



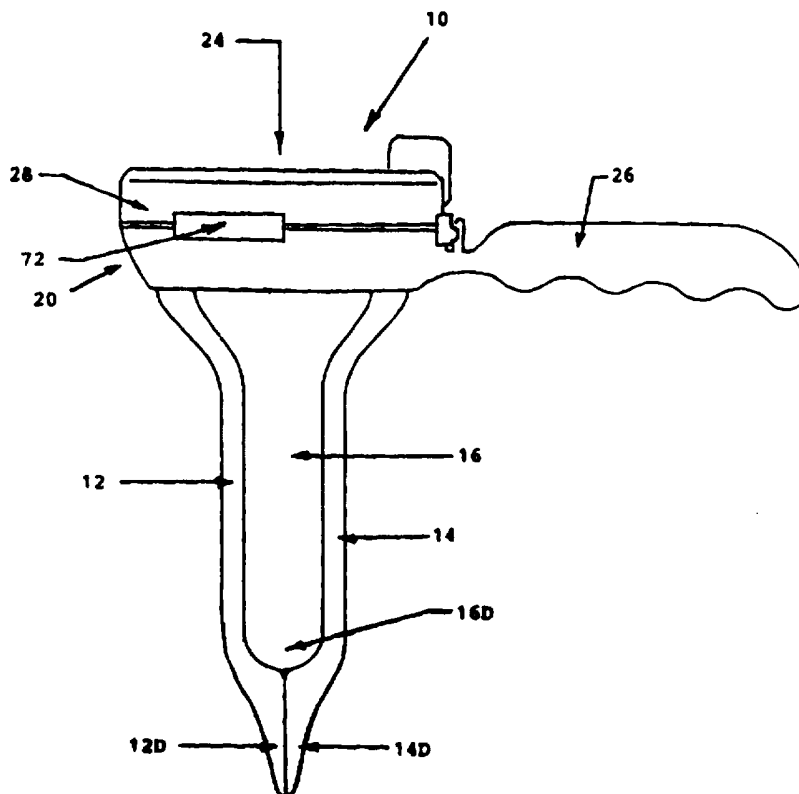
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| (21) International Application Number: PCT/AU96/00125<br>(22) International Filing Date: 8 March 1996 (08.03.96)<br>(30) Priority Data:<br>PN 1613                      9 March 1995 (09.03.95)                      AU<br>PN 6162                      23 October 1995 (23.10.95)                      AU<br>(71) Applicant (for all designated States except US): MCA MEDICAL PRODUCTS PTY. LTD. [AU/AU]; 63 King Edward Road, Osborne Park, W.A. 6017 (AU).<br>(72) Inventor; and<br>(75) Inventor/Applicant (for US only): TAN, Eric, Gay, Chee [AU/AU]; 63 King Edward Road, Osborne Park, W.A. 6017 (AU).<br>(74) Agent: MIZZI, Anthony, Paul; Griffith Hack & Co., 6th floor, 256 Adelaide Terrace, Perth, W.A. 6000 (AU). |  | (81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).<br><br>Published<br>With international search report. |   |

(54) Title: A SPECULUM

## (57) Abstract

A speculum (10) comprises a plurality of dilator fingers (12, 14, 16 and 18) which are disposed about and pivotally coupled to a support (20). The support (20) comprises an annular head portion (22) having a central opening (24). Handle (26) is formed integrally with and extends from the head portion (22). An actuator (28) is rotatably coupled to the support (20) and engages the fingers (12-18) so that when the actuator is rotated in the first direction, it contacts a first side of each of the fingers (12-18) to pivot the fingers in a manner so that their respective distal ends (12D, 14D, 16D and 18D) move away from each other; and when rotated in a second opposite direction, the actuator (28) contains opposite sides of each finger (12-18) pivoting the fingers in a manner so that their distal ends (12D-18D) move toward each other. The fingers (12-18) are held in place by retaining ring (94) which sits inside the central opening (24) of the head portion (22). The retaining ring (94) is itself held in place by the actuator (28).



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**Title****A SPECULUM****Field of the Invention**

5 The present invention relates to a speculum and in particular, but not exclusively, to a speculum for dilating, visualising and instrumenting a body cavity such as a vagina or rectum.

**Background of the Invention**

10 A conventional speculum comprises a plurality of dilator members or arms which are spread by an actuator for enlarging a body cavity. There is commonly two types of actuators, the lever type and the cam or iris type. In the lever type actuator, typically a pair of handles is provided to which the dilator arms are connected where the  
15 handles can be squeezed together so as cause spreading of the dilator arms. An inherent draw-back with most lever type specula is that the levers or handles are disposed in the line of sight of the body cavity therefore obscuring a view of the cavity under examination and/or interfering  
20 with the placement of medical instruments.

A draw-back with known cam type specula is that when opening, the dilator arms move in an outward spiralling motion. As a result, the arms must slide against the tissue in the cavity being examined which may  
25 cause pinching of the tissue or discomfort to the patient. A further disadvantage with the known cam type specula is their relatively complex construction and manufacture which increases costs to the extent that these specula, are in general, intended for multiple use. This in itself  
30 necessitates a strict hygiene and sterilisation program to ensure that there is no cross-infection between patients. Accordingly, the use of such specula is generally inconvenient to practitioners and increases the cost of service.

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**Summary of the Invention**

It is an object of the present invention to provide a speculum which is simple in construction and manufacture and which overcomes the deficiencies in the  
5 above-described prior art.

According to the present invention there is provided a speculum comprising:

a plurality of dilator members disposed about and pivotally coupled to a support; and,

10 an actuator rotatably coupled to said support for engaging said dilator members in a manner so that when said actuator is rotated in a first direction said actuator contacts a first side of each dilator member to pivot said dilator members so that distal ends of said dilator members  
15 move radially away from each other and when said actuator is rotated in a second opposite direction, said actuator contacts an opposite second side of each dilator member, to pivot said dilator members so that said distal ends move radially toward each other.

20 Preferably said actuator comprises a plurality of cam slots, each receiving a near end of each dilator member, each cam slot comprising a radially inner wall for contacting said first side of a received cam rider and a radially outer wall for contacting said second side of said  
25 received near end.

Preferably said near ends of said dilating members are dimensioned so that frictional forces between contacting surfaces of said cam slots and said dilating members maintain said dilating members in a desired  
30 relative juxtaposition determined by the position of said actuator against forces applied in a radial direction to said dilator members.

Preferably each of said near ends is radially offset relative to a central axis of said actuator, the  
35 degree of said offset substantially corresponding to the radial offset of the cam within which it rides.

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Preferably, each dilator member is coupled to said support by a pivotal joint formed between opposite edges of said dilator members and said support.

5 Preferably said support is provided with a plurality of circumferentially spaced members, each member located between adjacent dilator members, wherein opposite edges of each dilator member are pivotally connected to adjacent members.

10 Preferably said pivotal joints comprise a protrusion formed on one of an edge of each dilator member and an adjacent members, and a recess for receiving the protrusion formed on the other of said edge and said adjacent member.

15 Preferably, said protrusion is a substantially cylindrical boss and said recess comprises a socket of complementary shape for receiving said cylindrical boss protrusion.

20 Preferably said substantially cylindrical bosses are formed on opposite edges of each of said dilator members and said recesses are formed on said members.

25 In an alternate embodiment said protrusion is dome-shaped and recess comprises a socket of complementary shape for receiving the dome-shaped protrusion. In this embodiment it is preferred that said protrusion is formed on the spaced members and the recesses in opposite sides of the dilator members.

Preferably said speculum further comprises a retaining ring supported by said support for retaining said dilator members on said support.

30 Preferably said support is annular in shape and said retaining ring includes a cylindrical tube dimensioned to extend through a central opening in said support wherein said dilator members are retained between an outer circumferential wall of said tube and said support.

35 Preferably said retaining ring further comprises a plurality of locating elements disposed about an outer

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circumferential wall at an end of said tube each locating element being adapted to engage one of said members.

Preferably said actuator is provided with a plurality of resilient lugs for engaging said support to effect connection of said actuator to said support and wherein the actuator effectively clamps said retaining ring to said support.

Preferably said speculum further comprises resistance means acting between said actuator and said support for resisting rotation of said actuator relative to said support.

Preferably said resistance means comprises a plurality of projections formed on one of said actuator and said support, and means for engaging one of said projections formed on the other of said actuator and said support.

Preferably said projections are formed on said lugs of said actuator and said means for engaging is formed on said support.

Preferably said actuator, support, dilating members and retaining ring are made from plastics materials.

In an alternate embodiment said speculum further comprises a retaining ring detachably connectable to said support for retaining said actuator and said dilator members on said support.

In this embodiment said support is annular in shape and said retaining ring includes a cylindrical tube dimensioned to extend through a central opening in said support wherein said dilator members are retained between an outer circumferential wall of said tube and said support. Also said retaining ring further comprises an annular flange extending about an end of said tube wherein, said actuator is rotatably retained between said annular flange, said tube and said support. Furthermore said retaining ring is provided with a plurality of resilient lugs for engaging said spaced members to connect said

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retaining ring to said support and wherein said lugs can be resiliently displaced to disengage said spaced members for detaching said retaining ring from said support.

**Brief Description of the Drawings**

5           Embodiments of the present invention will now be described by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of an embodiment of the speculum;

10           Figure 2 is a plan view from the top of a support member of the speculum shown in Figure 1;

Figure 3 is a side view of the support shown in Figure 2;

15           Figure 4A is a view of Section 4-4 of the support shown in Figure 2;

Figure 4B is an enlarged view of detail 1 shown in Figure 4;

Figure 5 is a bottom plan view of an actuator used in the speculum shown in Figure 1;

20           Figure 6 is a top plan view of the actuator shown in Figure 5;

Figure 7 is a side view of the actuator shown in Figures 5 and 6;

25           Figure 8 is a view of Section 8-8 taken through the actuator shown in Figure 5;

Figure 9A is a front view of a first type of dilator member used in the speculum shown in Figure 1;

Figure 9B is a side view of the dilator member shown in Figure 9A;

30           Figure 10A is a front view of a second type of dilator member used in the speculum shown in Figure 1;

Figure 10B is a side view of the dilator member shown in Figure 10A;

35           Figure 10C is a view of section A-A of the dilator member shown in Figure 10A;

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Figure 10D is a view of section B-B of the dilator member shown in Figure 10A;

Figure 11A - 11D are respective views of Sections AA to DD shown in Figure 9A.

5           Figure 12A is a side view of the dilator members of the speculum when in a closed position;

Figure 12B is a bottom end view of the dilator members shown in Figure 12A;

10           Figure 12C is a top end view of the dilator members shown in Figure 12A;

Figure 13A is a side view of the dilator members of the speculum when in a fully opened position;

Figure 12B is a bottom end view of the dilator members shown in Figure 12A;

15           Figure 13C is a top end view of the dilator members shown in Figure 13A;

Figure 14A is a side view of the dilator members shown in Figures 9A and 10A;

20           Figure 14B is a top view of the dilator member shown in Figure 9A;

Figure 15 is a top view of a retaining ring incorporated in the speculum shown in Figure 1;

Figure 16 is a side view of the retaining ring as shown in Figure 15;

25           Figure 17 is a section view of the retaining ring;

Figure 18 is a bottom view of the retaining ring shown in Figure 15;

30           Figure 19 is a perspective view of a second embodiment of the speculum;

Figure 20 is a plan view from the top of a support member of the speculum shown in Figure 19;

Figure 21 is a view of Section 21-21 of the support shown in Figure 20;

35           Figure 22 is a bottom plan view of an actuator used in the speculum shown in Figure 19;



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Figure 23 is a side view of the actuator shown in Figure 22;

Figure 24 is a side view of the dilator members used in the second embodiment shown in Figure 19;

5 Figure 25 is a top view of a retaining ring incorporated in the second embodiment shown in Figure 19;

Figure 26 is a side view of the retaining ring as shown in Figure 25;

10 Figure 27 is a partial section view of the support and retaining ring when connected together; and,

Figure 28 is an enlarged view of a portion of the retaining ring shown in Figure 25.

#### **Detailed Description of the Preferred Embodiments**

15 Referring to the accompanying drawings, and in particular, Figures 1 and 2, it can be seen that a first embodiment of speculum 10 comprises a plurality of dilator members in the form of fingers 12, 14, 16 (and 18, located directly behind finger 16), which are disposed about and pivotally coupled to a support 20. The support 20  
20 comprises an annular head portion 22 having a central opening 24. Support 20 also includes a handle 26 which extends from and is formed integrally with the head portion 22. Actuator 28 is rotatably coupled to the support 20 and engages the fingers 12-18 so that when the actuator is  
25 rotated in a first direction, it contacts a first side of each of the fingers 12-18 to pivot the fingers in a manner so that distal ends 12D, 14D, 16D and 18D of the fingers move away from each other; and when rotated in a second opposite direction, the actuator contacts opposite sides of  
30 each finger 12-18, pivoting the fingers in a manner so that the distal ends 12D-18D move toward each other.

Referring to Figures 2-4B, it can be seen that the head 22 is provided with an upper annular bearing surface 30 on which the actuator 28 is seated and rotates.  
35 Outer circumferential surface 32 of the head 22 curves inwardly from bearing surface 30 in the axial direction

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terminating at lower circumferential edge 34 of the head 22. Planar inner circumferential surface 36 of the head 22 is also inclined inwardly in the axial direction from bearing surface 30 to lower edge 34. A rim 35 extends about and sticks out from the outer circumferential surface 32 at the top of the head 22.

Four members 38 are provided on inner surface 36. Each member 38 has a lower part 40 which, in plan view, (refer to Figure 2) is in the shape of a truncated triangle, with sides converging toward each other in a direction toward the centre of the head 22. The pair of U-shaped recesses 42 are formed in upper surface 44 of the lower part 40. The recesses 42 extend perpendicularly to each other and are bisected by a radius of the head 22. A web 46 extends from upper surface 44 of each member 38 in a plane containing a radius of the head 22. Each web 46 bisects the U-shaped recesses 42 of its corresponding member 38 and has a radially outermost edge 48 which is integrally formed with inner circumferential surface 36 of the head 22. Lower surface 50 of each member 38 is flush with the lower circumferential edge 34 of the head 22.

Handle 26 extends from a line which bisects adjacent members 38 and passes through central axis 52 of the head 22. A recess 54 is formed in the handle 26 near where the handle 26 joins the head 22. Post 55 extends upright from the recess 54 to a position substantially flush with the bearing surface 30 and the upper surface of the handle 26. A series of depressions or undulations 56 is formed in the handle 26 on the same side as lower edge 34 for accommodating the fingers of a hand holding the speculum 10.

Referring now to Figures 5-8, it can be seen that the actuator 28 which is of substantially annular shape has a lower surface 57 for seating on bearing surface 30 of the head 22. Four cam slots 58, 60, 62 and 64 are formed in the actuator 28 and open on to surface 57. Slot 58 is of arcuate shape and has radially outer end A and radially

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inner end B which are radially displaced from each other relative to axis 66 of the actuator. That is, opposite ends of cam slot 58 are radially offset relative to each other. In the assembled speculum 10, axis 66 coincides with axis 52. In general terms, the cam slot 58 is in the shape of a portion of a spiral. Cam slot 58 is also provided with a radially outer wall C and a parallel radially inner wall D. Cam slots 60, 62 and 64 are of identical construction to cam slot 58. Cam slots 58-64 are disposed about the actuator 28 in a manner so that the radially outer end A of one cam slot is adjacent the radially inner end B of an adjacent cam slot. A plurality of curved triangular recess 68 are also formed in the actuator 28 in order to reduce the amount of material required in the manufacture of the actuator 28 and the speculum 10.

A thumb tab 70 is provided on the outer periphery of the actuator 28.

Three resilient evenly spaced lugs 72 are formed about the outer side peripheral surface 74 of the actuator 28. The lug 72 are essentially in the form of hooks having a radially inwardly extending barb 76 which extends beneath lower surface 57 of the actuator 28. A series of projections or bumps 78 are formed on the radially outermost surface of each lug 72. As will be explained in greater detail below, the projections 78 cooperate with the post 55 to form a resistance means for resisting rotation of the actuator 28. In use, the lugs 72 snap over the rim 35 formed on head 22 so that the barbs 78 are disposed beneath the rim 35 and effectively lock the actuator 28 to the head 22.

The dilator members or fingers 12-18 are shown most clearly in Figures 9A-14B. As is evident, (refer Figures 12A and 13A) the fingers are arranged in opposing pairs with finger 12 opposite finger 14; and finger 16 opposite finger 18. Finger pair 12 and 14 (hereinafter

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referred to as the upper and lower fingers) are of the same shape and configuration as is finger pair 16 and 18 (hereinafter referred to as the side fingers). An end of each of the fingers nearest the actuator 28 is formed as a cam rider 80. The cam rider 80 is located centrally of longitudinal axis 82 of each finger and, as seen most clearly in Figure 14B is of arcuate transverse section. The transverse section of each cam rider is configured so as to ride in a respective cam slot 58-64 when the actuator 28 is rotated. Moreover the cam riders 80 are radially offset relative to central axis 54 by a degree corresponding to the offset of the cam slots 58-64. As explained in greater detail below, each cam rider 80 also has a radially outer surface 85 and radially inner surface 87 for engaging its corresponding cam slot.

Adjoining cam rider 80 is a shoulder portion 84 which is also of arcuate section transverse to axis 82. The curvature of shoulders 84 corresponds with the curvature of inner circumferential surface 36 of head 22. The sides of the shoulder portion 84 taper inwardly in both the radial and circumferential directions relative to axis 52, leading to extension 81.

As seen in Figures 10A and 10B, the distal end 16D, 18D of side fingers 16, 18 is smoothly curved and is maintained at a substantially constant radius to axis 82. However, the distal end 12D, 14D of the upper and lower fingers 12, 14, terminates in a dolphin nose like portion 86 which is also curved radially inwardly relative to axis 82 (this is most evident from Figures 1 and 12A). When the fingers 12-18 are in a closed position, the dolphin nose like portions 86 of upper and lower fingers 12, 14 abut each other and extend beyond the distal ends 16D, 18D of side fingers 16, 18 (refer Figures 12A and 12B). As seen in Figures 11-11D, the fingers 12 and 14 are of arcuate transverse section throughout their length.

Inner surface 88 of each finger is of a generally concave shape and faces the axis 52. Opposing outer

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surface 90 of each finger is of a generally convex shape. As shown in Figure 14B, a substantially cylindrical boss 92 is formed on opposite side edges of the shoulders 84 of each finger for receipt in the U-shaped recesses 42 of the members 38.

Retaining ring 94 shown in Figures 15-18 is provided for retaining the fingers 12-18 on the head 22. Retaining ring 94 comprises a cylindrical tubular portion 96 dimensioned to fit inside central opening 24 when the fingers 12-18 are pivotally coupled to members 38 and the actuator 28 resting on bearing surface 30. A plurality of locating members in the form of prong pairs 98 are provided about the outer circumferential surface at the top of retaining ring 94. The prong pairs 98 are evenly spaced about the retaining ring 94 and disposed at locations so as to engage the webs 46 of the members 38. That is, each web 46 is disposed between the prongs of respective prong pairs 98. When the retaining ring 94 is disposed within the head 22, lower surfaces of the prong pairs 98 rest on the upper surfaces 44 of the members 38. Further, the fingers 12-18 are held between the retaining ring 94 and the inner circumferential surface 36 of the head 22.

When assembling the speculum 10, initially, the fingers 12-18 are pivotally connected with members 38 by placing the cylindrical bosses 92 into the U-shaped recesses 42. Next, the retaining ring 94 is placed inside the head 22 with the webs 46 disposed between adjacent prongs in each prong pair 98. Finally, the actuator 28 is snap fitted to the head 22. This is achieved by pushing the actuator 28 downwardly so as to flex the lugs 72 to snap over the rim 35. When coupling the actuator 28 to the head 22, the fingers 12-18 are also orientated so that their corresponding cam riders 80 fall within their respective cam slots 58-64.

When assembled and in a fully closed position, the cam rider 80 of each finger 12-18 is disposed in individual ones of cam slots 58-64 adjacent the radially

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outermost end A of each cam slot. If the actuator 28 is now rotated in the clockwise direction, radially outer wall or side surface C of each cam slot will abut the outer surface 85 of each cam rider 80 causing the fingers 12-18 to pivot so that the cam riders 80 are moved radially closer to axis 52 and the distal free ends of each finger move radially outwardly. This pivoting motion continues until the actuator 28 is rotated to the point where the cam riders 80 lie adjacent the radially inner-most ends B of their respective cam slots. In this position, the fingers 12-18 are fully spread as shown in Figures 13A-13C. Inspection or treatment of the thus dilated body cavity can be effected through tubular portion 96 of the retaining ring 94.

In order to fully close the speculum and return the fingers to the position shown in Figures 12A-12C with the dolphin nose like portions 86 of fingers 12 and 14 in mutual abutment, the actuator is now rotated in the clockwise direction so that the radially inner side D of each cam slot abuts inner side 87 of each cam rider 80 causing the fingers 12-18 to pivot in a direction so that the cam riders 80 are moved radially away from axis 52 and the distal ends of the fingers 12-18 pivoted toward each other.

The frictional forces which exist between the contacting surfaces of the cam riders 80 and cam slots is such so as to maintain the fingers 12-18 in a predetermined spatial relationship when inserted in the body cavity. That is, the natural compressive forces which would be applied to the outer surfaces 90 of the fingers 12-18 when inserted in a body cavity, cannot collapse the fingers 12-18. Nevertheless, resistance means formed by the combination of the projections 78 on the lugs 72 and the post 55 provide a further, soft, resistance to the rotation of actuator 28 and thus assist in maintaining the fingers 12-18 in selected spread positions.

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The rotation of the actuator 28 is accomplished by "pushing" one's thumb against thumb tab 70.

Each of the separate components of the speculum, namely the fingers 12-18, the support 20, actuator 28 and retaining ring 94 can be made from plastics material and advantageously by an injection moulding process. Accordingly, the speculum 10 is very well suited to high volume mass production and therefore can be made at a very low unit cost. In addition, the speculum 10 can be assembled from its components very easily without the need of any hand tools in under one minute. For these reasons, speculum 10 is ideal for disposable and/or single use. This eliminates the need for a doctor to sterilise and disinfect a speculum prior to use with different patients.

As the fingers 12-18 move in a pivotal motion rather than an outward spiralling motion, the fingers do not slide across the tissue forming the cavity when moving toward or away from each other. Also, the fingers are able to maintain a spatial relationship within the body cavity without the need for locking mechanisms such as ratchets or locking pins and screws. This also greatly simplifies the construction and manufacture of the speculum 10.

A second embodiment of the speculum 10' is illustrated in Figures 19 to 28. In describing these figures, the features of the second embodiment which correspond to those of the first embodiment are indicated by the same reference numbers but with those numbers being designated with the prime symbol ('). In general terms, the speculum 10' is very similar to the first embodiment of the speculum 10 shown in Figures 1-18 and includes a plurality of dilator members in the form of fingers 12', 14', 16' and 18' (with finger 18' located directly behind finger 16' and therefore not visible in Figure 19). The fingers 12'-18' are disposed about and pivotally coupled to a support 20'. The support 20' comprises an annular head portion 22' having a central opening 24'. A handle 26' extends integrally from the head portion 22'. Actuator 28'

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is rotatably coupled to the support 20' and engages the fingers 12'-18' so that when the actuator 28' is rotated in a first direction, it contacts a first side of a near end of each of the fingers 12'-18' thereby pivoting the fingers so that their distal ends 12D'-18D' respectively move away from each other. When rotated in the opposite direction, the actuator 28' contacts opposite sides of the near end of each finger 12'-18' thereby pivoting the fingers so that their respective distal ends 12D'-18D' move toward each other.

Referring to Figures 20 and 21, it can be seen that the head 22' is provided with an upper bearing surface 30' on which the actuator 28' is seated and rotates. Outer circumferential surface 32' of the head 22' curves inwardly from bearing surface 30' in the axial direction terminating at lower circumferential edge 34'. Planar inner circumferential surface 36' of the head 22' is also inclined inwardly in the axial direction from bearing surface 32' to lower end 34'. In contrast with the first embodiment shown in Figures 1-18, in the second embodiment, the members 38' are in the form of ribs provided on the inner surface 36' which extend in substantially the axial direction from bearing surface 30' to marginally below lower edge 34'. A longitudinal slot 100 is formed in front face 102 of each rib or member 38' and faces axis 104 of the head 22'. Slot 100 is open at lower end 106 adjacent the lower edge 34'. Hemispherical or dome-like protrusions 108 are formed on opposite side faces 110 and 112 of each rib 38' at the lower end 106. Upper end 114 of slot 100 is closed.

As seen in Figures 22 and 23, actuator 28' the shape, configuration and relative positions of cam slots 58', 60', 62' and 64' are identical to that of actuator 28 shown in Figure 5.



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The main differences between actuator 28' and 28 are: the absence of the lugs 72 from actuator 28'; and, the inclusion of a series of adjacent thumb depressions 116 on the actuator 28' for seating the thumb of the hand gripping handle 26'.  
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The lugs 72 are not required for the actuator 28', because, as explained in greater detail below, the actuator 28' is retained on the head 22' by the retaining ring 94'.

The only difference of any significance between the fingers 12'-18' of the second embodiment is the replacement of the cylindrical boss 92 of the first embodiment with a hemispherical recess 118 (refer Figure 24) on the opposite side edges of the shoulder 78' of each finger. The recesses 118 receive the hemispherical or dome-like projections 108 of the ribs 38'.  
10  
15

Retaining ring 94' shown in Figures 25-28 is provided for retaining the fingers 12'-18' and the actuator 28' on the head 22'. Retaining ring 94' comprises a cylindrical tubular portion 96' dimensioned to fit inside central opening 24' when the fingers 12'-18' are pivotally coupled to ribs 38' and the actuator 28' is resting on bearing surface 30'. Upper end of the retaining ring 94' is formed with an annular flange 120. As seen most clearly in Figure 19, the annular flange 120 circumferentially overlies a portion of upper surface of the actuator 28' preventing substantial axial displacement of the actuator 28' and retaining the actuator 28' on the head 22'. Four evenly spaced axially extending lugs 122 are formed about the tubular portion 96'. Each lug 122 is provided with a tang 124 which is joined and suspended at its upper end 126 to the tubular portion 96'. As the retaining ring 94' is made from a resilient material, the tang 124 is able to resiliently flex about upper end 126. An elongate projection 128 is formed along a lower portion of the tang  
20  
25  
30

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124 extending collinearly with axis 104. Opposite side surfaces 130 and 132 of the projection 128 are convergent in the radial direction away from axis 104. As a result, front face 134 of the projection 128 is narrower in width than base 136 of the projection. The lower-most end of tang 124 is provided with a hook-like member 138 which extends for the whole width of the tang 124.

When assembling the speculum 10', initially the fingers 12'-18' are pivotally connected with ribs 38' by snapping the protrusions 108 into recesses 118. Next the actuator 28' is lowered onto bearing surface 30 with cam riders 80' located in cam slots 58'-64'. The retaining ring 94' is orientated so that lugs 122 are aligned with respective ribs 38' and then inserted into central opening 24'. During insertion of the retaining ring 94', the front surface 134 of the projections 128 will initially bear against upper end 114 of the ribs 38'. This will cause the tangs 124 to flex radially inwardly. When the uppermost end of a projection 128 is lower than the upper end 114 of a facing rib 38' the tangs 124 will snap back with projections 128 being received in longitudinal slots 100 and the hooks 138 engaging lower end face of the ribs 38'.

Thus, in the speculum 10', the retaining ring 94' locks both the fingers 12'-18' to the ribs 38' and maintains the actuator 28' in rotatable connection with the head 22'. In contrast, in the first embodiment of the speculum 10 shown in Figures 1-19, it is the actuator 28 which effectively clamps all of the components together by virtue of the lugs 72 which engage the rim 35 formed about the head 22.

Now that embodiments of the speculum has been described in detail, it will be apparent that numerous modifications and variations may be made without departing from the basic inventive concepts. For example, while the speculums 10 and 10' are shown as having four fingers 12-18, any number

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of fingers can be used provided of course there is a minimum of two. Further, the fingers need not be of the exact configuration as shown and can for example be rod-like instead. Moreover, the fingers can all be of identical shape and configuration and may also be pointed at their distal ends. The configuration of the fingers when in a closed state can also be arranged in a shape other than the dolphin nose as shown in Figures 1 and 12A, for example the fingers may take on a conical or cylindrical shape. The cam profiles may be different from each other so that for example one or more fingers pivot to a greater degree than other fingers. Additionally, the thumb tab 70 of speculum 10 and the thumb depressions 116 of speculum 10' can be replaced with a series of scalloped recesses formed about the periphery of the actuator 20/28' to allow engagement with a person's thumb for rotating the actuator 28/28'. All such modifications and variations are deemed to be within the scope of the present invention the nature of which is to be determined from the foregoing description.

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**THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:**

1.           A speculum comprising:  
          a plurality of dilator members disposed about and  
          pivotally coupled to a support; and,  
5           an actuator rotatably coupled to said support for  
          engaging said dilator members in a manner so that when said  
          actuator is rotated in a first direction said actuator  
          contacts a first side of each dilator member to pivot said  
          dilator members so that distal ends of said dilator members  
10           move radially away from each other and when said actuator  
          is rotated in a second opposite direction, said actuator  
          contacts an opposite second side of each dilator member, to  
          pivot said dilator members so that said distal ends move  
          radially toward each other.
- 15    2.           A speculum according to claim 1, wherein said  
          actuator comprises a plurality of cam slots, each receiving  
          a near end of each dilator member, each cam slot comprising  
          a radially inner wall for contacting said first side of a  
          received cam rider and a radially outer wall for contacting  
20           said second side of said received near end.
3.           A speculum according to claim 2, wherein said  
          near ends of said dilating members are dimensioned so that  
          frictional forces between contacting surfaces of said cam  
          slots and said dilating members maintain said dilating  
25           members in a desired relative juxtaposition determined by  
          the position of said actuator against forces applied in a  
          radial direction to said dilator members.
4.           A speculum according to claim 3, wherein each of  
          said near ends is radially offset relative to a central  
30           axis of said actuator, the degree of said offset  
          substantially corresponding to the radial offset of the cam  
          within which it rides.

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5. A speculum according to claim 1, wherein each dilator member is coupled to said support by a pivotal joint formed between opposite edges of said dilator members and said support.
- 5 6. A speculum according to claim 5, wherein said support is provided with a plurality of circumferentially spaced members, each member located between adjacent dilator members, wherein opposite edges of each dilator member are pivotally connected to adjacent members.
- 10 7. A speculum according to claim 6, wherein said pivotal joints comprise a protrusion formed on one of an edge of each dilator member and an adjacent members, and a recess for receiving the protrusion formed on the other of said edge and said adjacent member.
- 15 8. A speculum according to claim 7, wherein said protrusion is a substantially cylindrical boss and said recess comprises a socket of complementary shape for receiving said cylindrical boss protrusion.
- 20 9. A speculum according to claim 8, wherein said substantially cylindrical bosses are formed on opposite edges of each of said dilator members and said recesses are formed on said members.
- 25 10. A speculum according to claim 1, wherein said speculum further comprises a retaining ring supported by said support for retaining said dilator members on said support.
- 30 11. A speculum according to claim 10, wherein said support is annular in shape and said retaining ring includes a cylindrical tube dimensioned to extend through a central opening in said support wherein said dilator

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members are retained between an outer circumferential wall of said tube and said support.

12. A speculum according to claim 11, wherein said retaining ring further comprises a plurality of locating elements disposed about an outer circumferential wall at an end of said tube each locating element being adapted to engage one of said members.

13. A speculum according to claim 12, wherein said actuator is provided with a plurality of resilient lugs for engaging said support to effect connection of said actuator to said support and wherein the actuator effectively clamps said retaining ring to said support.

14. A speculum according to claim 13, further comprising resistance means acting between said actuator and said support for resisting rotation of said actuator relative to said support.

15. A speculum according to claim 14, wherein said resistance means comprises a plurality of projections formed on one of said actuator and said support, and means for engaging one of said projections formed on the other of said actuator and said support.

16. A speculum according to claim 15, wherein said projections are formed on said lugs of said actuator and said means for engaging is formed on said support.

17. A speculum according to claim 7, wherein said protrusion is dome-shaped and recess comprises a socket of complementary shape for receiving the dome-shaped protrusion.

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18. A speculum according to claim 17, wherein said protrusion is formed on the spaced members and the recesses in opposite sides of the dilator members.

5 19. A speculum according to claim 6, wherein said speculum further comprises a retaining ring detachably connectable to said support for retaining said actuator and said dilator members on said support.

10 20. A speculum according to claim 19, wherein said support is annular in shape and said retaining ring includes a cylindrical tube dimensioned to extend through a central opening in said support wherein said dilator members are retained between an outer circumferential wall of said tube and said support.

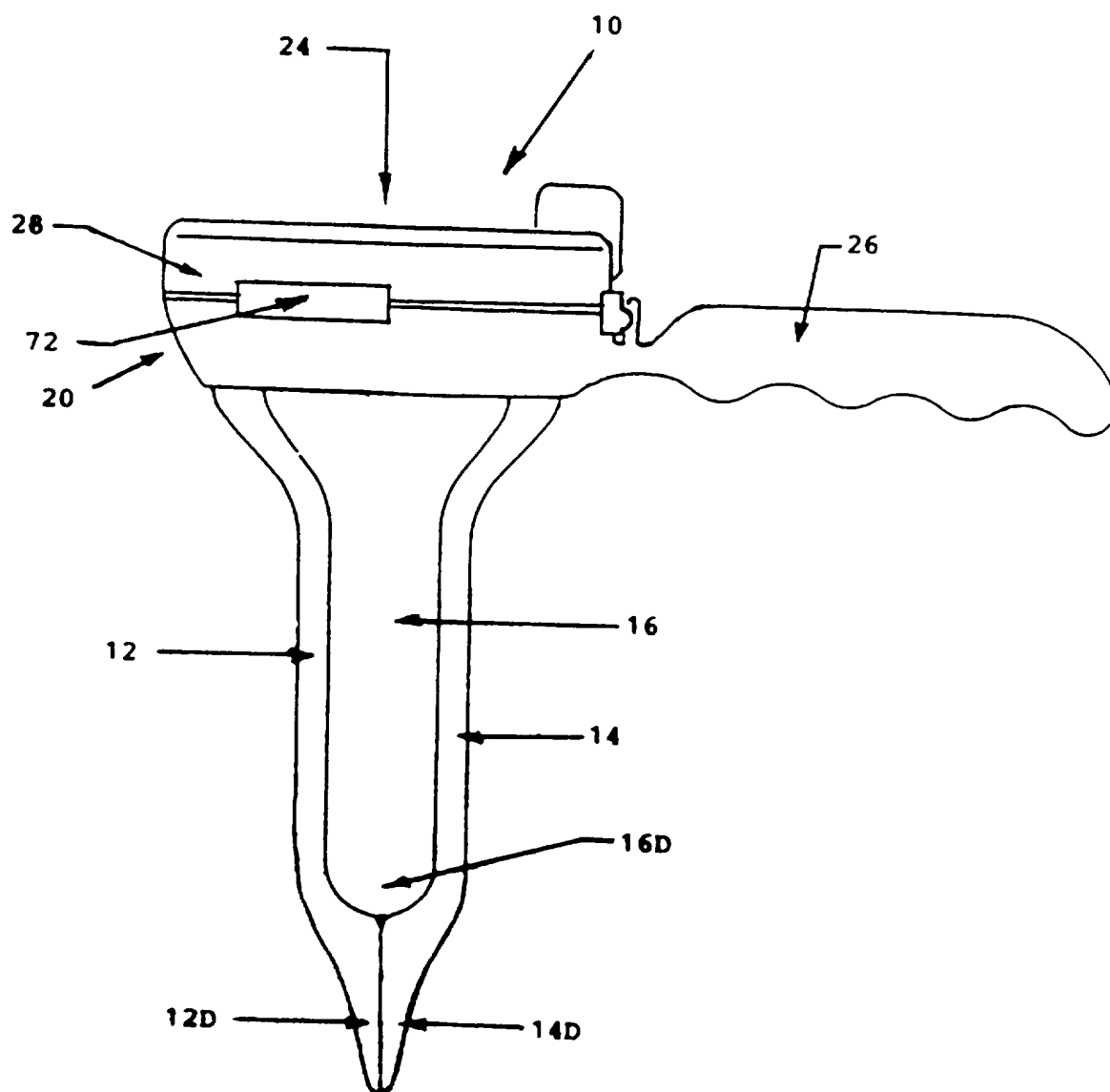
15 21. A speculum according to claim 20, wherein said retaining ring further comprises an annular flange extending about an end of said tube wherein, said actuator is rotatably retained between said annular flange, said tube and said support.

20 22. A speculum according to claim 21, wherein said retaining ring is provided with a plurality of resilient lugs for engaging said spaced members to connect said retaining ring to said support and wherein said lugs can be resiliently displaced to disengage said spaced members for detaching said retaining ring from said support.

25 23. A speculum according to claim 1, wherein said actuator, support, dilating members and retaining ring are made from plastics materials.

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FIGURE 1





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FIGURE 4A

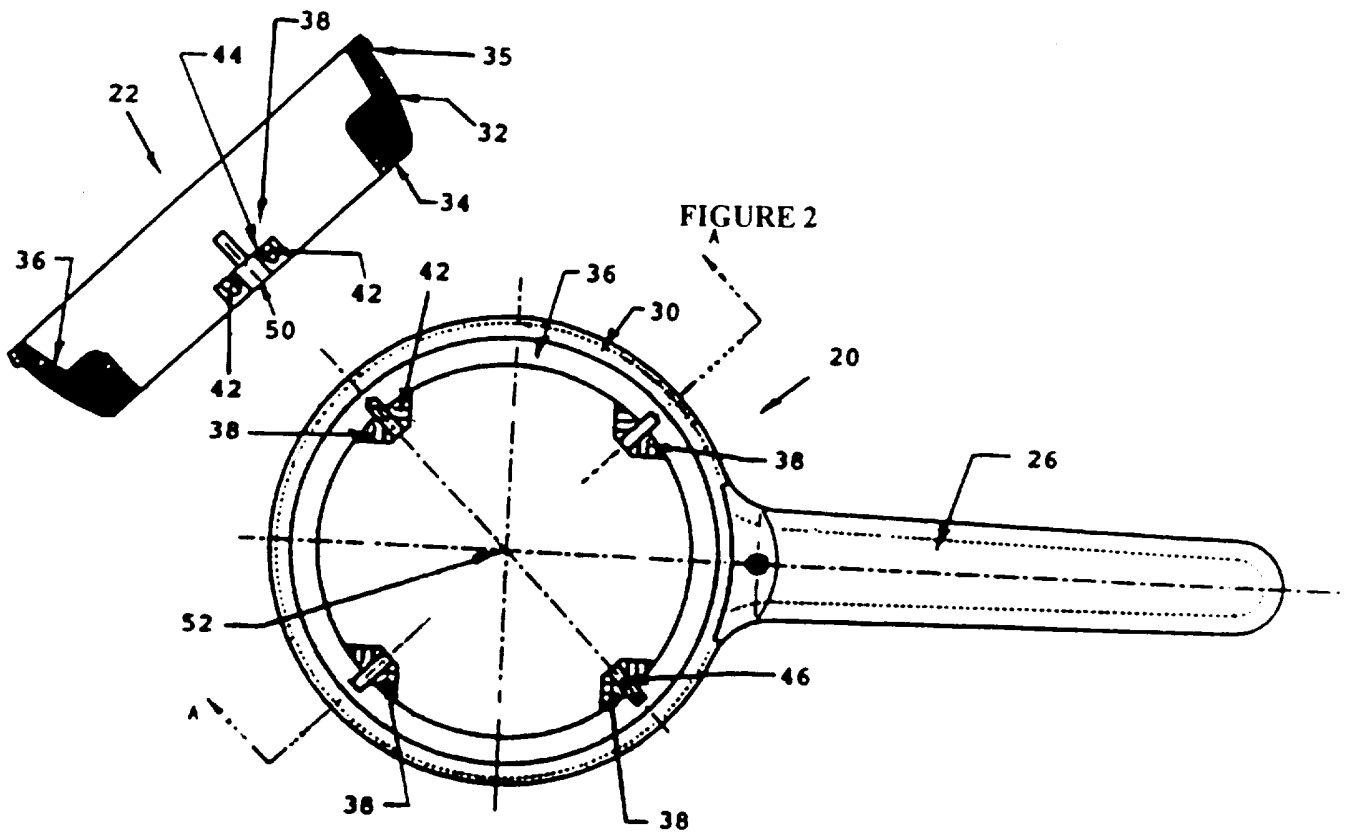
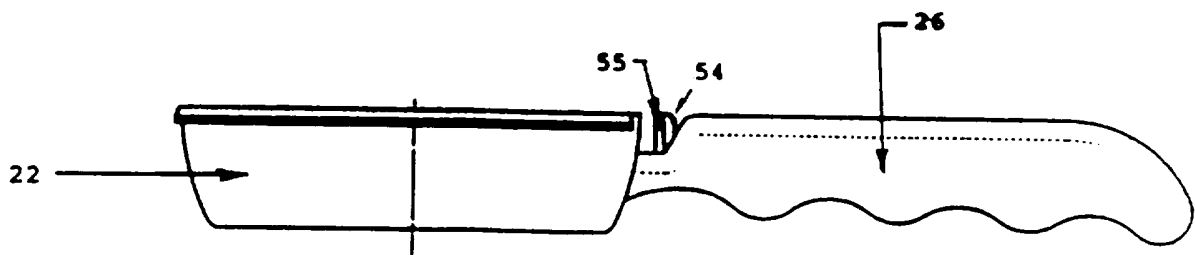


FIGURE 2

FIGURE 3



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FIGURE 5

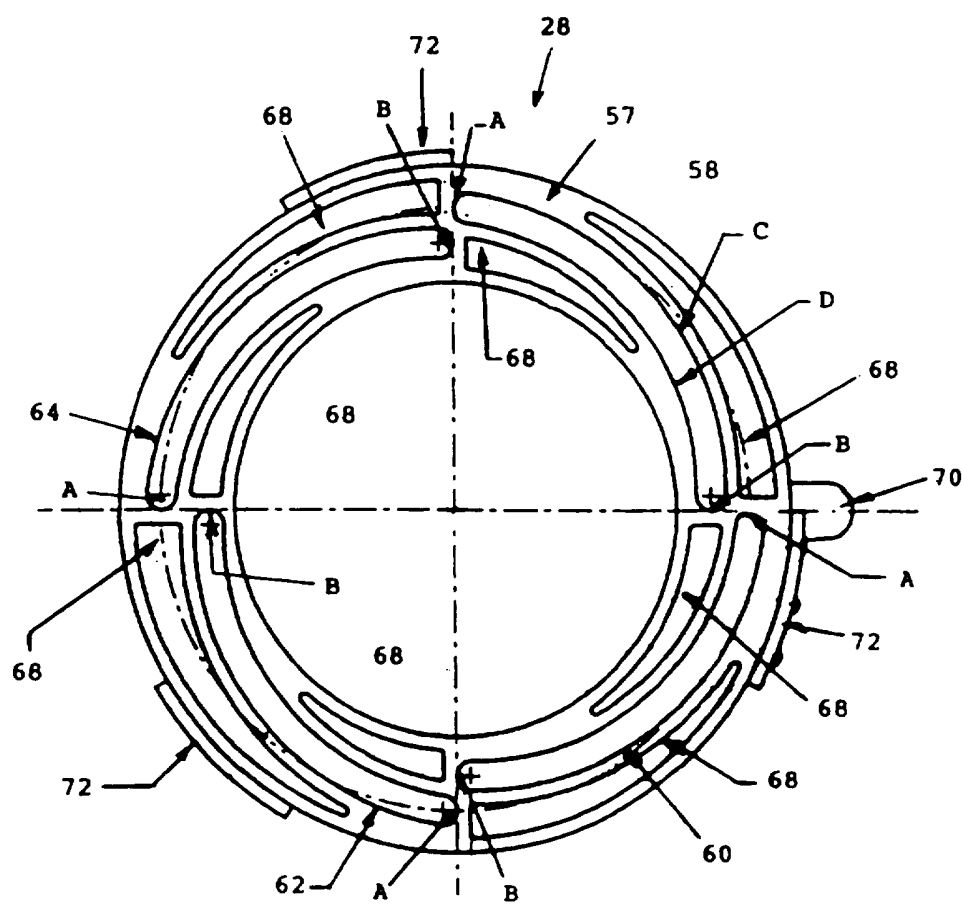
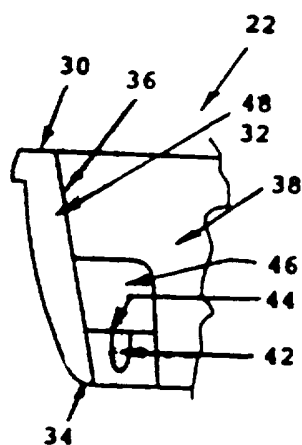


FIGURE 4B



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FIGURE 6

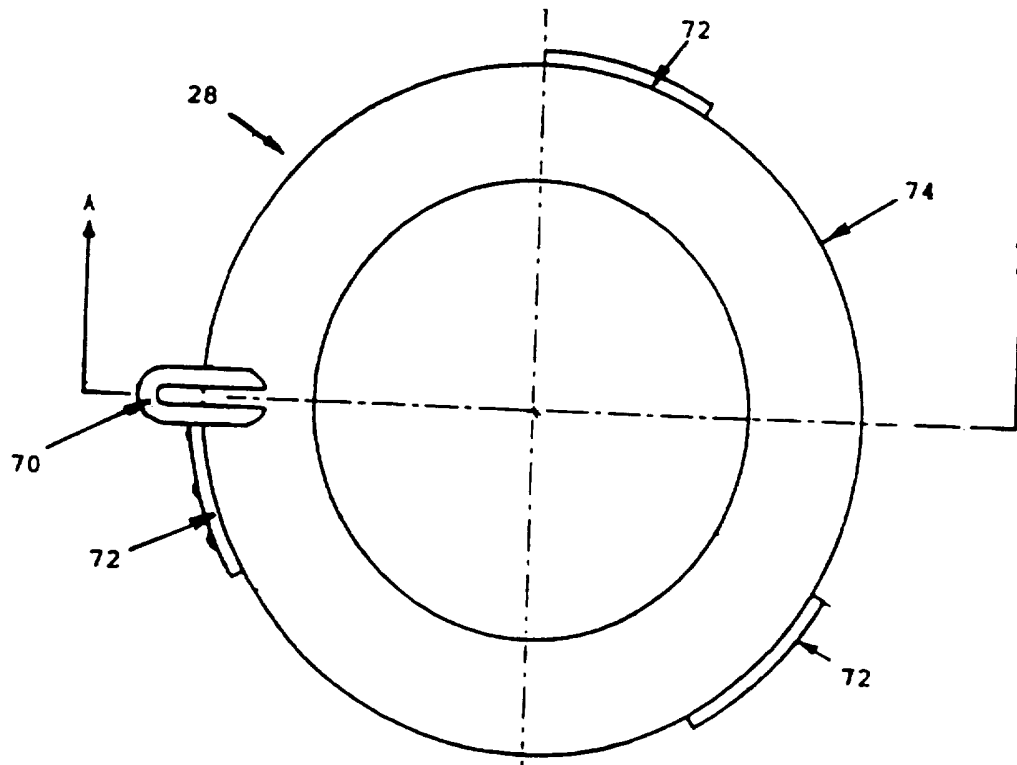


FIGURE 7

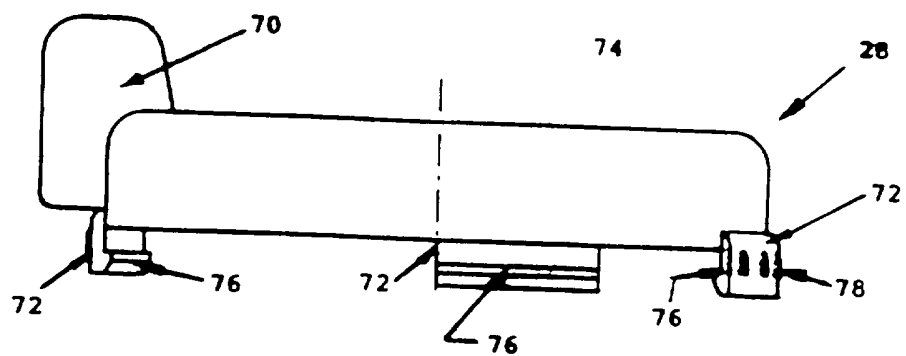
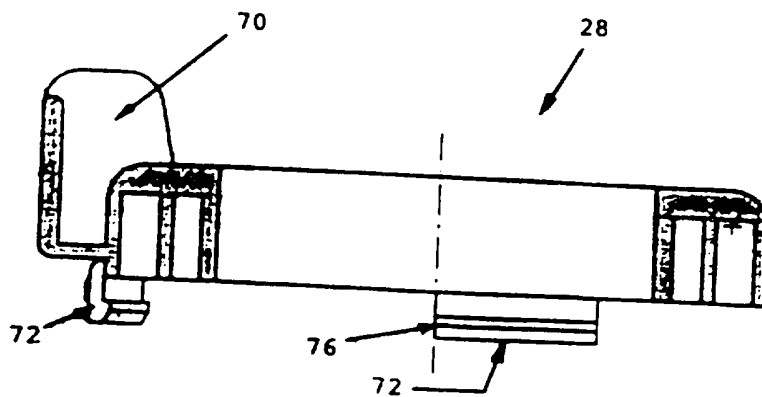


FIGURE 8



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FIGURE 9A

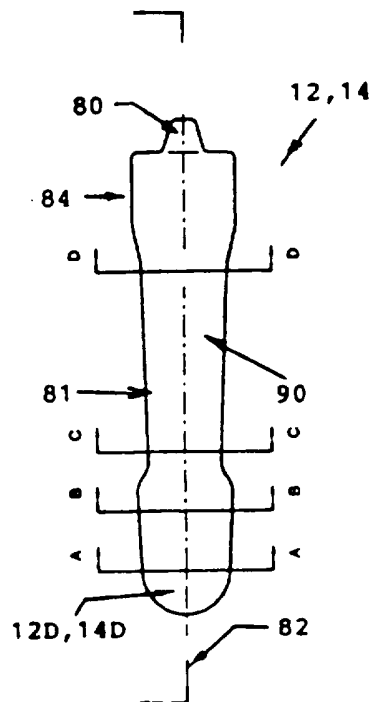


FIGURE 9B

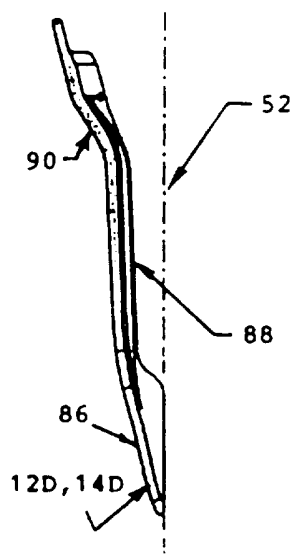


FIGURE 10A

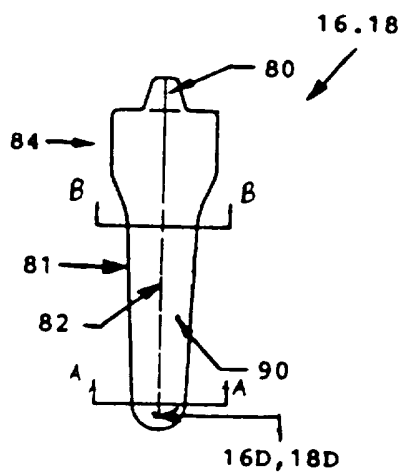


FIGURE 10B

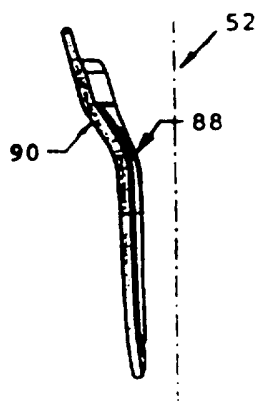
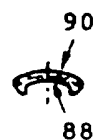


FIGURE 10C



FIGURE 10D



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FIGURE 11A

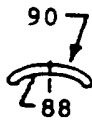


FIGURE 11B



FIGURE 11C



FIGURE 11D

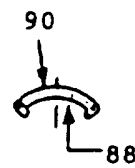


FIGURE 12A

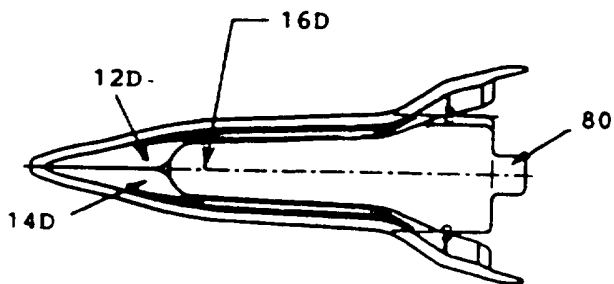


FIGURE 13A

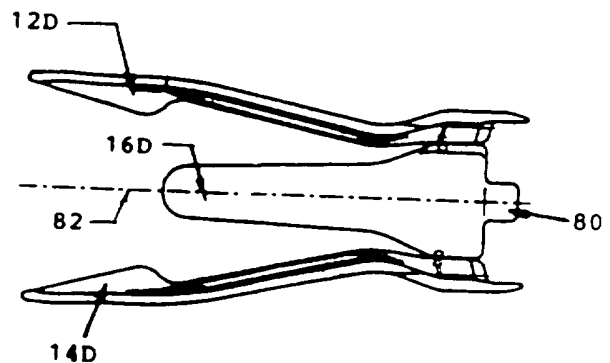


FIGURE 12B

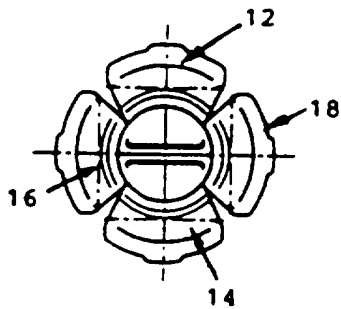


FIGURE 13B

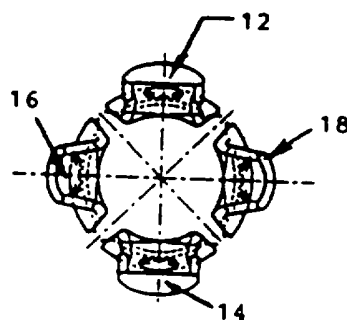


FIGURE 13C

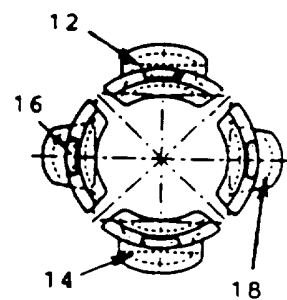
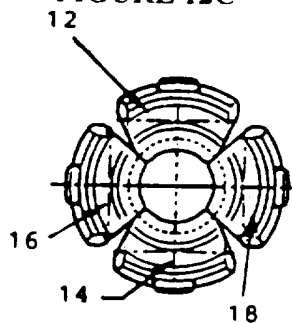


FIGURE 12C



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FIGURE 14A

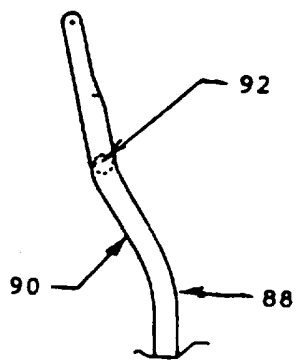


FIGURE 14B

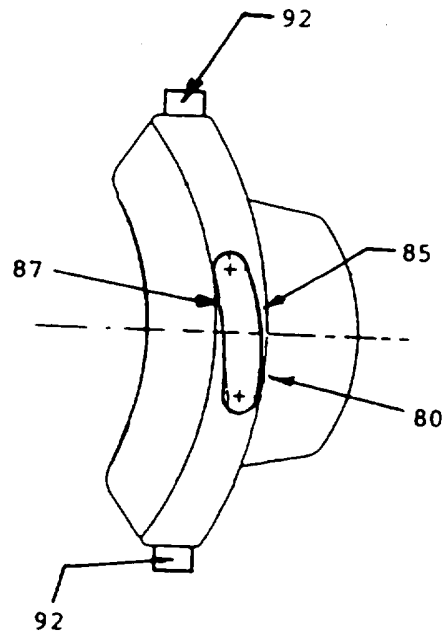
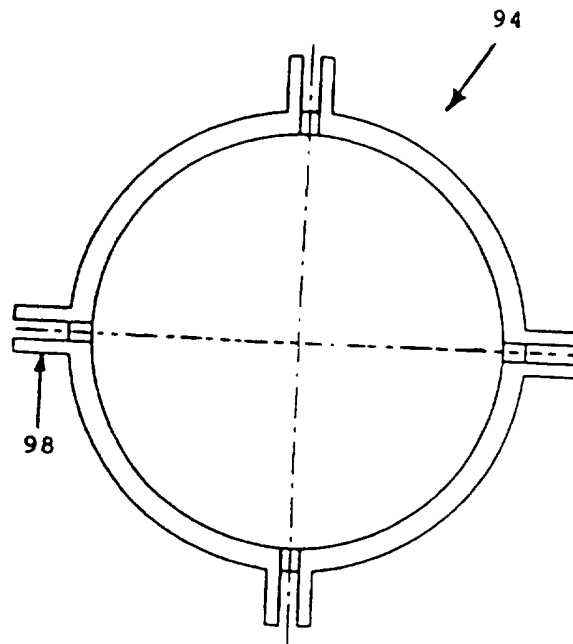


FIGURE 15



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FIGURE 16

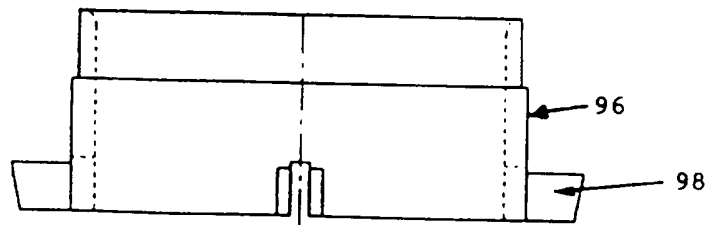


FIGURE 17

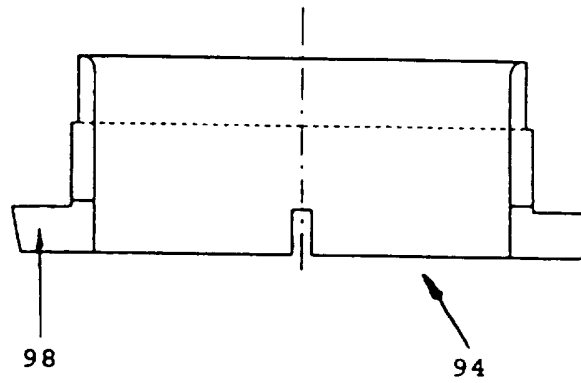
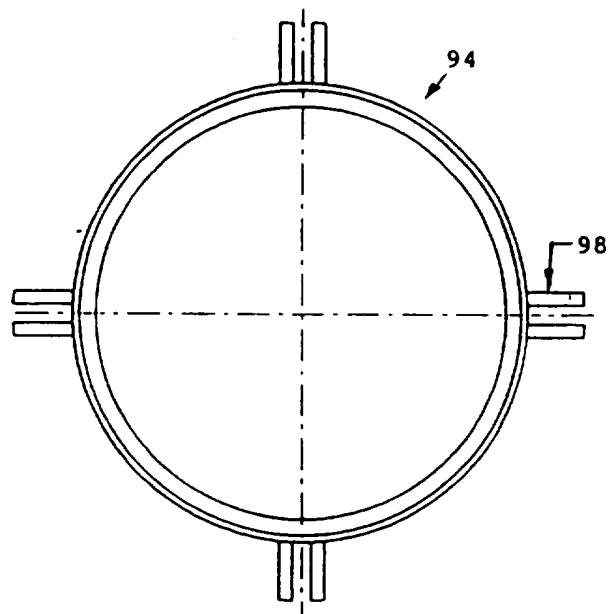
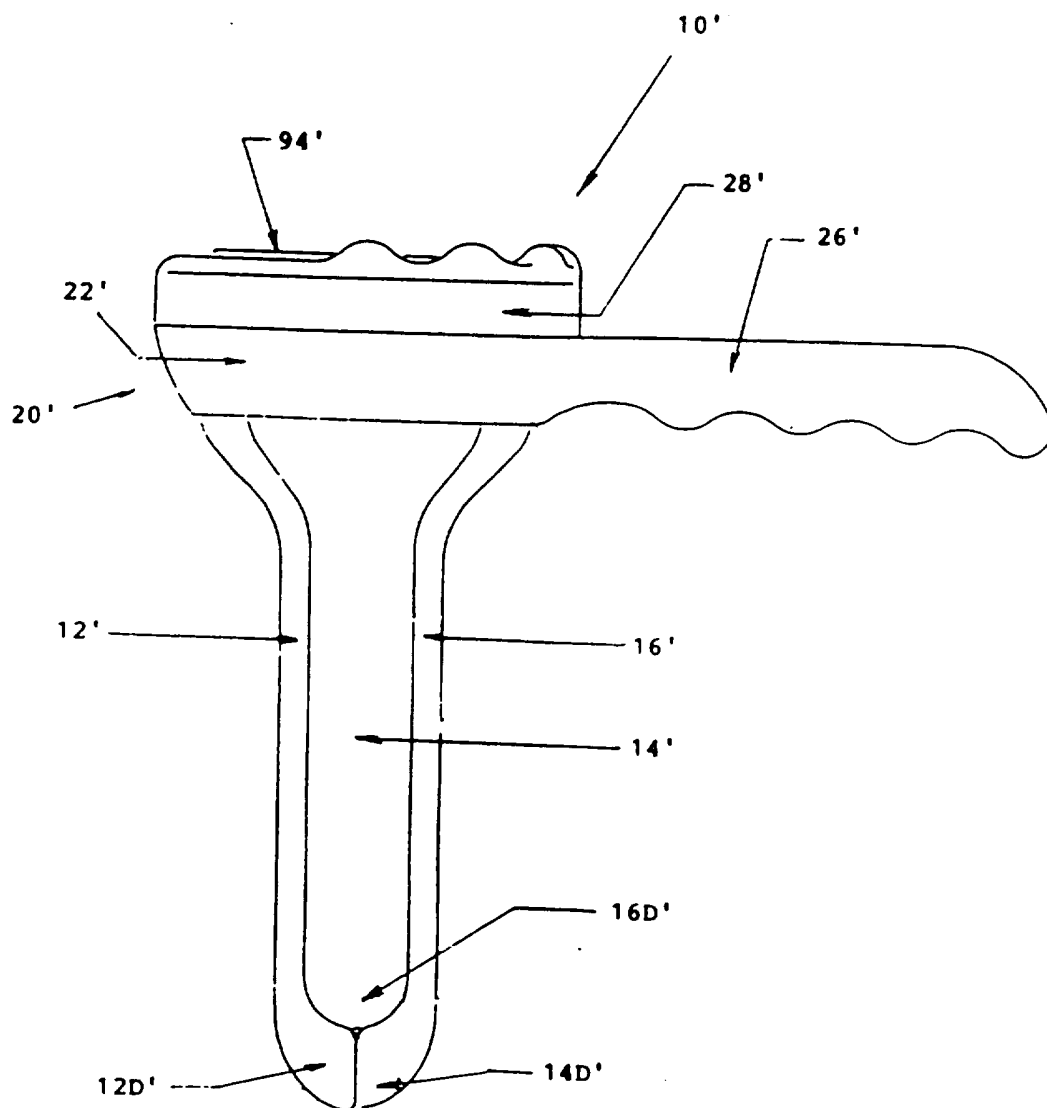


FIGURE 18



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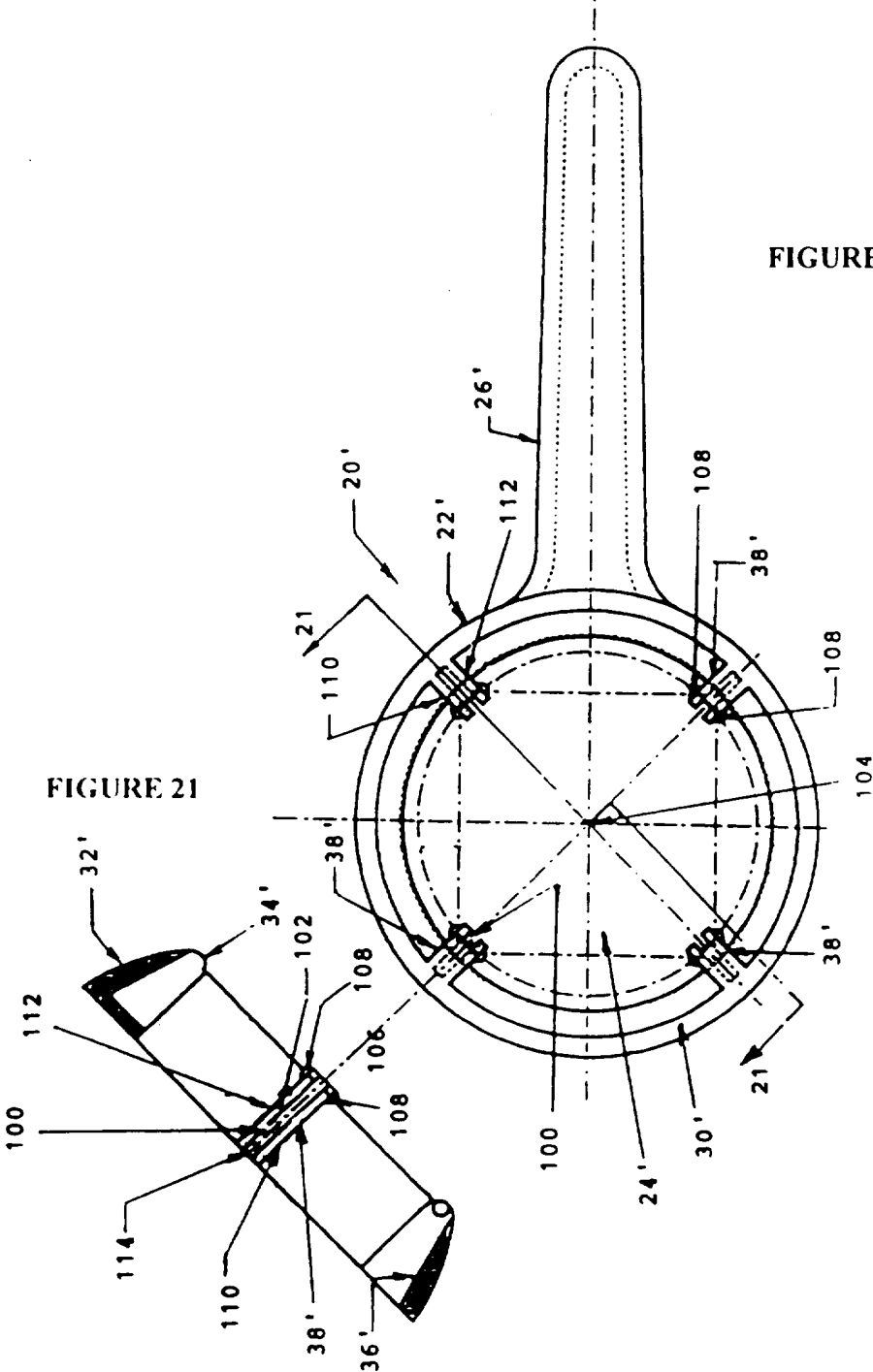
FIGURE 19





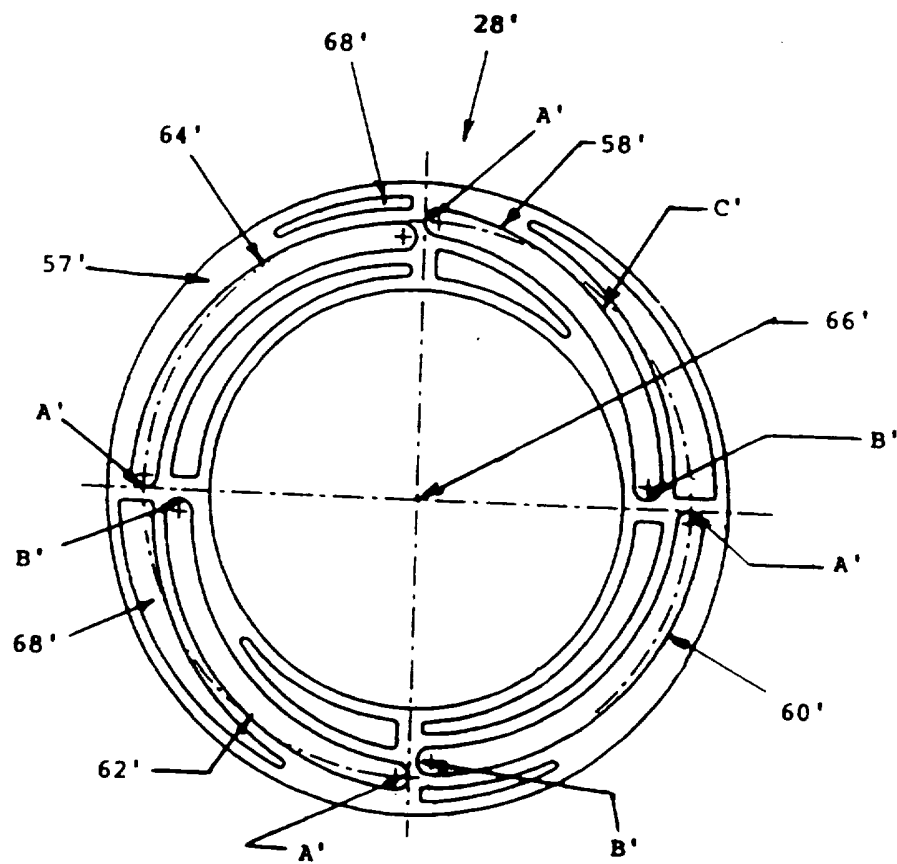
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FIGURE 20



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FIGURE 22



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FIGURE 23

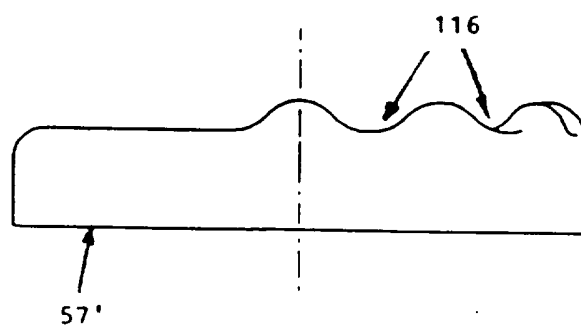
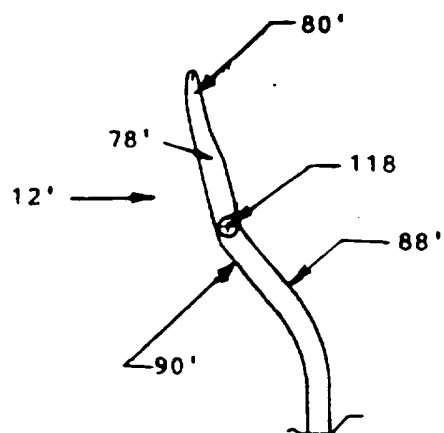


FIGURE 24



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FIGURE 25

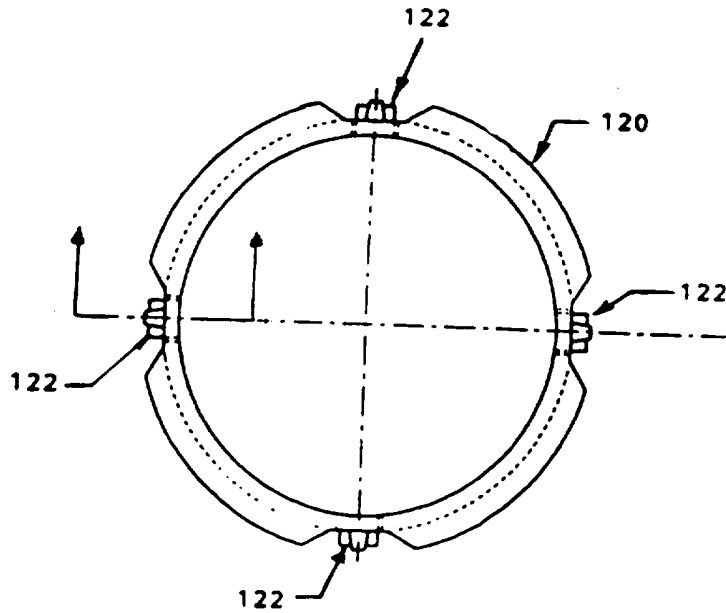


FIGURE 26

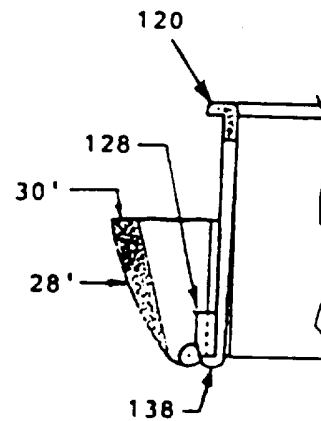


FIGURE 27

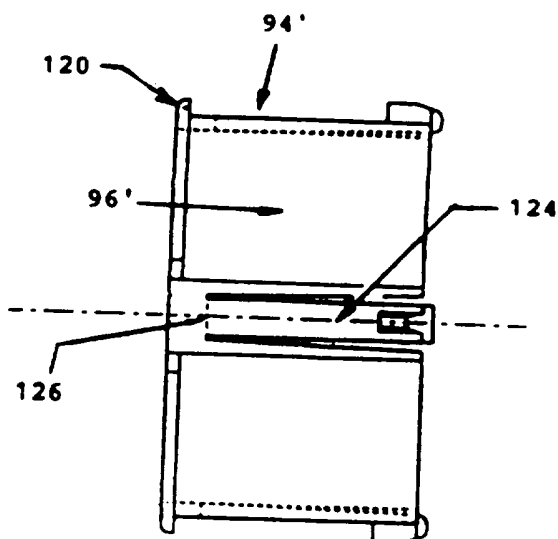
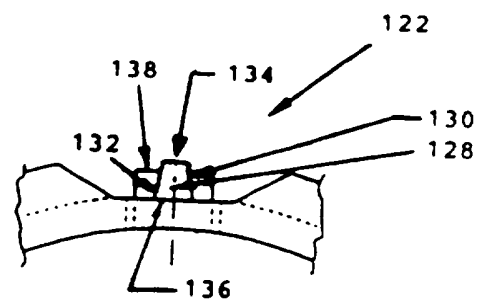


FIGURE 28



**INTERNATIONAL SEARCH REPORT**

International Application No.

PCT/AU 96/00125

**A. CLASSIFICATION OF SUBJECT MATTER**Int Cl<sup>6</sup>: A61B 1/32

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC : A61B 1/303, 1/30, 1/32, A61D 1/30, 1/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU : IPC AS ABOVE (NON CON)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DERWENT : SEPARAT: DILAT: SPECULUM# ELONGAT: ROD#, BLADE#, RADIAL: LATERAL:

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                      | Relevant to claim No. |
|-----------|---|-----------------------|
| X         | WO 94/26344 A1 (TRE F STRUMENTI CHIRURGICI S.R.L.) 24 November 1994<br>page 5 line 26 to page 6 line 4 page 9 lines 6-7 | 1-23                  |
| X         | Derwent Abstract Accession No. A0782W/01 Class P31 SU,A 408637 (KUBAN<br>MEDICAL INST) 17 July 1974                     | 1-23                  |
| X         | US 2083573 A (MORGAN) 15 June 1937<br>see figure 1  | 1-23                  |



Further documents are listed in the continuation of Box C



See patent family annex

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| "E" earlier document but published on or after the international filing date  | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone   |
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| "O" document referring to an oral disclosure, use, exhibition or other means  | "&" document member of the same patent family  |
| "P" document published prior to the international filing date but later than the priority date claimed  |  |

Date of the actual completion of the international search  
9 May 1996Date of mailing of the international search report  
13.06.96Name and mailing address of the ISA/AU  
AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION  
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Authorized officer

PETER T. WEST

Telephone No.: (06) 283 2108

**INTERNATIONAL SEARCH REPORT**

International Application No.

**PCT/AU 96/00125**

| <b>C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT</b> |   |                              |
|---|---|------------------------------|
| <b>Category*</b>  | <b>Citation of document, with indication, where appropriate, of the relevant passages</b> | <b>Relevant to claim No.</b> |
| X   | WO 94/12091 A1 (PATTON) 9 June 1994<br>see figures 10, 11, 24                             | 1-23                         |
| X   | WO 92/21279 A1 (PRACAS) 10 December 1992<br>see figures 2, 6                              | 1-23                         |

### Information on patent family members

**PCT/AU 96/00125**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report |         |          |                     | Patent Family Member |                    |    |          |
|--|---------|----------|---------------------|----------------------|--------------------|----|----------|
| WO                                     | 9426344 | AU       | 68068/94            | IT                   | 93730299           | IT | 93730637 |
| WO                                     | 9412091 | AU<br>US | 57310/94<br>5377667 | CA<br>US             | 2150916<br>5505690 | EP | 674491   |
| WO                                     | 9221279 | AU       | 18891/92            | EP                   | 591253             | US | 5509893  |
| FR                                     | 2635451 | FR       | 2635451             |                      |                    |    |          |
|  |         |          |                     |                      |                    |    |          |
| END OF ANNEX                           |         |          |                     |                      |                    |    |          |