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(54) **Device comprising an articulated handle with specific housing on broom or brush or other implement with multi angular positioning about two orthogonal axes**

Vorrichtung mit einem beweglichen Griff mit spezifischem Gehäuse an Besen oder Bürste oder einem anderen Arbeitsgerät mit mehrwinkliger Positionierung um zwei rechtwinklige Achsen

Dispositif comportant une poignée articulée avec un boîtier sur un balai ou brosse ou autre outil avec un positionnement multi-angulaire autour de deux axes orthogonaux

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EP-A1- 0 430 846 US-A- 1 687 953
US-A- 4 893 370

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Description

Field of the invention

[0001] The present invention generally relates to a device of the type comprising a handle for the use of broom or brush or other implement, herein named broom, and more particularly to the handles providing the possibility to set the broom at different angular positions in relation to the handle.

Background of the invention

[0002] The prior art discloses articulated handles connected by different kind of hinges to a broom with the purpose to change the inclination of the broom and keep a good sweeping position in particular when sweeping under furniture. Most of them provide this skill by means of a hinged joint between the handle and the broom pivoting about only one axis with the possibility to lock the broom.

[0003] The state of the art also include some other devices combining two different rotations of the broom about two orthogonal axes with the possibility to lock the broom for the purpose to increase the said sweeping effect and the manoeuvrability of the device.

[0004] The devices disclosed by documents EP 0 430 846 A1 - 05-06-1991, us 1 687 953 A - 16-10-1928, US 4 893 370 A - 16-01-1990, comprise an articulated handle for cleaning implements with a locking device of two different rotation of the implement on two axes.

[0005] Although the improvement disclosed in said prior art, however it is possible to note a limited number of angular positions of said implements or a not user friendly activation of the locking device or the presence of a not functional size in proximity of the hinge.

Summary of the invention

[0006] The purpose of the present invention is to solve said problems improving a manual working device, in particular a cleaning device, and more specifically a broom, having an higher possibility of articulation of the handle and the broom as to maximize the operational flexibility.

[0007] The present invention disclose an articulated handle connected by a hinge to a broom or brush or other implement, herein named broom, comprising a first spring locking and unlocking device inside the handle, activated by means of a knob or similar along the handle, which allows the rotation of the broom up to 180°, by gravity or by hand, around the axis of the pivotal connection between the handle and the hinge, and also allows the locking of the broom at multiple predefined angular positions.

[0008] Furthermore it comprises a second spring locking and unlocking device inside the hinge, activated by means of two buttons on both lateral sides of the hinge, which allows the rotation of the broom up to 360°, by hand, around the central rotational axis of the connection

between the hinge and a specific housing on the broom-back, and also allows the locking of the broom at different predefined angular positions.

[0009] Both said axes are orthogonal.

[0010] Furthermore said second spring locking and unlocking device inside the hinge allows the fastening and unfastening of the hinge on the broom-back, so that it is possible to use the handle with another kind of broom or implement having the same said housing.

[0011] Each angular position of the broom around one rotation axis can be combined with each angular position around the other axis.

[0012] It is the object of the invention to provide:

- a more efficient cleaning effect: for example when sweeping under domestic or industrial furniture, where it is possible for the operator to choose the better sweeping inclination on the floor and the better orientation of the handle in respect to his position;
- more contexts of use: the wide possibility of articulation allows, for example, to sweep on walls, inclined surfaces, ceilings, shelves, cars, camper, equipments, shutters, tents and so on;
- an effective flexibility: the rapidity of the activation of the locking devices which allows to change constantly the operational setting, it is for example another skill the rapid unfastening of the broom and its manual use;
- a multi tasking device: it is possible to use different implements with one handle;
- an easy transport device: unfastening the broom, for example, it is easier to put it on a car;
- a less cumbersome device/a compact device: it is possible choosing the best inclination when putting back or unfastening the broom.

Brief description of the drawings

[0013] The drawings show an embodiment of the device in which the implement is a broom, for example purposes only:

Fig. 1 shows a frontal side view of the device;

Fig. 2 shows a frontal side view of the hinge (1), the handle (2), the housing (3), the broom-back (4), the angular knob (21) and the buttons (11);

Fig. 3 and 4 shows lateral side views of the device representing five angular positions predefined around the rotation axis up to 180° of the pivotal connection between the handle and the hinge;

Fig. 5 shows a up side view of the device representing four angular positions predefined around the rotation axis up to 360° of the connection between the hinge and the broom;

Fig. from 6 to 14 shows perspective views of the device representing the possible combinations between the angular positions predefined on both rotation axes;

Fig. 15 shows a frontal side view of the hinge (1);
 Fig. 16 shows a longitudinal sectional view of the hinge representing five notches (6) corresponding to the angular positions predefined around the rotation axis up to 180° around the geometrical axis x;
 Fig. 17 shows a perspective up side view of the supports (5);
 Fig. 18 shows a perspective down side view of the base (9) of the hinge;
 Fig. 19 shows a perspective sectional view of the hinge representing one of the locking device;
 Fig. 20 shows a frontal side view of the pivotal pin (16) having a terminal ring (17);
 Fig. 21 shows a perspective longitudinal sectional view of the handle (2), the pin (16) and the hinge (1) representing one of the locking device;
 Fig. 22 shows a perspective view of the housing (3) and the hinge (1);
 Fig. 23 shows an up side view of the housing (3) representing four angular positions predefined around the rotation axis up to 360° around the geometrical axis y;
 Fig. 24 shows a frontal side view of the hinge (1) representing the buttons (11) and the screws (13) compressed by the spring (12) inside the tubular axis (7);
 Fig. 25 shows a perspective view of the housing (3) and the hinge (1) representing the buttons (11) and the screws (13) when compressed by hand;
 Fig. 26 shows a down side view of the base (9) of the hinge fastened in the housing (3) representing the locking and unlocking positions of the screws (13) and the clockwise or anticlockwise rotation of the base (9) of the hinge or of the housing (4) on the broom-back and the locking on a different angular position.

Detailed description of a preferential embodiment

[0014] With reference to Fig. 1 and Fig. 2, the device comprise a hinge (1), a handle (2), a housing (3) on the broom-back (4)

[0015] With reference to Fig. 15, 16, 17, 18 and 19, the hinge has two semicircular lateral support (5); a sequence of notches (6) are placed along the internal edges of both supports (5) at 0°, 45°, 90°, 135° and 180°; a tubular axis (7) is fixed in two holes (8) on both supports (5); the hinge has a circular base (9); two slots (10) extent from the tubular axis (7) until the bottom of the base (9); two cylindrical buttons (11) are fitted inside the tubular axis (7) partially coming out from external ends of both supports (5); a compression spring (12) is inside the tubular axis (7) between the two buttons (11); two screws (13) are fixed in the segment of the buttons (11) resting inside the tubular axis (7), so that its upturned heads and a segment of its stems vertically come out from the bottom of the base (9) of the hinge through the slots (10).

[0016] With reference to Fig. 20 and 21 the pin (16)

joining the handle and the hinge (1) is fixed in the end of the handle having a ring termination (17) pivoting on the tubular axis (7) of the hinge (1) between the two supports (5) its adjacent; a spring (18) inside the pin compress the plate (19) toward the hinge (1); the plate (19) is rectangular and substantially as wide as the internal diameter of the handle and as thick and strong material made as to guarantee a strong locking engagement; the plate (19) is in a constraining guide of the pin (16) as to slide keeping its main sides substantially on the same plane of the geometric rotation axis x of the hinge (1); both lower corners (20) of the plate, under pressure of the spring (18), come out from the end of the handle on both sides of the termination ring (17) engaging two of the notches (6) along both internal edges of both supports (5).

[0017] With reference to Fig. 22 and 23, the housing (3) on the broom-back (4) has a circular cavity (14) having on its internal circular edge a sequence of vertical grooves (15) specifically fitted as to allow the engagement of the screws (13); the grooves (15) are placed as specular couples around the geometrical rotation axis y at 0° and 180°, 45° and 225°, 90° and 270°, 135° and 315°, where the first couple, 0° and 180°, lies parallel to the longitudinal axis (L) of the broom.

[0018] In operation:

With reference to Fig. 20 and 21, lifting up the anular knob (21) along the handle the plate (19) disengage the notches (6) allowing the rotation of the broom up to 180° around axis x, by gravity or by hand; releasing the anular knob (21) the plate (19) engage another couple of notches at a new degree.

With reference to Fig. 24, 25 and 26, the screws (13), following the centripetal and centrifugal movement of the buttons (11) provided by hand pressure and by the opposite pressure of the spring (12), slide keeping their vertical orientation in slots (10) which are fitted as to serve as a limit and a guide of the sliding; released the buttons (11) the heads of the screws (13) engages one couple of opposite grooves (15) in the housing on the broom-back (4), providing at the same time the fastening the base of the hinge (9) on the broom and its angular positioning; pushing the buttons (11) the broom can be unfastened or rotated, clockwise or anticlockwise, until a different angular position.

[0019] According to the described preferred embodiment, each angular position of the broom around each rotation axis can be combined with each angular position around the other orthogonal axis, as shown in drawings, from Fig. 3 to Fig. 14.

Claims

1. Device of the type comprising an articulated handle

(2) connected by a hinge (1) to a broom or brush or other implement,
herein named broom, which provides the possibility to set the broom at different angular positions in relation to the handle (2),
characterized in that :

- a first spring locking and unlocking device (18, 19) inside the handle (2) activated by means of a knob (21) or similar along the handle (2) allows a rotation of the broom up to 180° by gravity or by hand around the axis (x) of the pivotal connection between the handle (2) and the hinge (1), and allows the locking of the broom at multiple predefined angular positions;
- a second spring locking and unlocking device (12, 13) inside the hinge (1) activated by means of two buttons (11) on both lateral sides of the hinge (1) allows a rotation of the broom up to 360° by hand around the central rotational axis (y) of the connection between a base of the hinge (1) and a housing (4) on the broom, and allows the locking of the broom at different predefined angular positions;
- both said axes (x, y) are orthogonal;
- said second spring locking and unlocking device (12, 13) inside the hinge (1) also allows the fastening and unfastening of the broom on/from the handle with the possibility to change the implement having the same said housing;
- each angular position of the broom around each rotation axis (x, y) can be combined with each angular position around the other orthogonal axis (y, x).

2. Device as in claim 1 wherein said first spring locking and unlocking device is **characterized in that:**

- a rectangular plate (19) made of the appropriate material and thickness as to guarantee a strong locking engagement and substantially as wide as the internal diameter of the handle (2) slides inside the handle in a constraining guide as to keep its main sides substantially on the same plane of said 180° rotation axis (x);
- said sliding of said plate (19) is provided by the compression of an internal spring (18) toward the hinge (1) and by the lifting up of said knob (21) along the handle by an internal rod or wire or similar; Wherein said plate (19) is linked to said knob (21)
- said sliding make said plate (19) to engage and disengage with its lower corners, coming out from the end of the handle on both sides of the ring termination of the handle, a couple of fitting notches (6) placed at different degrees along internal semicircular edges of two supports of

the hinge (1) adjacent to said ring termination of the handle pivoting between them.

3. Device as in claim 1 wherein said second spring locking and unlocking device (12, 13) is **characterized in that:**

- said two buttons (11) on both lateral sides of the hinge slide inside a rigid tube (7) which serve as rotation axis of said pivotal connection between the handle and the hinge;
- a compression spring (12) is inside said tube (7) between said buttons (11) as to keep both said buttons (11) under a centrifugal pressure;
- said sliding of said buttons (11) is centripetal under the manual compression on the buttons;
- two screws (13) or other element likewise shaped are fixed in the segment of both said buttons (11) resting inside the tubular axis (7) so that its upturned heads and a segment of its stems vertically come out from the base of the hinge through slots (10) extended all along the thickness of said base of the hinge following the same said centripetal and centrifugal sliding of said buttons;
- said slots (10) are fitted as to serve as a limit and a guide of said sliding of said screws (13);
- said housing (4) on the broom has a circular cavity (14) having on its internal circular edge a sequence of vertical grooves (15) specifically fitted as to allow the engagement of said screws (13);
- said grooves (15) are made in a sequence of specular couples disposed at different degrees around said 360° rotation axis (y), each couple corresponding to one angular position of the broom; said sliding of said screws (13) allows its engaging and disengaging with said grooves (15) of said housing (4) on the broom providing at the same time.
the locking of the broom at one of the different angular position and
the fastening and unfastening of said base of the hinge on the broom.

4. Device as in claims 1 **characterized in that said multiple predefined angular positions of the broom around said 180° rotation axis (X) are predefined at 0°, 45°, 90°, 135° and 180°.**

5. Device as in claims 1 **characterized in that said multiple predefined angular positions of the broom around said 360° rotation axis (Y) are predefined at where the angular 0° and 180°, 45° and 225°, 90° and 270°, 135° and 315° position at 0° and 180° lies parallel with the longitudinal axis (L) of the broom.**

Patentansprüche

1. Vorrichtung mit einem beweglichen Griff (2) verbunden durch eine Scharniergelenk (1) an einen Besen oder einer Bürste oder anderen Arbeitsgerät, hierin genannt Besten, was die Möglichkeit den Besen an unterschiedlichen Winkelpositionen in Bezug auf den Griff (2), **dadurch gekennzeichnet, daß** gesetzt bereitstellt:

- Eine erste Federvorrichtung Verriegelungs und Entriegelungs (18, 19) innerhalb des Griffs (2), mit Hilfe eines Knopfes (21) oder ähnlichem entlang der Handgriff (2) aktiviert, erlaubt eine Drehung des Besens bis 100°, durch Schwerkraft oder von Hand, um die Achse (x) der schwenkverbindung zwischen dem Griff (2) und das Scharniergelenk (1) und ermöglicht die Verriegelung der Besen an mehreren vordefinierten Winkelpositionen;
- Eine zweite Federvorrichtung Verriegelungs und Entriegelungs (12, 13) innerhalb des Scharniergelenks (1), durch zwei Tasten (11) an beiden seitlichen Seiten des Scharniersgelenks (1) aktiviert, erlaubt eine Drehung des Besens bis 360° per Hand um die zentrale Drehachse (y) der Verbindung zwischen der Basis des Scharniergelenks (1) und dem Gehäuse (4) auf dem Besen, und ermöglicht die Verriegelung des Besens zu unterschiedlichen vordefinierten Winkelpositionen;
- Beide besagten Achsen (x, y) orthogonal sind;
- die zweite Federvorrichtung Verriegelungs und Entriegelungs (12, 13) innerhalb des Scharniergelenks (1) ermöglicht auch Verhinderung und Trennung des Besen mit der/vom der Griff, mit der Möglichkeit der Veränderung die Arbeitsgerät mit das gleichen Gehäuse (4);
- Jede Winkelposition des Bestens um jede Drehachse (x, y) kann mit jeder Winkelstellung um die andere orthogonale Achse kombiniert werden (y, x).

2. Vorrichtung nach Anspruch 1, wobei die erste Federvorrichtung Verriegelungs und Entriegelungs ist dadurch gekennzeichnet:

- Eine rechteckige Platte (19) aus dem entsprechenden Material und Dicke um einen starken Verriegelungseingriff zu garantieren, und wesentlich so breit wie der Innendurchmesser der Handgriff (2), gleitet im Inneren des Griffs (2) in einer Zwangsführung zu halten ihren Hauptseiten wesentlich auf der gleichen Ebene der genannten 180° Drehachse (x);
- Besagten Gleiten der Platte (19) durch die Kompression einer internen Feder (18) in Richtung des Scharniersgelenks (1) sowie durch das

vorgesehen Anheben des Knopfes (21) entlang der Griff (2) wobei des Knopfes (21) an die Platte (19) verknüpft ist durch eine interne Stange oder Draht oder dergleichen verwendet wird ;

- besagten Gleiten ermöglicht die seiner unteren Ecken (20) der Platte (19), die sich aus dem Ende des Griffs (2) auf beiden Seiten des Ringes Beendigung (17) der Griff, betreten und verlassen in und außer Eingriff ein paar Fitting Kerben (6) in unterschiedlichen Graden an den internen halbkreisförmigen Hecken zweier platziert Stützen (5) des Scharniersgelenk benachbart zu dem Ring Beendigung (17) des Griffs Schwenken zwischen ihnen.

3. Vorrichtung nach Anspruch 1, wobei die zweite Federvorrichtung Verriegelungs und Entriegelungs ist **dadurch gekennzeichnet:**

- Dient zwei Tasten (11) auf beiden seitlichen Seiten des Scharniersgelenks (2) gleiten im Inneren eines starren Rohrs (7), das als Drehachse dient der schwenkbaren Verbindung zwischen dem Handgriff (2) und dem Scharniergelenk (1);
- Eine Druckfeder (12) im Inneren des Rohres (7) zwischen den Tasten (11) zu halten sowohl die Tasten (11) unter einer zentrifugalen Druck;
- Besagten Gleiten der Tasten (11) ist ihre zentripetale unter der manuellen Kompression des Tasten (11);
- Zwei Schrauben (13), oder andere Element ebenfalls förmigen, sind im Segment der beide diese Tasten (11) ruht sie im Inneren des rohrförmigen Achse (7), verankert so dass ihre nach oben gerichteten Köpfen und ein Segment seiner skammt vertikal von der Basis des Scharniergelenk (1) durch Schlitze (10) verlängert kommen alle entlang der Dicke des Basis des Scharniergelenk (1) nach der gleichen besagten zentripetale und zentrifugale Gleiten der Tasten (11);
- die Schlitze (10) um als Grenzwert dienen angebracht sind und eine Führung des Gleitens der Schrauben (13);
- Das Gehäuse (4) auf dem Besen einen kreisförmigen Hohlraum (14), der auf seiner inneren kreisförmigen Rand eine Abfolge von vertikalen Nuten (15) versehen spezifisch als den Eingriff der Schrauben (13) zu erlauben;
- die Nuten (15) in einer Sequenz von spiegelnden Paare an verschiedenen Graden herum angeordnet des genannten gemacht 360° Rotationsachse (Y), wobei jedes Paar entsprechend einer Winkelposition der Besen;
- das Gleiten des genannten Schrauben (13) erlaubt seinen Ein- und Ausrücken der Nuten (15) des Gehäuses (4) auf dem Besen Bereitstellen

gleichzeitig die Verriegelung der Besen an einem der anderen Winkelstellung und der das Verbindung und Trennung der Basis des Scharniersgelenk (1) mit der/vom dem Besen.

4. Vorrichtung nach Ansprüche 1, **dadurch gekennzeichnet, dass** die Mehreren vordefinierten Winkelpositionen des Besens um die 160° Rotationsachse (x) sind vordefiniert bei 0°, 45°, 90°, 135° und 180°.
5. Vorrichtung nach Ansprüche 1, dadurch gekennzeichnet, **dass** die mehreren vordefinierten Winkelpositionen des Besens um die 360° Rotationsachse (y) sind vordefiniert bei 0° und 180°, 45° und 225°, 90° und 270°, 135° und 315° wobei die Winkelposition bei 0° und 180° liegt parallel zur Längsachse (L) des Besenkörpers.

Revendications

1. Dispositif du type comportant une poignée articulée (2) reliée par une charnière (1) à un balai ou brosse ou autre instrument, nommé ici balai, qui offre la possibilité de fixer le balai à différentes positions angulaires par rapport à la poignée (2), **caractérisé en ce que:**

- un premier ressort (18, 19) de verrouillage et de déverrouillage à l'intérieur de la poignée (2) activé au moyen d'un bouton (21) ou analogue le long de la poignée (2) permet une rotation de la brosse jusqu'à 180°, par gravité ou à la main, autour de l'axe (x) de la liaison pivot entre la poignée (2) et la charnière (1), et permet le blocage du balai à plusieurs positions angulaires prédéfinies;

- Un second ressort (12, 13) de verrouillage et de déverrouillage à l'intérieur de la charnière (1) activé par l'intermédiaire de deux boutons (11) sur les deux côtés latéraux de la charnière (1) permet une rotation de la brosse jusqu'à 360° à la main autour de l'axe (y) central de rotation de la liaison entre ladite base de la charnière (1) et ledit boîtier (4) sur le balai, et permet le verrouillage de la brosse à différentes positions angulaires prédéfinies;

- Les deux axes (x,y) sont orthogonaux;

- Le second ressort (12, 13) de verrouillage et de déverrouillage à l'intérieur de la charnière (1) permet également la fixation et l'enlèvement de la balai par et du poignée avec la possibilité de changer l'instrument ayant le même boîtier (4);
- chaque position angulaire du balai autour de chaque axe (x, y) de rotation peut être combinée avec chaque position angulaire autour de l'axe (y, x) orthogonal autre.

2. Dispositif selon la revendication 1 dans lequel ledit premier ressort (18, 19) de verrouillage et de déverrouillage est **caractérisé en ce que:**

- Une plaque (19) rectangulaire, faite d'un matériau approprié et l'épaisseur pour garantir une prise de verrouillage solide et façon substantielle aussi large que le diamètre intérieur de la poignée (2), coulisse à l'intérieur de la poignée (2) dans un guide contraignant à maintenir ses côtés principaux façon substantielle sur le même plan dudit axe (x) de rotation à 180°;

- Ledit coulisement de ladite plaque (19) est fournie par la compression d'un ressort (18) interne vers la charnière (1) et par l'élévation de ledit bouton (21) le long de la poignée (2) puisque ladite plaque (19) est relié ou ledit bouton par une tige ou un fil interne ou similaire;

- Ledit coulisement permet à ladite plaque (19) pour s'engager et se désengager de ses coins inférieurs (20), en sortant de l'extrémité de la poignée (2) sur les deux côtés de la bague (17) de terminaison de la poignée (2), un couple d'encoches (6) de montage placées à différents degrés le long des couvertures internes semi-circulaires de deux des supports (5) de la charnière (1) adjacente à ladite bague (17) de terminaison de la poignée pivotant entre eux.

3. Dispositif selon la revendication 1, dans lequel ledit second ressort (12, 13) de verrouillage et de déverrouillage est **caractérisé en ce que:**

- Lesdits deux boutons (11) sur les deux côtés latéraux des lames de charnière (1) coulissent à l'intérieur d'un tube rigide (7) qui sert comme axe de rotation de ladite liaison pivotante entre la poignée (2) et la charnière (1);

- Un ressort (12) de compression est à l'intérieur dudit tube (7) entre lesdits boutons (11) de maintenir à la fois lesdits boutons (11) sous une constante pression centrifuge;

- Ledit coulisement desdits boutons (11) de sa centripète sous la compression manuelle desdits boutons (11);

- Deux vis (13), ou autre élément de même forme, sont fixés à le segment de ladite boutons (11) de repos à l'intérieur de l'axe tubulaire (7) de manière à ce que ses têtes tournées vers le bas et un segment de ses tiges sortent verticalement à partir de la base de la charnière (1) à travers des fentes (10) s'étend le long de l'épaisseur de ladite base de la charnière (1) suivant la même coulisement centripète et centrifuge desdits boutons (11);

- Lesdites fentes (10) sont disposées de façon à servir de limite et un guide de coulisement dudit de ladite via (13);

- Ledit boîtier (4) sur le balai a une cavité circulaire (14) ayant à son bord circulaire interne d'une séquence de rainures verticales (15) équipées spécifiquement pour permettre l'engagement de ladite via (13); 5
 - Lesdites rainures (15) sont réalisées dans une séquence de couples spéculaire disposés à différents degrés autour au dit axe de rotation à 360° (y), chaque couple correspondant à une position angulaire du balai; 10
 - Ledit coulisement des dudit vis (13) permet son engagement et de désengagement dudit rainurée (15) dudit boîtier (4) sur le balai fournissant en même temps le blocage du balai à une de la position angulaire différente et la fixation et l'enlèvement de ladite base de la charnière (1) sur le balai . 15
4. Dispositif selon la revendications 1, **caractérisé en ce que** lesdits plusieurs positions angulaires prédéfinies de la balai autour de ladite axe de rotation à 180° (x) sont prédéfinis à 0°, 45°, 90°, 135° et 180°. 20
5. Dispositif selon la revendications 1, **caractérisé en ce que** lesdits plusieurs positions angulaires prédéfinies de la balai autour de ladite axe de rotation à 360° (y) sont prédéfinis à 0° et 180°, 45° et 225°, 90° et 270°, 135° et 315°, où la position angulaire de 0° et 180° est parallèle à l'axe longitudinal (L) du balai. 25

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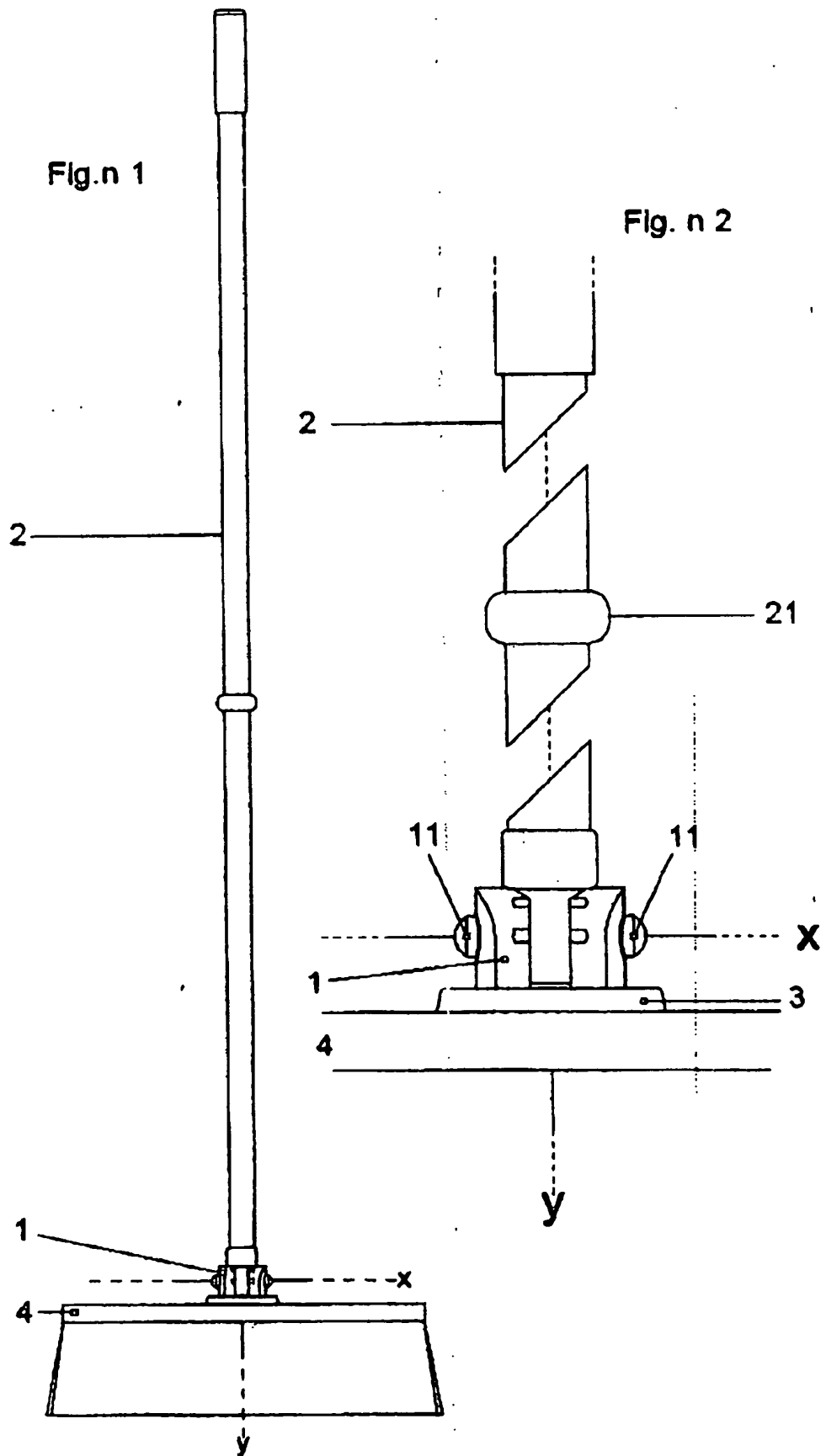


Fig. n 3

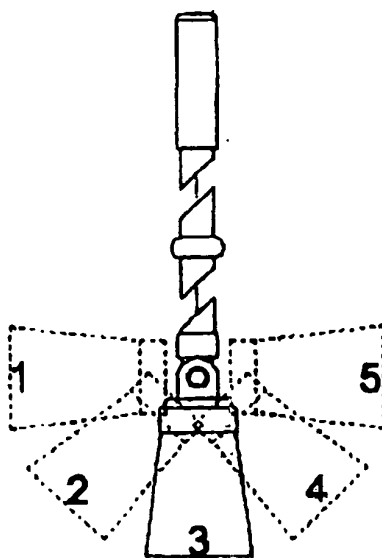


Fig. n 4

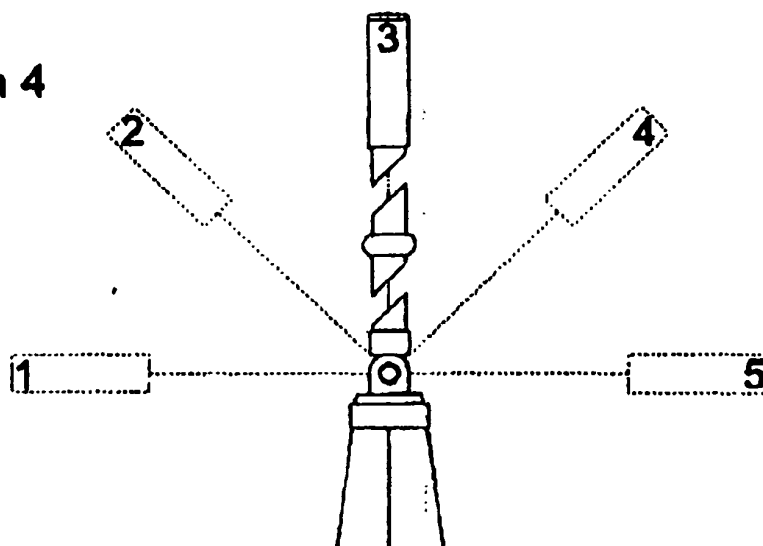
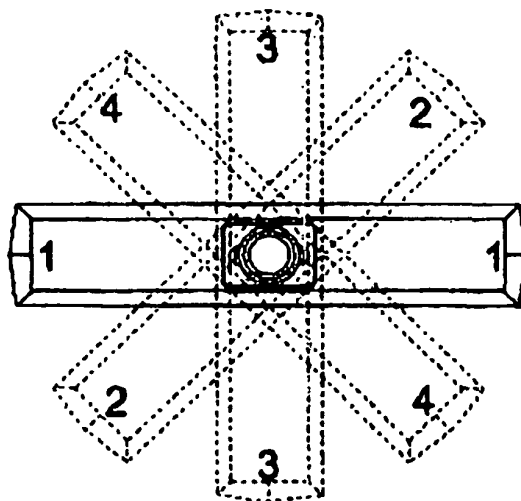


Fig. n 5



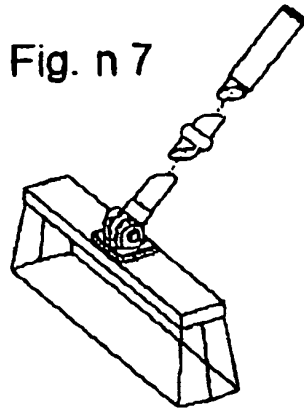
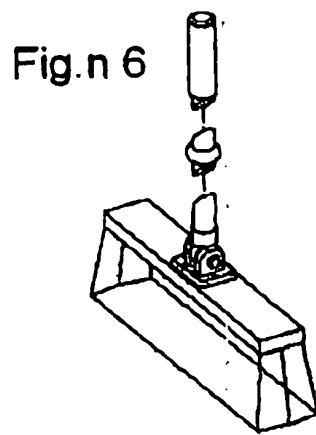


Fig. n 8

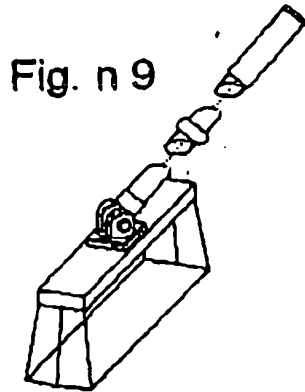
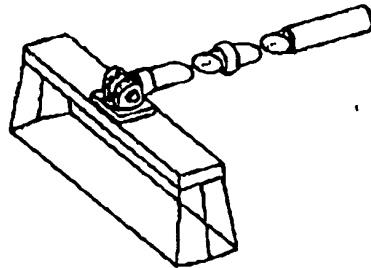


Fig. n 10

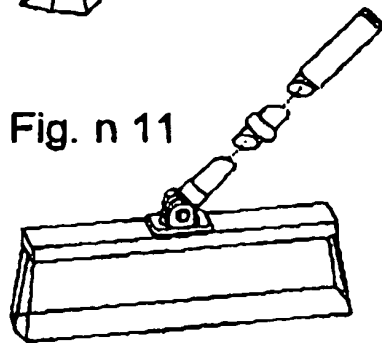
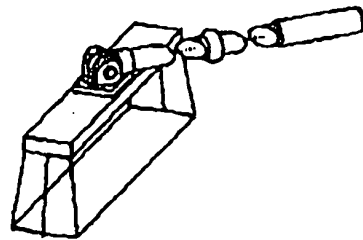


Fig. n 12

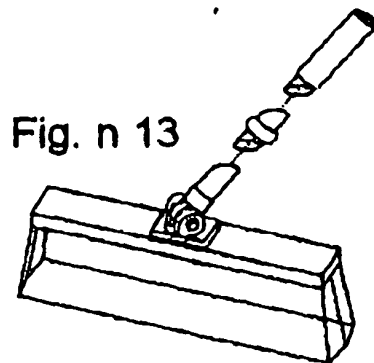
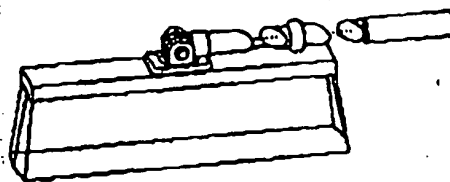


Fig. n 14

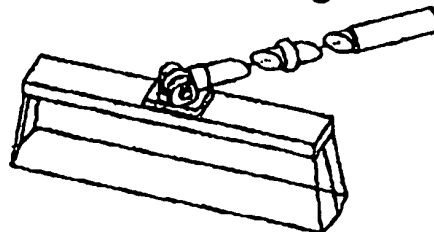


Fig. n 15

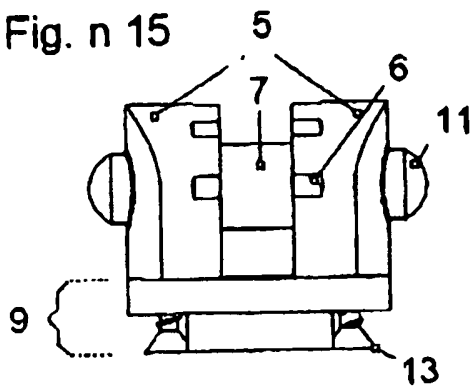


Fig. n 16

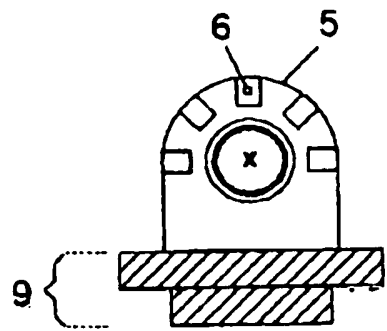


Fig. n 17

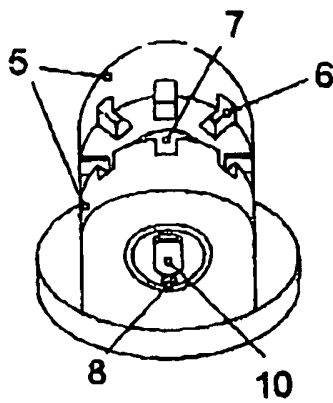


Fig. n 18

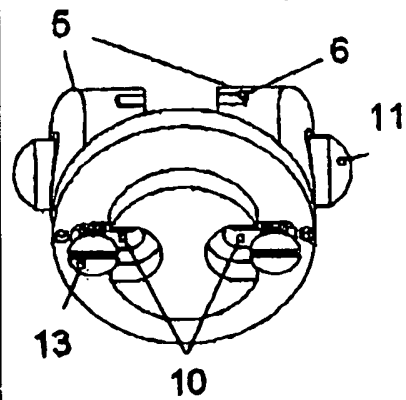


Fig. n 19

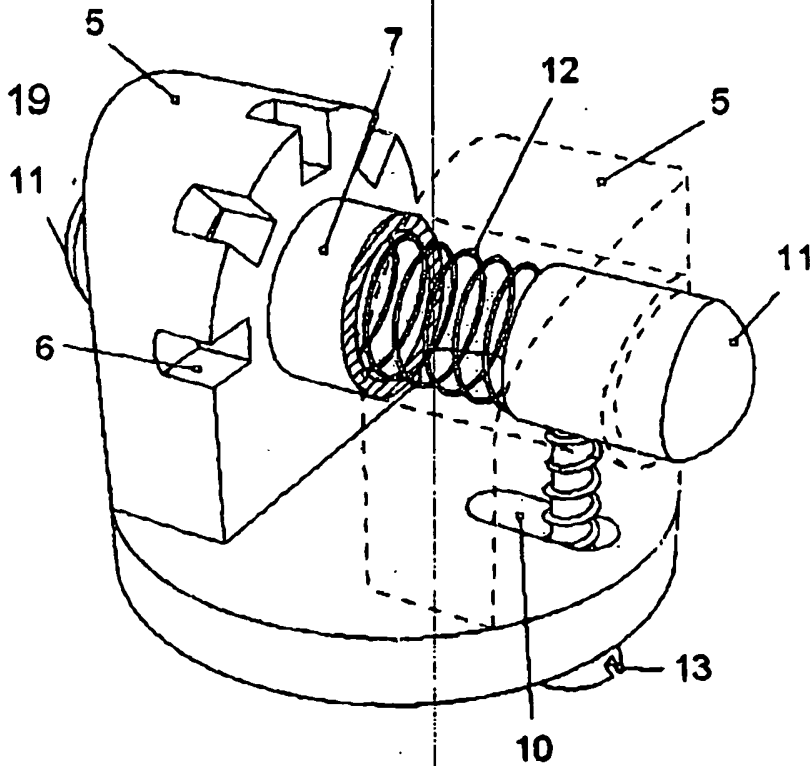


Fig. n 20

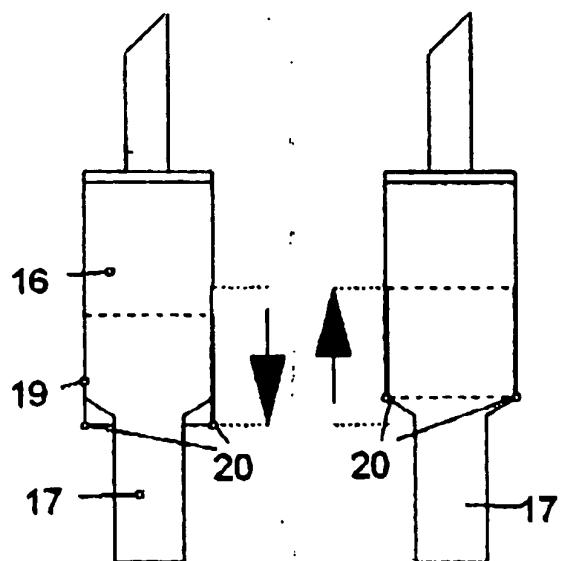


Fig. n 21

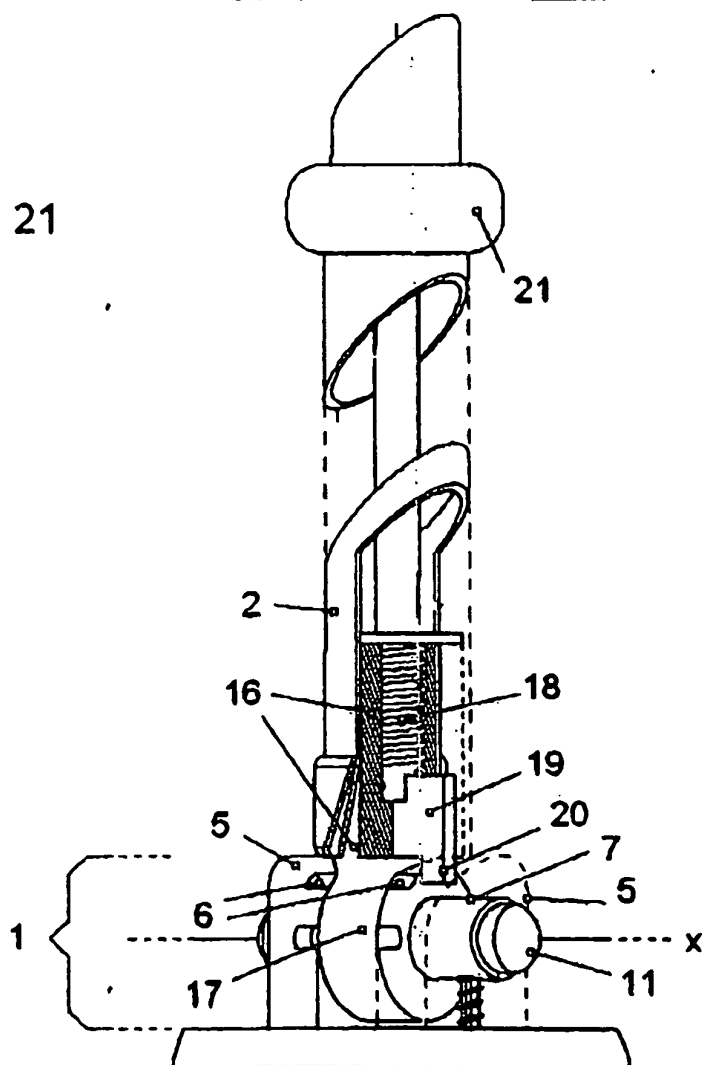


Fig. n 22

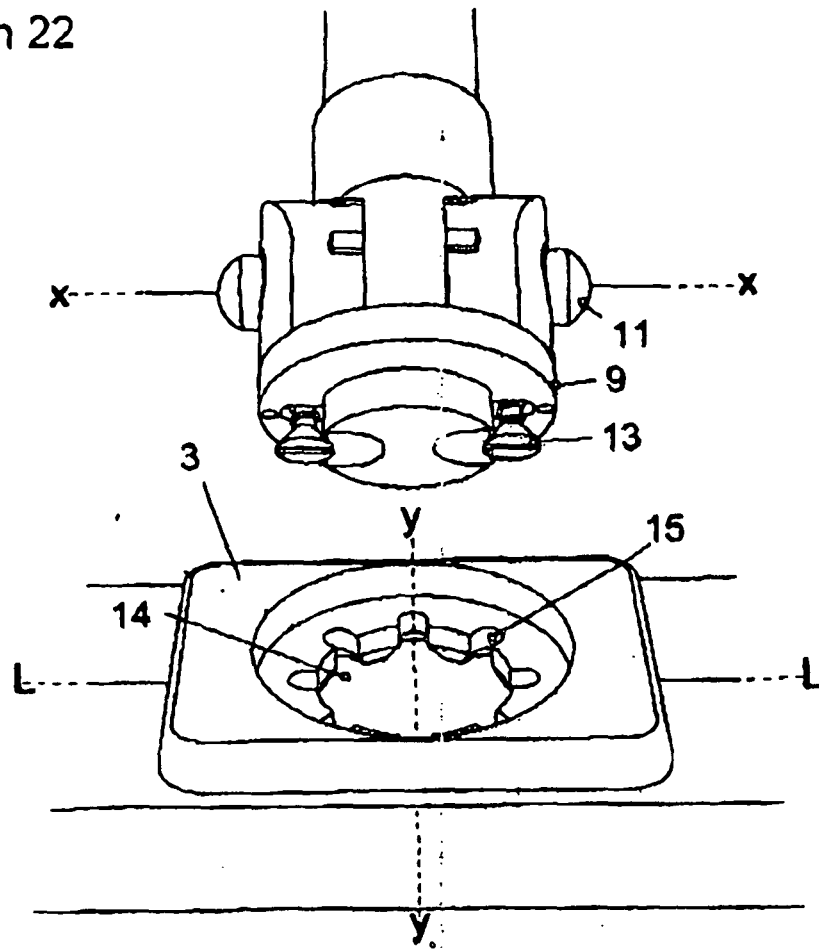


Fig. n 23

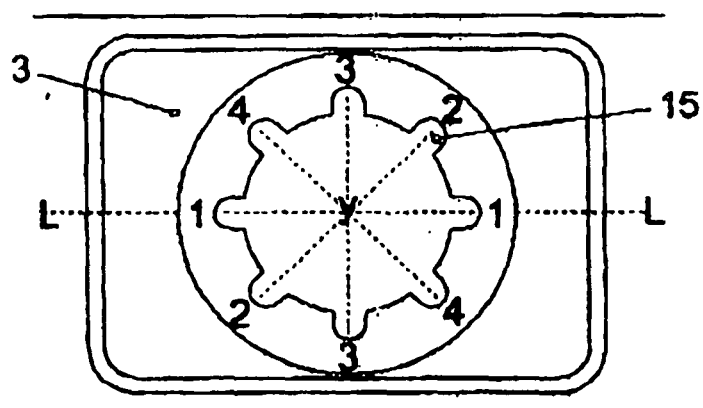


Fig. n 24

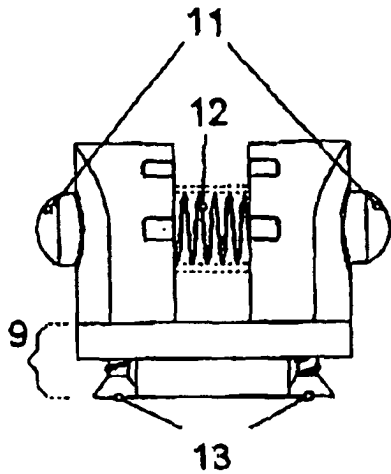


Fig. n 25

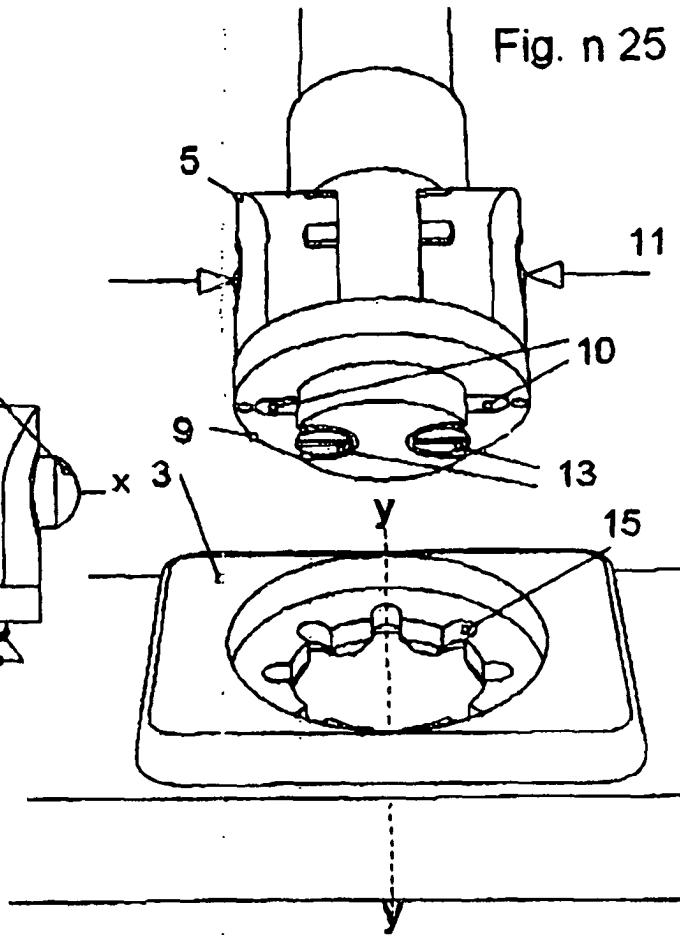
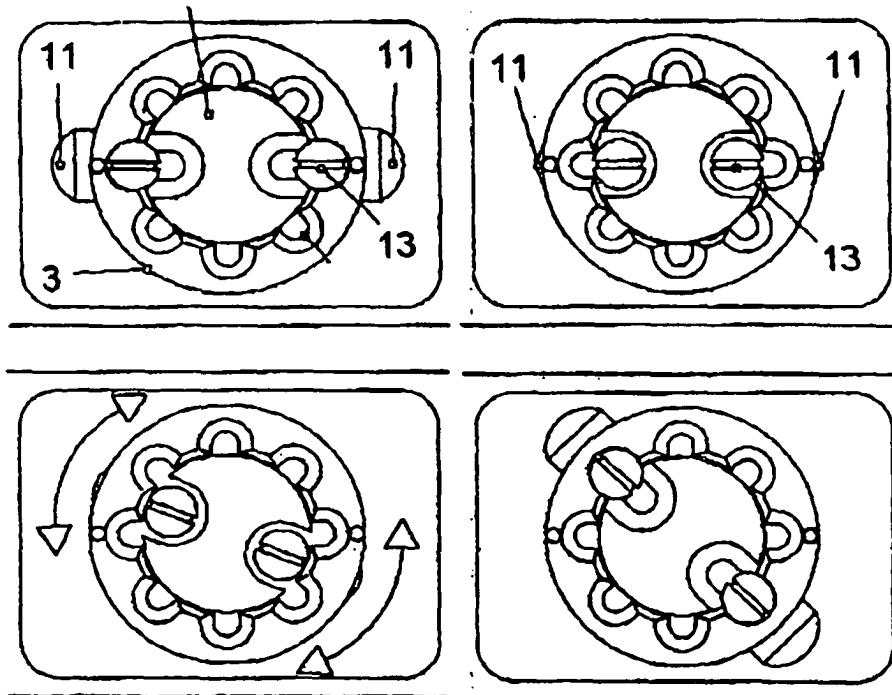


Fig.n 26



REFERENCES CITED IN THE DESCRIPTION

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