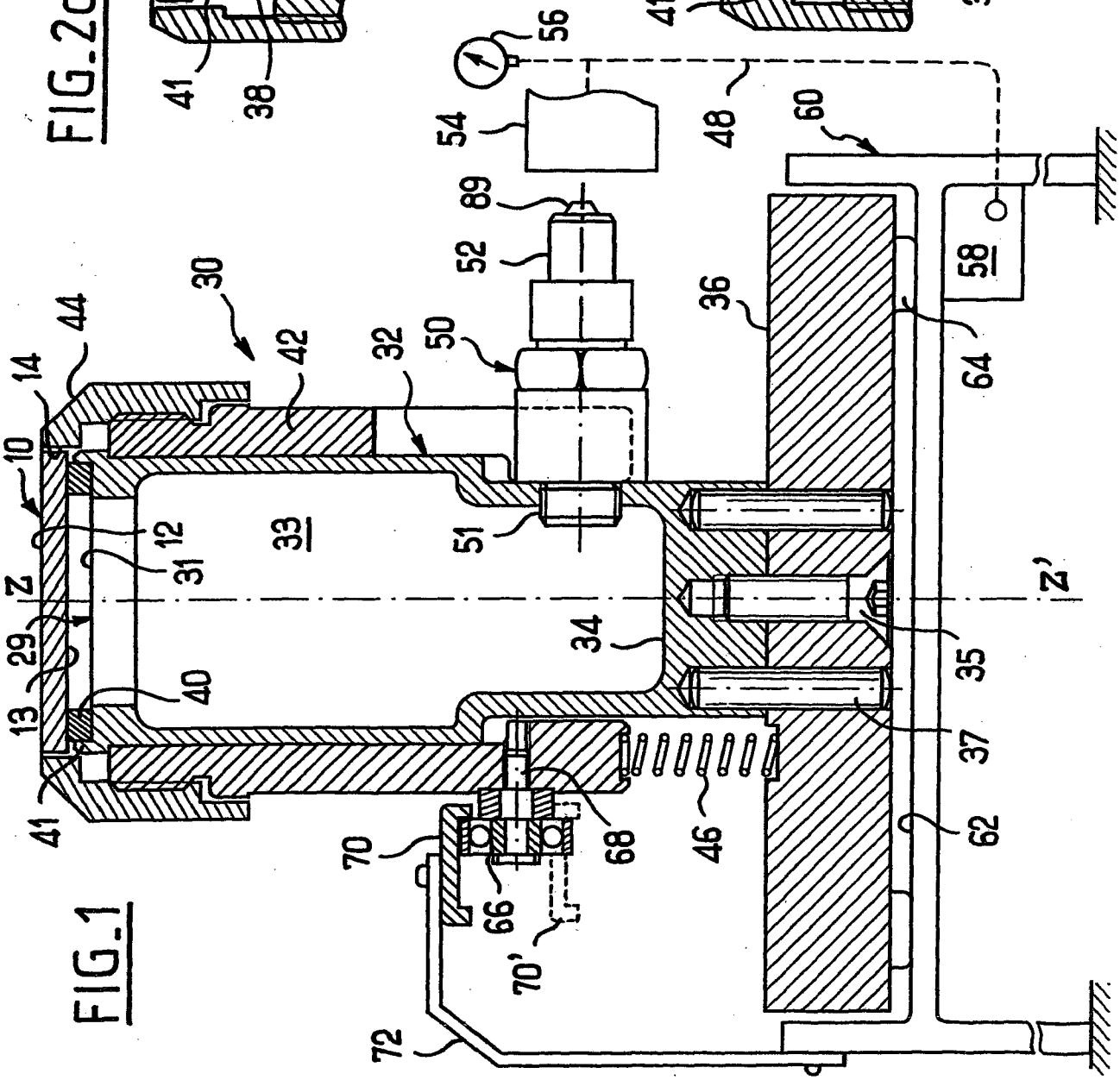


FIG.1

FIG_3

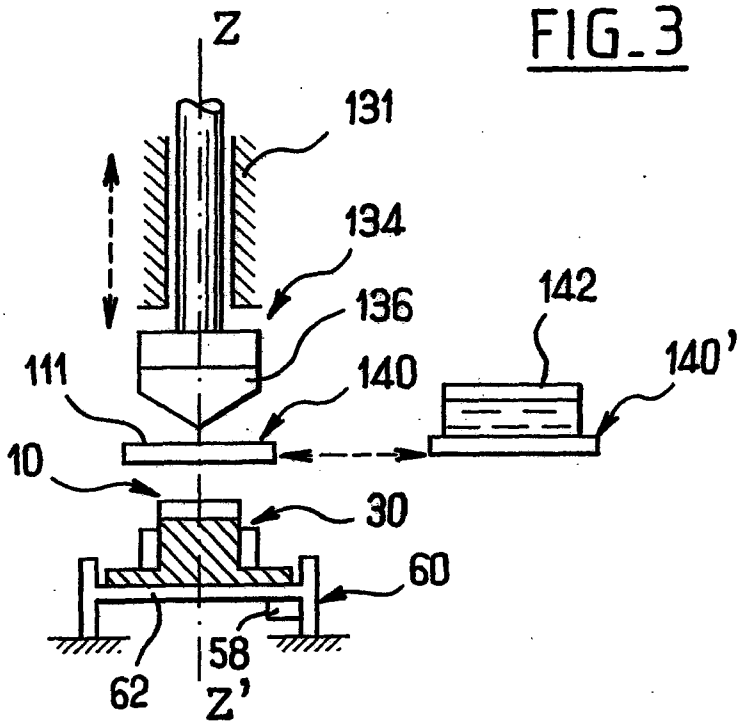


FIG_4a

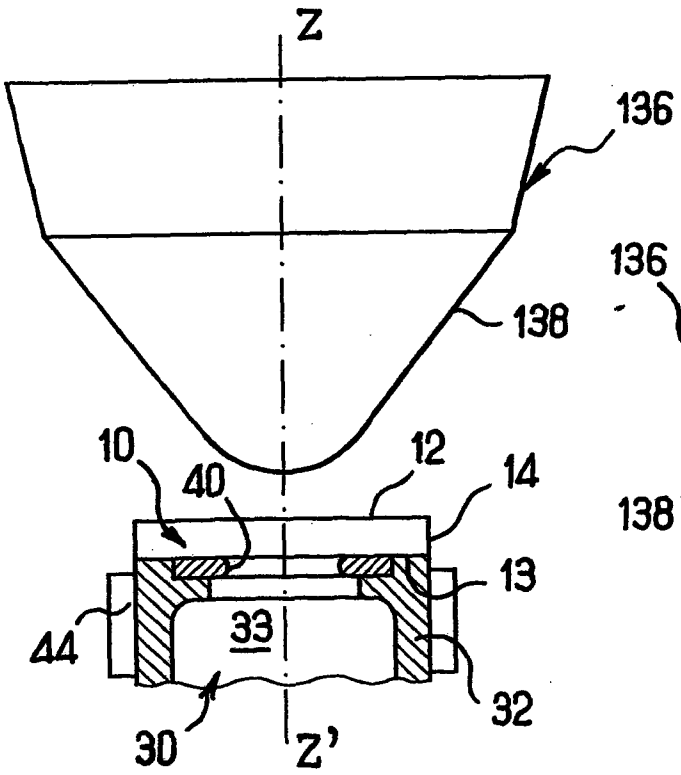
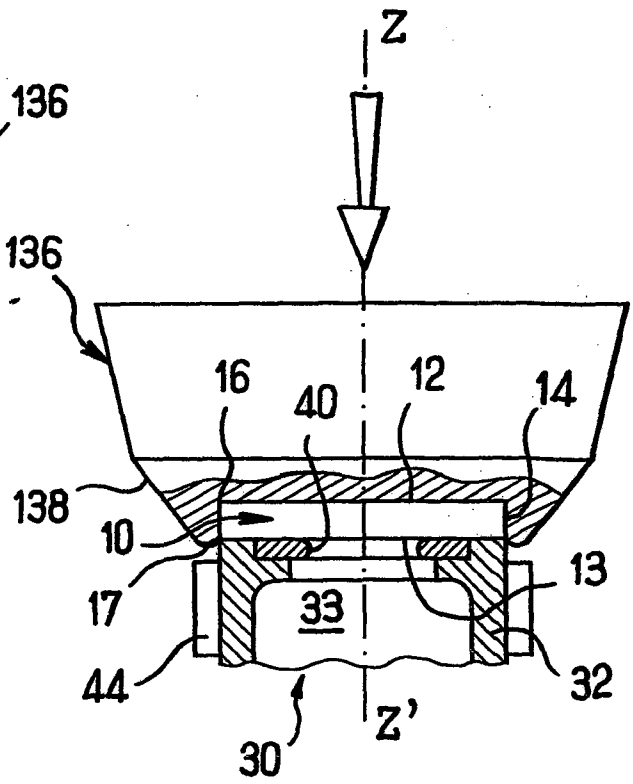


FIG_4b



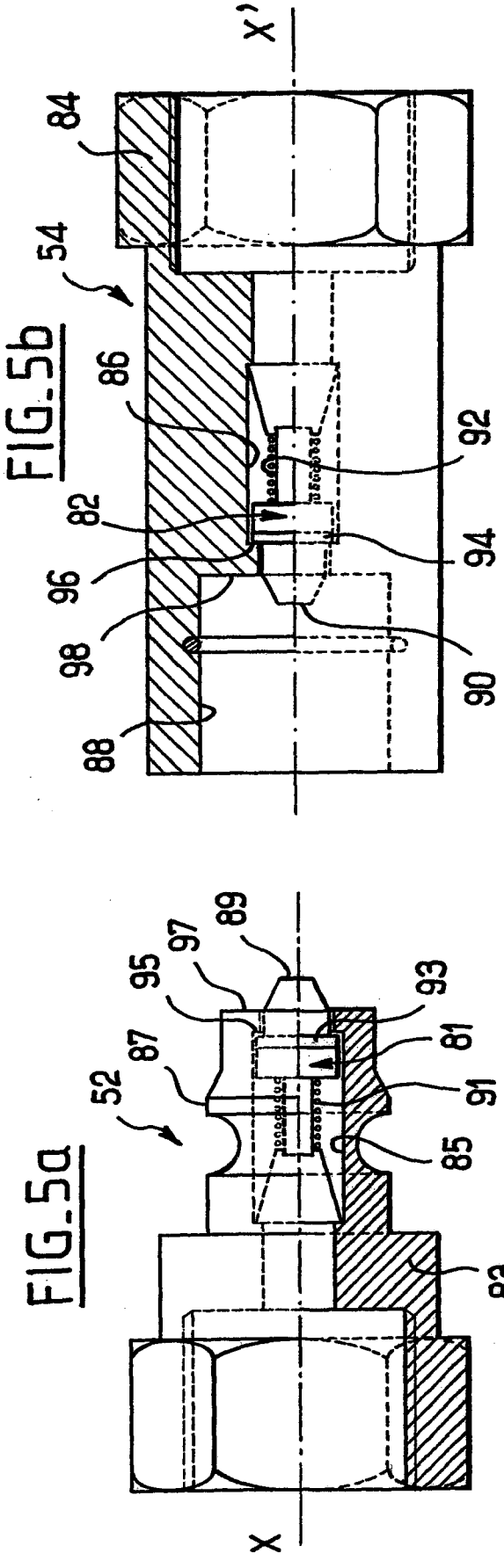


FIG.5b

FIG.5a

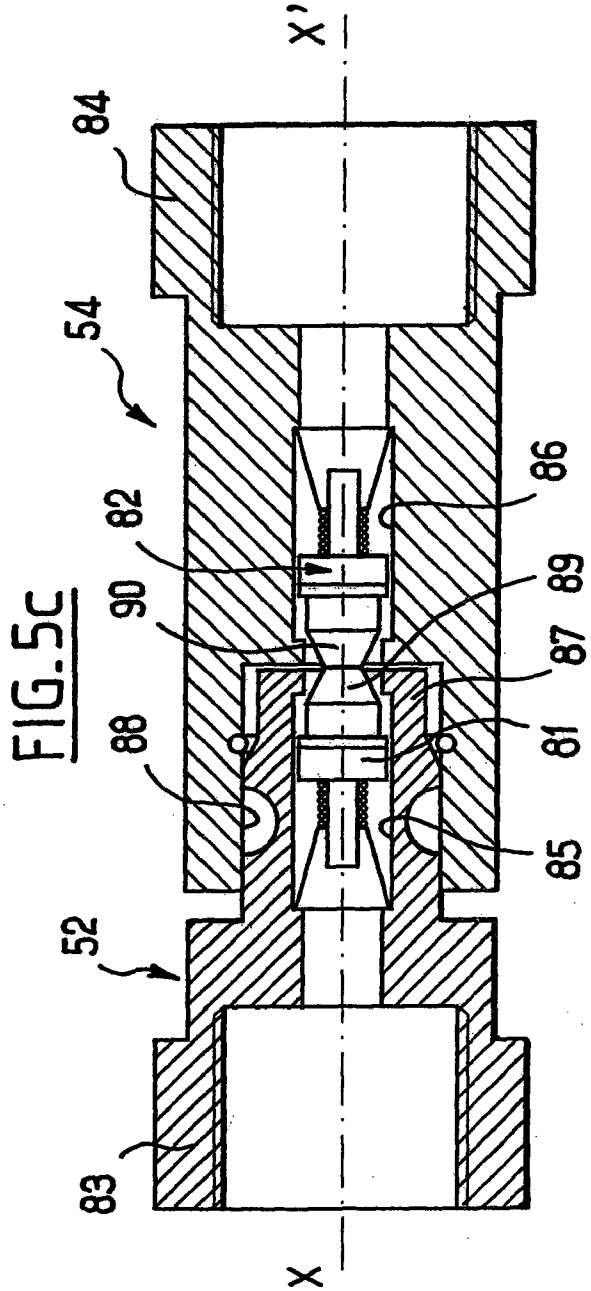


FIG.5c