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(54) **Tap outlet mountable appliance**

(57) Tap outlet mountable appliance, the appliance comprising an interface for retrofitting the appliance to a tap, the retrofitting interface comprising a cam/ wedging component (10) and a gripping body (20), wherein the

gripping body (20) can be biased to increasingly tightly grip to a tap outlet by movement of the cam/ wedging component (10) against the gripping body (20).

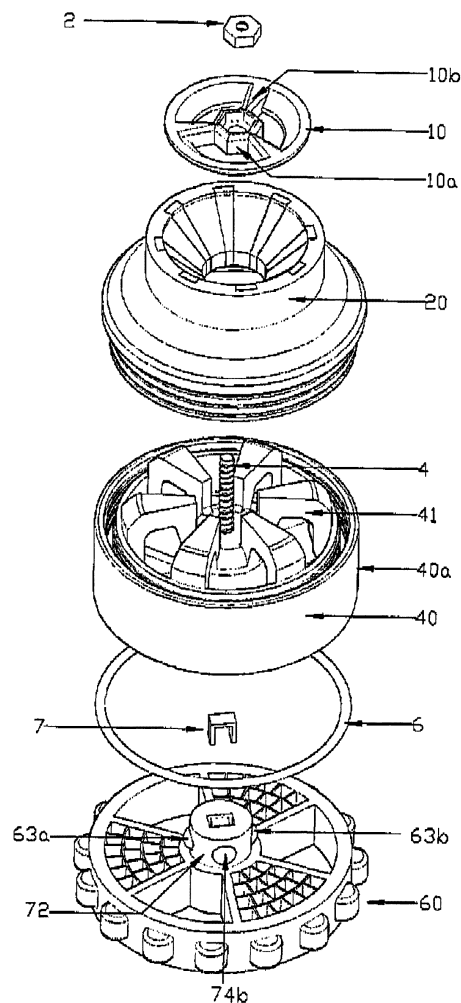


FIGURE 6

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Description

Field of the Invention

[0001] The present invention concerns improvements to tap outlet (tap spout) mountable appliances such as flow adjusting appliances including aerators, and other appliances of the type that are fitted to the outlet/ delivery end of a tap (faucet). Inter alia the invention concerns provision of an adjustable interface for retro-fitting an appliance to a tap outlet and to provision for 'single click' mounting/ demounting and/or operation of the appliance.

Background to the invention

[0002] Selectable tap outlet flow adjustors of the type in question have been available for many decades but in recent years their value as a means of economizing on water usage has become increasingly important. Many of the currently available tap outlet flow adjustors are designed primarily to provide selection between aerated and non-aerated water flows. In aerated flow state air is bubbled in with the water, reducing the amount of water used but allowing a soft bubbly flow. A common aspect of the design of these devices is that they tend to be arranged with the different flow states achieved by switching between an inner central/ axial flow path and an eccentric or outer concentric flow path and are generally relatively bulky, spreading laterally and extending well beyond the delivery end of the tap. Examples of this are shown in US patent US 4221338 and applications US 20060163387 and US 20070235091. Another type of such device is the non-aerated flow-reduced design that in its spray state forces the water through a set of smaller holes in the tap head, producing a fine, firmer spray. Again it is common in these tap heads to arrange the finer holes concentric to a broad inner central/ axial flow path.

[0003] In all of these existing tap outlet flow adjustor designs the structure is generally not only obtrusive but their assembly also tends to be liable to lime-scale obstruction over time in areas with hard water. Many tend to seize up, becoming increasingly difficult to move between operative states.

[0004] In granted UK patents GB2471435B and GB2464869B the present applicant has detailed a selectable tap outlet flow adjustor that addresses most of these problems of the existing tap outlet flow adjustor designs, providing a device that is affordable, economic in its use of water, discrete in form and attractive, able to maximize space between the tap outlet/delivery end and the basin or object to be cleaned and is relatively easy to operate and maintain in good functional condition, even in areas with hard water, it is suited for use in kitchen sinks, washing basins or the like to be able to, for example, facilitate dish washing/ cleaning tasks and be able to select between focused and spread area coverage as required to improve efficiency of washing/

cleaning and thereby save on cleaning time and overall water usage. However, in common with other prior tap outlet flow adjustors as it stands the retro-fitting of the tap outlet flow adjustor may not be suited to all shapes and sizes of tap and may necessitate a range of different sizes of adjustor to be provided.

[0005] in one aspect the present invention seeks to provide an improved selectable tap outlet flow adjustor that is more readily universal and simple to fit to tap spouts of a wide range of shapes and sizes. The present invention also seeks to provide an improved tap outlet flow adjustor that can make operation of the tap outlet flow adjustor, including switching between flow modes and mounting/ de-mounting more convenient for the user. In more general applications the present invention seeks to provide an adjustable interface for retro-fitting an appliance to a tap outlet, whether that appliance may be, for example, a selectable tap outlet flow adjuster, an aerator or a nozzle or simply a hose for directing/ extending the delivery of the water flow.

Summary of the Invention

[0006] According to a first aspect of the present invention there is provided a tap outlet mountable appliance, the appliance being characterized by comprising an interface for retrofitting the appliance to a tap, the retrofitting interface comprising a cam/ wedging component and a gripping body, wherein the cam/ wedging component is movable relative to the gripping body whereby the gripping body is biased to increasingly tightly grip to a tap outlet by movement of the cam/ wedging component against the gripping body.

[0007] According to a second aspect of the present invention there is provided an interface for retrofitting a tap outlet mountable appliance to a tap, wherein the retrofitting interface comprises a cam/ wedging component and a gripping body, wherein the cam/ wedging component is movable relative to the gripping body whereby the gripping body is biased to increasingly tightly grip to a tap outlet by movement of the cam/ wedging component against the gripping body.

[0008] Preferably the gripping body or a portion thereof (eg a wall) is resiliently distorteble/ expandable. Suitably the gripping body is elastomeric and preferably it has an annular form. The annular form may be of any shape that can ring around an axis of a structure, The ring may be a circular ring or not. It may be polygonal or faceted internally and/ or externally. It may, for example, be a simple triangle with a triangular or circular hole through the centre as viewed in cross section or, for example, a cylinder having an octagonal cross section with eight faces internally and externally. Whereas a regular geometric shape is preferred and shapes that approximate to circular cylindrical are preferred for maximal grip area, the shape may be asymmetric and could be, for example, trapezoidal and its axis may be offset from the axis of the structure.

[0009] The gripping body of the tap outlet mountable appliance may have a plurality of ribs, flanges or other projections that project laterally/ radially inwardly or outwardly to enhance engagement with the tap outlet. These may be arranged in an array at intervals around the gripping body and/ or at intervals along the length of the gripping body. They may be arranged to be progressively less projecting to conform to the taper of the gripping body.

[0010] In a preferred embodiment the cam/ wedging component is threaded on a central threaded stem within the gripping and the gripping body can be biased radially outwardly of the threaded stem by movement of the wedging component along the threaded stem when the threaded stem is turned within the wedging component, the outer gripping body thence pressing against and gripping to the bore of a tap outlet

[0011] Preferably the gripping body has a portion with a wall that forms a conical/ frusto-conical recess and which is resiliently distortable/ expandable radially outwardly. Preferably the wedging component has a conical/ frusto-conical exterior form that complements the conical/ frusto-conical recess.

[0012] Preferably the tap outlet mountable appliance is a selectable tap outlet flow adjustor that comprises a control disk and a spray forming disk. The control disk may serve for selecting the flow state and comprise angularly spaced open voids spaced about an axis through which voids water passes when in use. The spray forming disk may comprise angularly spaced open running voids spaced about an axis through which voids water may pass when in use but further comprising perforations in those parts of its body between the angularly spaced open voids through which perforations water may pass at a reduced spray rate when in use, the spray forming disk and control disk being axially rotatable with respect to each other whereby when one disk is rotated relative to the other so that the open running voids of the spray forming disk are aligned with the open voids in the control disk, water may pass through at a first flow rate and when one disk is rotated relative to the other so that the perforations in the spray forming disk are aligned with the open voids in the control disk, water may pass through at a second flow rate.

[0013] The adjustable retro-fitment interface is suitably fixed, eg. bolted, to a first end of the selectable tap outlet flow adjustor.

[0014] The device of the present invention may thus be adjusted to suit a wide range of dimensions of existing/ standard commercially available taps and may be sold with taps or separately to be fitted to the outlet of the tap/faucet by the user. The adjustable retro-fitment interface will primarily be sold as an integral part of a selectable tap outlet flow adjustor or other tap outlet mountable appliance but can be sold separately as an upgrade or as a repair spare part.

[0015] According to a third aspect of the present invention there is provided a tap outlet mountable appliance,

eg a selectable tap outlet flow adjustor for controlling water flow, the tap outlet mountable appliance being mountable to the outlet/ delivery end of a tap and comprising first and second relatively rotatable parts, wherein one of the first and second relatively rotatable parts is closer than the other to the outlet/ delivery end of a tap in use and the first and second part couple together by a latching action, where one of the first and second parts has a spring-loaded bearing or a latch member that can resiliently deflect and is able to pass and latch/ engage behind a shoulder on the other part. The relative rotation preferably controls water flow. The first part is preferably a control disk for selecting the flow state and the second part is preferably a spray forming disk.

[0016] Preferably the appliance has a spring loaded bearing wherein the spring loaded bearing has a spring-loaded ball bearing that projects laterally/ radially outwardly from an axle stub on one of the parts.

[0017] The appliance may alternatively have a latch member attached to one part that comprises a collet that can resiliently deflect and can pass through an aperture in the other part and latch/ engage behind a shoulder on the other part. Preferably the shoulder is on a spring loaded plate or ring that is captive within said other part. Suitably the collet has a release arm/ rod passing down there-through and preferably the release arm secures to a lower of the first and second relatively rotatable parts the arm/ rod having an enlarged head that sits at the mouth of the collet and which when the arm/rod is pulled down causes the collet to flare and latch behind the shoulder and whereby when the arm/ rod moves upwardly the collet is able to resiliently return to its unflared state unlatching the coupling of the first and second parts.

[0018] In the appliance having a spring loaded bearing preferably the spring loaded bearing further engages with an interface that enables rotary switching between different modes of water flow in a clicking action. Preferably the interface is an inner surface of a cylindrical member of one of the rotatable parts and which is undulating, having alternating ridges and furrows extending in the axial direction of the cylindrical member.

[0019] In the tap outlet mountable appliance of this third aspect preferably the first part comprises a control disk for selecting the flow state comprising open voids through which voids water passes when in use: and the second part comprises a spray forming disk, the spray forming disk also comprising open running voids through which voids water may pass when in use but further comprising perforations in those parts of its body between the open voids through which perforations water may pass at a reduced spray rate when in use, the spray forming disk and control disk being axially rotatable with respect to each other whereby when one disk is rotated relative to the other so that the open running voids of the spray forming disk are aligned with the open voids in the control disk, water may pass through at a first flow rate and when one disk is rotated relative to the other so that the perforations in the spray forming disk are aligned with

the open voids in the control disk, water may pass through at a second flow rate, less than the first flow rate and as a spray.

[0020] According to a further aspect of the present invention there is provided a tap outlet mountable appliance, the tap outlet mountable appliance being mountable to the outlet/ delivery end of a tap and comprising first and second relatively rotatable parts for selecting between first and second different modes of operation, wherein one of the first and second relatively rotatable parts is closer than the other to the outlet/ delivery end of a tap in use and where one of the first and second parts has a spring-loaded bearing that can resiliently deflect and is able to pass a crest on the other part when one part is rotated relative to the other to bias the tap outlet mountable appliance to ensure full selection between the first and second different modes of operation. Preferably the tap outlet mountable appliance is a selectable tap outlet flow adjustor for controlling water flow from the tap enabling selection between first and second different modes of flow.

Brief Description of the Drawings

[0021] Preferred embodiments of the present invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is an exploded general assembly diagram of a first preferred embodiment of the tap outlet flow adjustor having a control disk for selecting the flow state and a spray forming disk, the control disk being separate from and coupled by a bolt and nut to a cylindrical body with a radially outwardly expandable body that fits to a tap outlet end; and the spray forming disk being assembled to the control disk by a first simple click-fit connector.

Figures 2A to 2C comprise close-up views of, respectively, the top side of the spray disk, the top bottom side of the control disk and the top side of the cylindrical body;

Figure 3 comprises an exploded general assembly diagram corresponding to Figure 1 but of the undersides of the parts;

Figure 4A comprises a part perspective part sectional view from above of the first preferred embodiment of the tap outlet flow adjustor as assembled and Figure 4B is a corresponding view of the tap outlet flow adjustor as assembled, viewed from below;

Figure 5 is a purely sectional view of the assembled flow rate adjustor of Figures 4A/B;

Figure 6 is an exploded general assembly diagram of a second preferred embodiment of the tap outlet

flow adjustor differing from the first embodiment substantially only in that the control disk is integrated into the cylindrical body;

Figures 7A to 7C comprise close-up views of, respectively, the top side of the spray disk, the bottom side of the control disk and the top side of the cylindrical body;

Figure 8 comprises an exploded general assembly diagram corresponding to Figure 6 but of the undersides of the parts;

Figure 9A comprises a part perspective part sectional view from above of the second preferred embodiment of the tap outlet flow adjustor as assembled and **Figure 9B** is a corresponding view of the tap outlet flow adjustor as assembled, viewed from below;

Figure 10 is a purely sectional view of the assembled flow rate adjustor of Figures 9A/B;

Figure 11 is an exploded general assembly diagram of a third preferred embodiment of the tap outlet flow adjustor, still having the wedge mechanism for connection to different sized taps but differing from the second embodiment in the structure of the click-fit fit connector;

Figure 12 is an exploded general assembly diagram corresponding to Figure 11 but with the sprung connector shaft demounted;

Figure 13 is an exploded general assembly diagram corresponding to Figure 12 but of the undersides of the parts;

Figure 14A comprises a part perspective part sectional view from above of the third preferred embodiment of the tap outlet flow adjustor as assembled and **Figure 14B** is a corresponding view of the tap outlet flow adjustor as assembled, viewed from below; and

Figure 15 is a purely sectional view of the assembled flow rate adjustor of Figures 14A/B.

Description of the Preferred Embodiments

[0022] Referring to Figure 1, the first preferred embodiment of the tap outlet flow adjustor comprises two operating 'disks' - a control disk 110 for selecting between first (stream-flow) and second (spray) flow states and a spray forming disk 60 that moves rotationally relative to the control disk 110.

[0023] The control disk 110 has a knurled or polygonal (here octagonal) faceted perimeter to facilitate holding

and turning and it is coupled via a nut and a bolt 4 to a cylindrical support body 40 (the nature of the nut and bolt coupling is described in further detail later). The cylindrical support body 40 comprises an upstanding circumferential wall 40a that is spanned at its proximal end by a flower-like spider array 41 of eight arched legs radiating out from the axial centre through which the bolt 4 projects. The hub of the spider structure 41 forms a bolt head ring 47 that holds a central bolt head chamber 112 of control disk 110 with a central aperture for the shaft of the bolt 4 to pass through. The threaded bolt 4 has a head 4a at its lower end that is housed in the annular bolt head casing 112 within/ below the bolt head ring 47 of the cylindrical support body 40 when the bolt 4 is inserted up through the central bolt aperture of the spider structure 40b in the cylindrical support body 40 (the spider structure 41 is union together with an internal vertical wall of the support body 40). The hub of the spider structure 41, and in particular the upper parts of the legs where they radiate le extend radially/ 'horizontally', not only comprise the bolt head ring 47 but also serve to provide a platform the purpose of which will be described shortly below.

[0024] The cylindrical support body 40 has a special elastomeric radially expandable gripping body 20 integrally assembled at the proximal end of the support body 40 that is adapted to grippingly mount the adapter to the outlet of a tap/ faucet by expansion. The upper end of the gripping body 20 has an upstanding funnel-shaped portion 20a that is adapted to be inserted/ plugged into the bore of a tap outlet to fit the adapter to the tap.

[0025] The upstanding funnel-shaped portion 20a of the upper end of the gripping body 20 has a frusto-conical recess in its upper face that leads down to a central bore through which water from a tap may flow in use. The frusto-conical recess of the upstanding funnel-shaped portion 20a has a slope of conical surface that complements a corresponding annular frusto-conical-shaped wedge component 10 that sits in the frusto-conical recess. The wedge component 10 is configured to reversibly move down in the frusto-conical recess and in so doing cause the outside diameter of the upstanding funnel-shaped portion 20a to reversibly expand radially outwardly.

[0026] The lower end of the gripping body 20 has a broadened diameter tubular base portion 24 that is further extended downwardly in a thinner walled extension 25 that has a plurality of annular ribs and which is fitted and securely integrally held/ fixed in place in a deep circular groove 40b in the cylindrical support body 40. The upper parts of the legs where they radiate ie extend radially/ 'horizontally', collectively serve to provide a platform which supports the underside of the elastomeric gripping body 20 while the gripping body 20 is being acted on/ deflected by the wedge component 10. It thus ensures that the gripping body 20 expands laterally/ radially as required. The radial extent/ diameter of the 'platform' formed by the upper part of the legs is substantial and may substantially correspond to a maximum diameter of

range of sizes of tap spout to be fitted allowing a wide extent of spread/ expansion of the gripping body 20. The 'platform' provided by the radiating upper parts of the spider 41 legs also serves as an end stop for defining the limit of the downward motion of the wedge component 10.

[0027] The threaded shaft/bolt 4 extends centrally axially up through the control disk 110 up through the central aperture of the bolt head casing 47 in the cylindrical support body 40 and up through the central bore of the elastomeric gripping body 20. The threaded shaft/bolt 4 has mounted to it at the extreme proximal end, the annular frusto-conical-shaped wedge component 10 that is held captive to the bolt 4 by a nut 2 that is threaded onto the end of the bolt 4 when the control disk 110, cylindrical support body 40 and wedge component 20 are all assembled in place together. The lower head 4a of the bolt 4 is splined/ keyed to the control disk 110 in the bolt head casing 112 of the control disk 110 so that whenever the control disk 110 is turned about the axis it too will be turned.

[0028] The bolt 4 once secured to the nut 2 holds the control disk 110 assembled to the cylindrical support body 40. The wedge component 10 has a central hexagonal ring 10a through which the bolt 4 passes and having a central hexagonal recess/ chamber in which the hexagonal nut sits held against rotation. The wedge component 10 has three spider arms 10b radiating out from the central hexagonal ring 10a between which are open voids down through which the water from the tap is able to flow in use.

[0029] With the control disk 110 bolted to the cylindrical support body 40 the wedge mechanism comprising the annular frusto-conical-shaped wedge component 10 and the gripping body 20 is tightened by holding and turning the control disk 110 about the axis of the device and parts of the flow adaptor, that are mounted to the tap. The control disk 110 thus rotates while the cylindrical support body is static. Tightening the wedge mechanism expands the elastomeric radially expandable gripping body 20 into the bore of the tap spout/ outlet end and thereby fixes the cylindrical support body 40 and control disk 110 to the tap outlet end prior to then assembling the spray disk 60 to the control disk 110.

[0030] The control disk 110 may be moulded of nylon or other tough plastics material or may be of a rust-proof metal or alloy. The cylindrical support body 40 carries the control disk 110 bolted by bolt 4 at its lower/ distal in use end. The control disk 110 has radiating occluding segments and apertures that alternate around the central axis of the body 110. The control disk component 110 has an array of three equi-angularly spaced such apertures/ open voids spaced about its central axis and it is through these voids in the control disk 110 that water passes in use. The voids / apertures through the floor of the disk 110 are sectors of the circular plan shape of the disk. The non-apertured sectors of the disk floor between adjacent voids are equally-sized sectors and each acts

as a barrier to water flow at that sector and can thus act as a means to selectively divert water flow.

[0031] The control disk 110 nests against the underside of the cylindrical support body 40 and is at its perimeter sealed against the control disk 110 by an 'O' ring 6 seated in the perimeter at the underside of the cylindrical support body 40 encircling the cylindrical support body 40.

[0032] The spray-forming disk 60 is in several respects similar to the control disk 110. In particular, it has an array of three equi-angularly spaced open running voids. These are spaced about the central axis/ axle stub 72 of the spray-forming disk 60 to match the shape, size and arrangement of the voids of the control disk 110. Between the open running voids of the spray-forming disk 60 are the spray-forming sectors of the spray-forming disk 60, each of which has a plurality of nozzle 66-tipped perforations 65. The spray-forming disk 60 has a short circumferential wall that has rounded lugs 67 formed on it around its perimeter to facilitate the spray-forming disk 60 being turned to be able to adjust the operation from flow to spray and vice-versa.

[0033] The spray-forming disk 60 nests against the underside of the control disk 110 and is at its perimeter sealed against the control disk 110 by an 'O' ring 6 seated in the perimeter at the underside of the control disk 110 encircling the control disk 110. The circular cylindrical axle stub 72 of the spray-forming disk 60 is engaged into a correspondingly circular cylindrical -shaped recess 46 on the underside of the control disk 110.

[0034] The axle stub 72 click locks into place in the recess 46 of the control disk 110 (see Figures 3, 4A and 5) by the latching action of a pair of spring-loaded ball-bearings 63a, 63b held within the axle stub 72. When the axle stub 72 is pressed into the recess 46 the ball bearings 63a, 63b resiliently depress radially inwardly against their biasing spring 7 and pass over and then catch against a lower radially inwardly projecting rim/ lip 44 of the cylindrical -shaped recess 46 of the control disk 40. The spray disk 60 can be readily demounted again if needs be by a simple pulling action, reversing the axle stub 72 out of the recess 46, causing the ball bearings to be pressed radially inwardly again to pass back through the lower radially inwardly projecting rim/ lip 44 of the cylindrical -shaped recess 46 of the control disk 110.

[0035] The Spring-loaded ball-bearings 63a, 63b are held in a chamber 62 defined in the top of the axle stub 72 of the spray-forming disk 60 and are each biased by a respective leg of a bifurcated/U-shaped spring 7 to partly protrude radially out through a respective one of a pair of circular windows/ apertures 72a, 72b in radially opposite sides of the cylindrical side wall of the axle stub 72. The circular windows/ apertures 72a, 72b are of smaller diameter than the ball bearings 63a, 63b so that the ball bearings 63a, 63b can at most only partially project out through the windows/ apertures 72a, 72b. During assembly of the device the ball bearings 63a, 63b are loaded

into the chamber 62 through a larger diameter circular window/ aperture 74b in the cylindrical wall of the axle stub 72 that is radially offset from the smaller diameter apertures 72a, 72b and fall to either side within the chamber 62 and the bifurcated/ U-shaped spring 7 is wedged between the ball bearings 63a, 63b on being inserted down through aperture 73 in the top of the axle stub 72. Please recheck this paragraph.

[0036] The circular cylindrical recess 46 of the control disk 110 has an upper annular rim/lip 45 and the lower annular rim/lip 44 with the cylindrical sidewall 43 vertically spanning between them, thus defining the latching chamber within part of which the ball bearings 63a, 63b of the spray disk's axle stub 72 latch and thus defining the axial location of the spray disk 60 relative to the control disk 110 in use.

[0037] The internal surface of the cylindrical sidewall is not smooth circular cylindrical unlike its corresponding exterior surface, but rather undulates providing ribs/ crests 43a and troughs/ furrows 43b that all run in the axial direction of the device and which interact with the ball bearings 63a, 63b. The protruding part of each of the ball bearings 63a, 63b will sit within a respective trough/ furrow 43b between ribs/ crests 43a thus defining the relative rotation limits of the working relationship between the spray disk 60 and control disk 110 when the spray disk 60 is turned while the control disk 110 remains static to switch between the spray or stream flow operational modes.

[0038] Turning to Figures 5 to 10, these show a second embodiment that is a variant of the first embodiment which differs substantially only in that the control disk 110a is integrated/ integrally formed or assembled into the base of the cylindrical body 40 rather than separate from it. In this embodiment since the control disk 110a cannot be rotated relative to the cylindrical body 40 it is not usable as a means for tightening up the wedging mechanism. Instead the wedging mechanism is tightened by the bolt 4 being inserted up through the central aperture 46 in the control disk 110a the bolt 4 having a head 4a with a hex socket at its lower end (see Figure 7B) that is adapted to be turned by an Allen key from below to operate and tighten the retro-fitting wedge mechanism,

[0039] The preferred sequence of assembly of the upper part of the tap adapter in this embodiment is to firstly place the nut 2 in the centre of the nut holding chamber 10a of the wedge component 10 and then place the wedge component down into the central inwards sloping recess of the funnel-shaped portion 20a of the upper end of the gripping body 20 and the thinner walled extension 25 of the gripping body 20 that has a plurality of annular ribs is then fitted and securely integrally held/ fixed in place in the deep circular groove 40b in the cylindrical support body 40. The O ring 6 is fitted to the underside of the control disk 110a and the bolt 4 is inserted up through the central aperture 46 in the control disk 110a.

[0040] In all of the illustrated embodiments of the in-

vention the output of water may be switched between a centralised stream flow of water and a more broadly spread spray of water simply by turning the spray-forming disk and control disk relative to each other. In most cases it is simply a matter of turning the lowermost/ outermost disk clock-wise or counter-clockwise by a partial turn. Turning one way provides stream flow while turning back the other way provides spray flow. The flow is thus alternatively either spray or stream-running depending on whether the turn is clock-wise or counter-clockwise. A simple part turn of the spray disk 60 by of the order of 60° will cause the ball bearings 63a, 63b to rise over the ribs/ crests 43a to drop down into the base of the next radially adjacent trough/ furrow 43b. This provides a firm clicking movement from one trough/ furrow 43b to the next whereby the spray disk 60 clicks from spray mode to stream mode or vice-versa. The ball bearings 63a, 63b will not rest on the ribs/ crests 43a since the spring 7 will bias them to seek to project as much as possible and hence run down the slope from the rib/ crest 43a into the foot of the trough 43b.

[0041] As noted earlier, to remove the spray-forming disk 60 for maintenance the user simply pulls the spray-forming disk 60 vertically downwardly so that the ball bearings 63a, 63b of the spray disk's axle stub 72 will, with a clicking action, dis-engage from the recess 46 of the control disk 110a underside. Thus the same spring-loaded ball bearings 63a, 63b mechanism allows for robust click-action assembly and dis-assembly of the spray disk 60 from the control disk 110a as well as robust click-action rotary switching between the spray mode and stream flow modes of operation. With a simple robust click-action rotary switching between the spray mode and stream flow modes accidental spills arising from the device being left mid-way between the modes/ states can be avoided and the user knows more surely that they have changed the mode from one state to the other.

[0042] The present invention thus provides very simple and secure 'single click' control of operation as well as of mounting and de-mounting the spray disk, and by use of the wedge-action tap fitting feature it is able to be fitted easily to a wide range of different taps. The wedge mechanism need not be configured centrally of the flow adaptor and designed to expand radially outwardly to wedge into the tap outlet bore. Instead it may fit over the exterior of the tap outlet end, eg as a sleeve, and be adapted for the gripping body to be deflected laterally/ radially inwardly by the wedge to grip onto the tap.

[0043] Turning now to Figures 11 to 15 these show a further embodiment of the tap outlet flow adjustor, still having the wedge 10 and gripping body 20 mechanism for connection to different sized tap outlets but differing from the previous embodiments in the structure of the latching connector that couples the spray forming disk 60 and the control disk 40 together and in the configuration of the interface that allows for clicking adjustment between the different usage states.

[0044] Here the resilient biasing/ spring loading for

driving the ball bearings 71a and 71 b into their sockets 71 is arranged to act in the axial direction of the flow adjustor rather than laterally/ radially and the positioning sockets for the operational mode selection are configured in an annular array around the axis as recesses in a plate facing in the axial direction of the flow adjustor. Thus, instead of having undulating crests 43a and troughs 43b in a cylindrical wall around the axis as found in the previous embodiment, in this embodiment the troughs 43b are replaced by an array of six recesses 45 in the bottom face of the plate. The plate in which the ball bearing receiving recesses 45 are provided is on the control disk 110a.

[0045] The ball bearings 71a, 71b are each held captive in a respective one of a pair of sockets 71 in the upper face of the spray disk 60 on radially opposing sides of the central axis. Only a top part of each ball bearing 71a, 71b protrudes up out of the sockets 71 each to engage with a respective one of two opposite ones of six recesses 45 in the underside of control disk 110a.

[0046] The latching coupling of the spray disk 60 to the control disk 110a and cylindrical support body 40 is by a collet-form of axle stub 70 on the spray disk 60. The axle stub 70 is vertically split/ divided into an array of fingers 70a projecting up from the spray forming disk 60. These fingers 70a form a collet the upper end of which defines a head 75. When the collet is in the relaxed state collet/ axle stub 70 is of substantially uniform diameter for its full length including the head 75. That changes, however, if the head 75 of the collet 70 is splayed apart, increasing its diameter. Furthermore the head 75 has an undercut 75a that can serve as a counter-shoulder able to engage/ latch against a shoulder within the control disk 40.

[0047] The head 75 end of the collet / axle stub 70 is splayed radially outwardly when the enlarged head 8a of a central release arm/rod 8 attached to the spray disk 60 is pulled down into the mouth in the head of the collet 70 and the undercut 75a in the splayed collet fingers latches behind an annular shoulder in the control disk 110a. The annular shoulder within control disk 110a in this case is provided by a small annular cap plate 9a that sits atop an upper coil spring 9b which in turn sits on the upper face of the control disk 110a in a chamber within the cylindrical support body 40.

[0048] The control disk 110a has a central aperture 44 of a diameter that is sized to accommodate the axle stub/ collet 70 extending up through it and the axle stub/ collet 70 will also pass up through the centre of the upper spring 9b. The cap plate 9a on the top of the upper spring 9b also has a central aperture of a diameter that is sized to allow the axle stub/ collet 70 to pass up or down through it but this can only happen when the head 75 mouth of the collet 70 is not splayed/ flared. When the head 75 is splayed/ radially expanded its diameter becomes too great to pass through the central aperture of cap plate 9a and the undercut 75a in the splayed collet fingers will catch against the rim of the central aperture of the cap plate 9a.

[0049] The release arm / rod 8 extends axially up through the centre of the axle stub/ collet 70 and has a lower end 8b that is screw threaded and which is thereby secured to a push button 90 that seats against the underside of the spray disk 60. The button 90 seated against the underside of the spray disk 60 and the arm/rod 8 and collet head 75 latching onto the cap plate 9a thus couples the spray disk 60 to the control disk 40.

[0050] The button 90 is, in normal use of the flow adaptor, biased downwardly by a lower spring 19b between the top/ inner surface of the button 90 and underside of the spray disk 60. This pulls the rod/arm 8 downwardly and accordingly pulls the head 8a of the release rod/ arm 8 into the collet head 75 and thus urges/keeps the collet head 75 in the splayed state. Demounting of the spray disk for maintenance is enabled by simply pressing and holding the button 90 inwardly/ upwardly against the downward bias of the lower spring 19b. This unseats the head 8a of the release rod/ arm 8 from the collet head 75 allowing the collet head 75 to resiliently return to its unexpanded state and thus unlatched and able to pass back down through the aperture in the cap plate 9a as the spray disk 60 is pulled downwardly for full retraction of the spray disk's axle stub 70 from the control disk 110a and thus fully demounting the spray disk 60 from the control disk 110a.

[0051] For assembling the spray disk 60, first insert the bottom end 8b of the rod 8 down through the axle stub 70, then place the lower plate 19a and lower spring 19b into their chamber 90a in the lower face of spray disk 60, and then threadedly couple the button 90 onto the lower threaded end 8b of the release arm/rod 8.

[0052] The upper 'spring chamber' for the spring 9b is centrally located in the upper face of the control disk 110a and delimited by an upstanding wall 72 with space to one side to feed in the upper plate 9a and upper spring 9b. The spring 9b and plate 9a cannot exit upwardly because of a blocking rim 72a formed on the top of the wall 72.

[0053] Next insert the assembled axle stub 70 through the central aperture 44 of the lower opening of control disk 110a while pressing the button 90 upwardly to keep the release arm head 8a of the rod 8 out of the axle stub head 75 so that the axle stub head 75 can pass through the passages from 44 to upper plate 9a. When the button 90 is pushed inwardly/ upwardly against its spring 19b this raises the head 8a of the release arm/ rod 8 up from the collet head 75 of the axle stub 70 and allows the collet fingers at the collet head 75 to close together so that the head 75 of the collet/ axle stub 70 is stream-lined and can be passed up through the central aperture 44 of the control disk 110a, up through the upper spring 9b and up through the central aperture of the cap plate 9a. Once the button 90 reaches its limit upwardly below the spray disk 60, the button can be released and the lower spring 19b will pull the rod head 8a into the upper rod head chamber 74.

[0054] With release of the button 90 the rod 8 is retracted by the lower spring 19b sufficiently for the collet

head 75 to splay and the undercut on the collet head to catch on the rim of the cap plate 9a, thereby latching/ coupling the spray disk 60 to the control disk 40. The head 8a of the rod 8 may lodge within the chamber 74 at the top of the axle stub 70 until such time as the button 90 is again depressed.

[0055] For operating this embodiment of the flow adjuster to switch between spray and stream flow modes, as with the other embodiments, the spray disk 60 is simply rotated about its axis and relative to the unmoving control disk 110a and cylindrical support body 40 that is fixed on the tap. The ball bearings 71a, 71b are initially located each in a respective one of a first radially opposing pair of recesses 45 in the underside of the control disk 110a but when the user applies turning force to the spray disk 60 the ball bearings 71a, 71b ride up the recess 45 side wall loading the upper spring 9b between the control disk 110a and the cap disk 9a and then over the very short crest and run fully down the slope into the next adjacent recess 45 propelled by the return force of the loaded spring 9b even should the user not continue to apply sufficient further turning force. This ensures that the spray disk moves fully from one operative mode state to the next fully and is not inadvertently left part-way between states.

Claims

1. A tap outlet mountable appliance, the appliance being **characterized by** comprising an interface for retrofitting the appliance to a tap, the retrofitting interface comprising a cam/wedging component and a gripping body, wherein the cam/ wedging component is movable relative to the gripping body whereby the gripping body is biased to increasingly tightly grip to a tap outlet by movement of the cam/ wedging component against the gripping body.
2. An interface for retrofitting a tap outlet mountable appliance to a tap, wherein the retrofitting interface comprises a cam/ wedging component and a gripping body, wherein the cam/ wedging component is movable relative to the gripping body whereby the gripping body is biased to increasingly tightly grip to a tap outlet by movement of the cam/ wedging component against the gripping body.
3. A tap outlet mountable appliance as claimed in claim 1 or interface as claimed in claim 2, wherein the gripping body or a portion thereof (eg a wall) is resiliently distortable/ expandable.
4. A tap outlet mountable appliance or interface as claimed in claim 3, wherein the gripping body is elastomeric and annular in form.
5. A tap outlet mountable appliance as claimed in claim

- 1 or interface as claimed in claim 2, wherein the cam/ wedging component is mounted on a central threaded stem within the gripping body and the gripping body is biased radially outwardly of the threaded stem by movement of the wedging component along the threaded stem when the threaded stem and the wedging component are turned relative to each other, the outer gripping body thence pressing against and gripping to the bore of a tap outlet.
6. A tap outlet mountable appliance or interface as claimed in claim 5, wherein the gripping body has a portion with a wall that forms a conical/ frusto-conical recess and which is resiliently distortable/ expandable radially outwardly.
7. A tap outlet mountable appliance or interface as claimed in claim 6, wherein wedging component has a conical/ frusto-conical exterior form that complements the conical/ frusto-conical recess.
8. A tap outlet mountable appliance as claimed in any preceding claim, wherein the tap outlet mountable appliance is a selectable tap outlet flow adjustor that comprises a control disk and a spray forming disk, the control disk serving for selecting the flow state and comprising one or more angularly spaced open voids spaced about an axis through which voids water passes when in use.
9. A selectable tap outlet flow adjustor as claimed in claim 8, wherein the spray forming disk comprises angularly spaced open running voids spaced about an axis through which voids water may pass when in use and further comprising perforations in those parts of its body between the angularly spaced open voids through which perforations water may pass at a reduced spray rate when in use, the spray forming disk and control disk being axially rotatable with respect to each other whereby when one disk is rotated relative to the other so that the open running voids of the spray forming disk are aligned with the open voids in the control disk, water may pass through at a first flow rate and when one disk is rotated relative to the other so that the perforations in the spray forming disk are aligned with the open voids in the control disk, water may pass through at a second flow rate.
10. A tap outlet mountable appliance as claimed in any preceding claim, wherein the adjustable retro-fitment interface is fixed, eg. bolted, to a first end of the selectable tap outlet flow adjustor.
11. A selectable tap outlet flow adjustor as claimed in claim 8 wherein the control disk is rotatable relative to the gripping body to tighten the cam/ wedging component in the gripping body and thus tighten the fit of the flow adjustor to a tap.
12. A selectable tap outlet flow adjustor as claimed in claim 8 wherein the flow adjustor further comprises a support body to which the gripping body is fixed and the control disk is coupled thereto and to the cam/ wedging component by a threaded bolt that extends from the control disk up through the support body to the cam/ wedging component.
13. A selectable tap outlet flow adjustor as claimed in claim 8 wherein the flow adjustor further comprises a support body to which the gripping body is fixed and the control disk is integrated into the support body.
14. A tap outlet mountable appliance as claimed in any of claims 1 to 13, wherein the gripping body of the tap outlet mountable appliance has a plurality of ribs, flanges or other projections that project laterally/ radially inwardly or outwardly to enhance engagement with the tap outlet.
15. A tap outlet mountable appliance, the tap outlet mountable appliance being mountable to the outlet/ delivery end of a tap and comprising first and second relatively rotatable parts, wherein one of the first and second relatively rotatable parts is closer than the other to the outlet/ delivery end of a tap in use and the first and second part couple together by a latching action, where one of the first and second parts has a spring-loaded bearing or a latch member that can resiliently deflect and is able to pass and latch/ engage behind a shoulder on the other part.

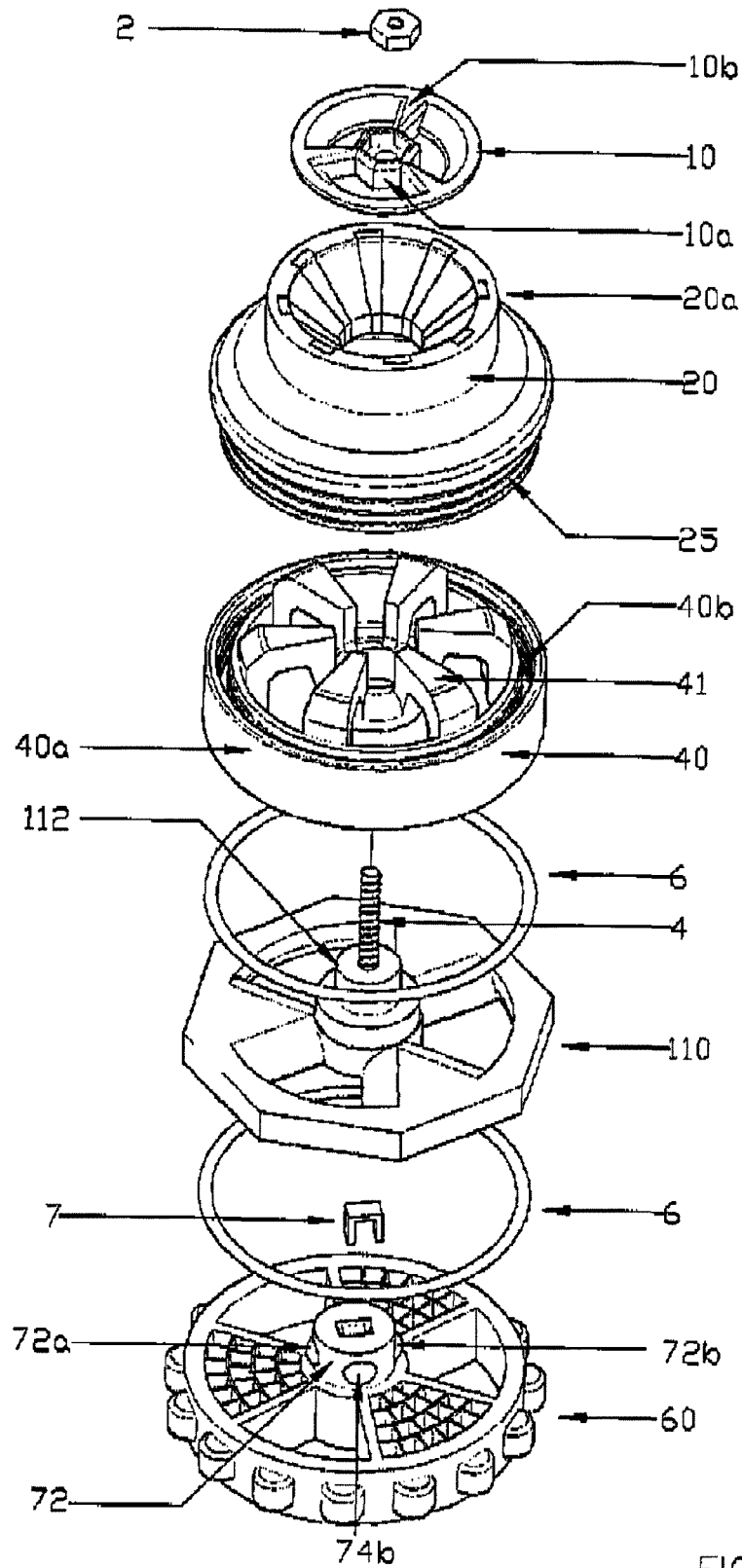
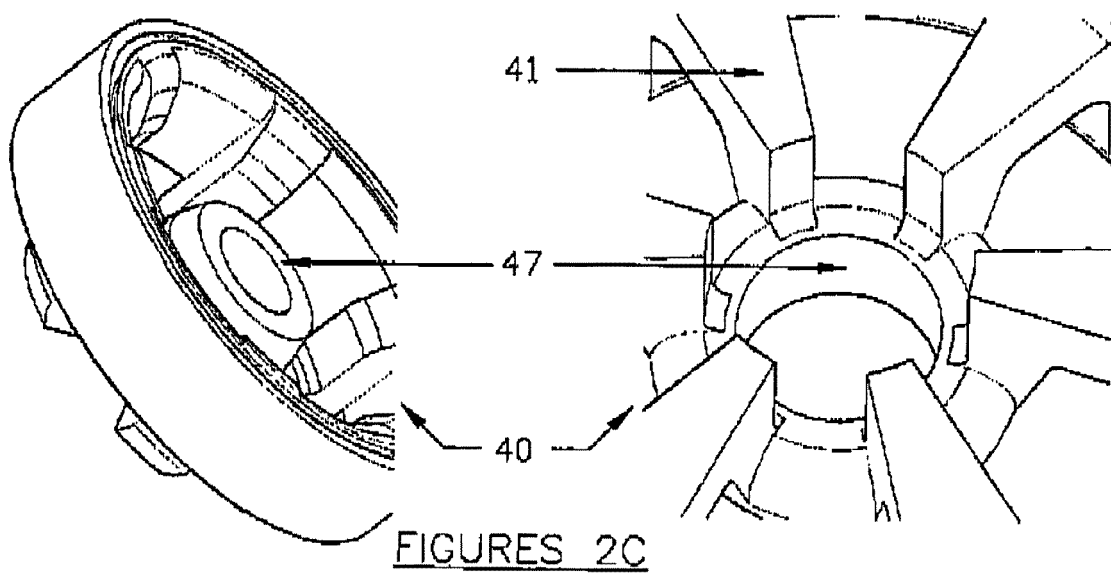
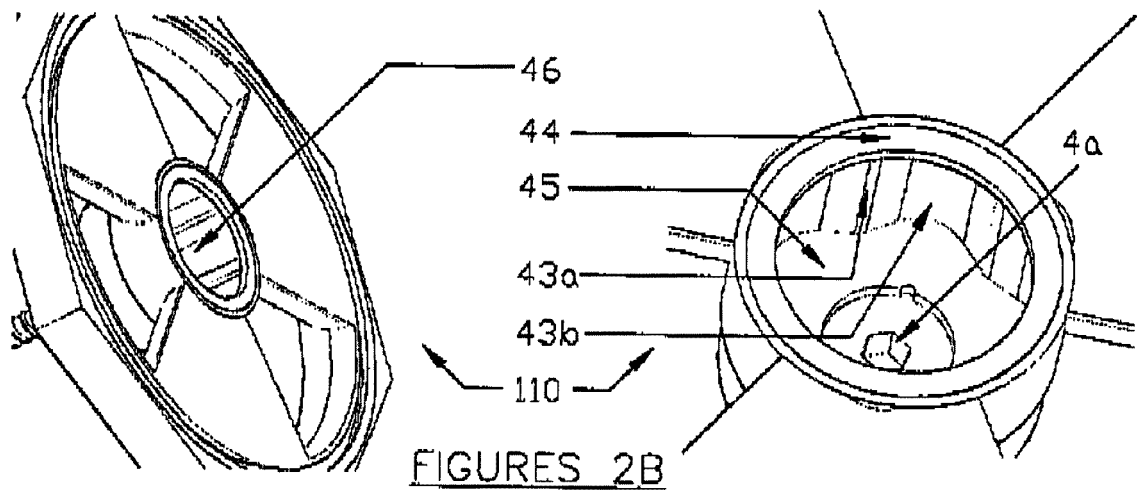
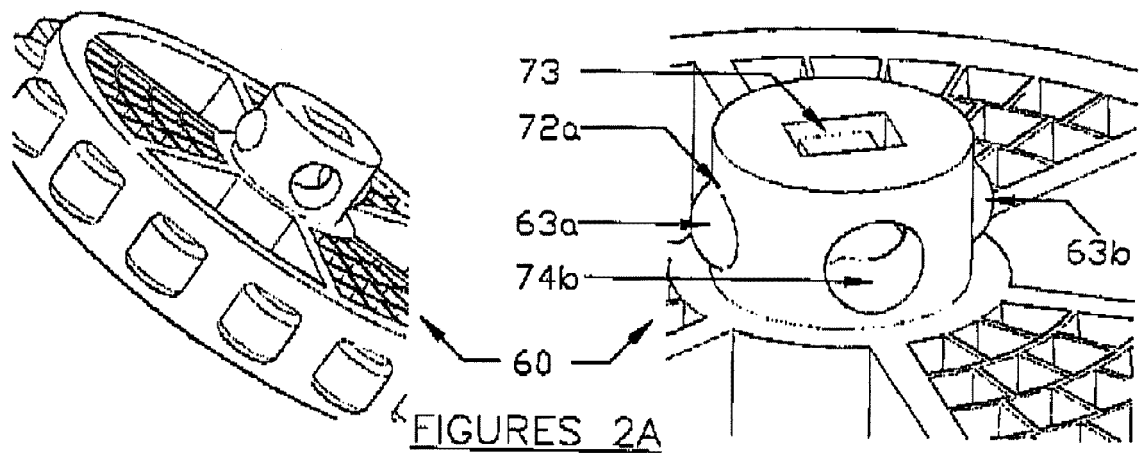


FIGURE 1



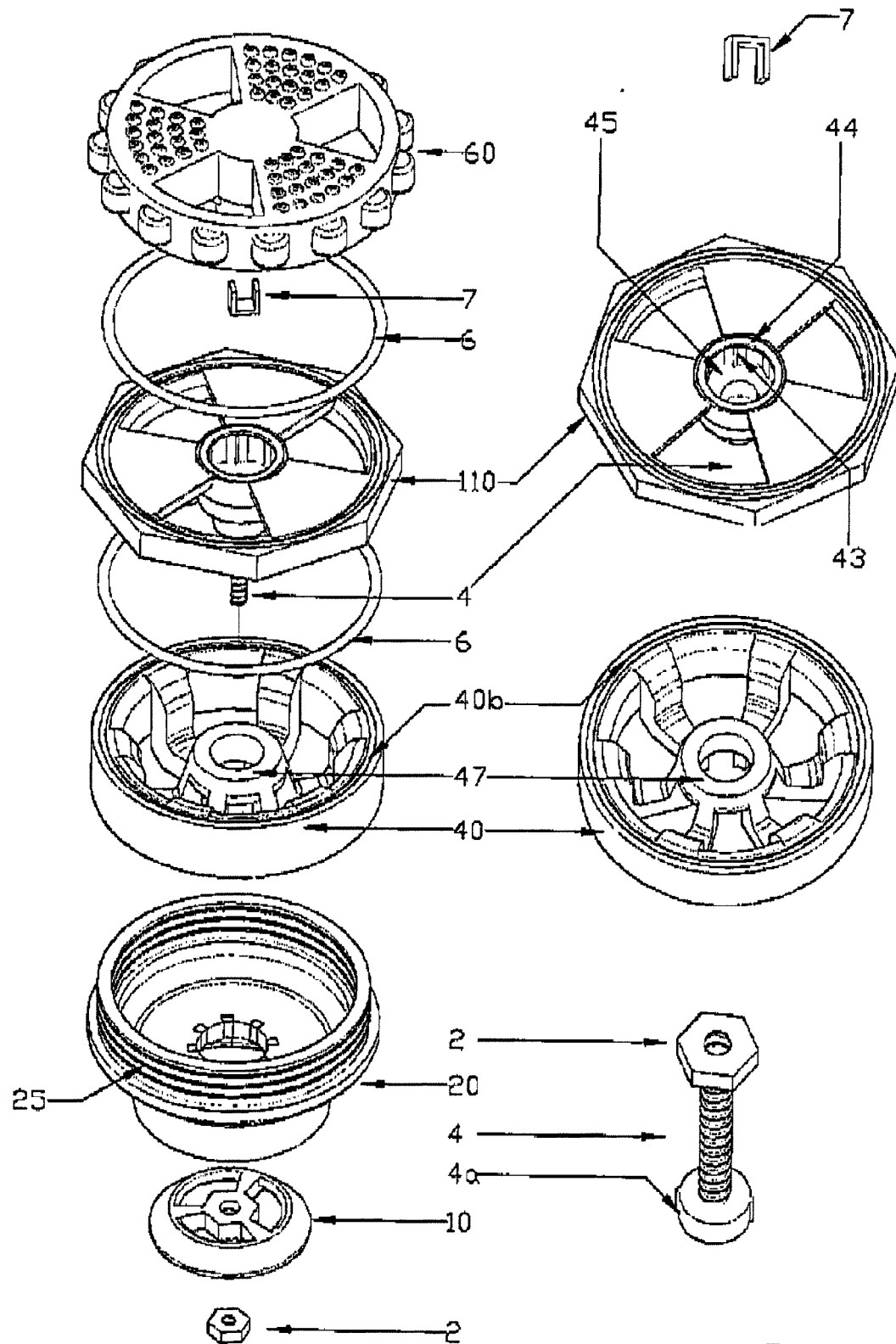


FIGURE 3

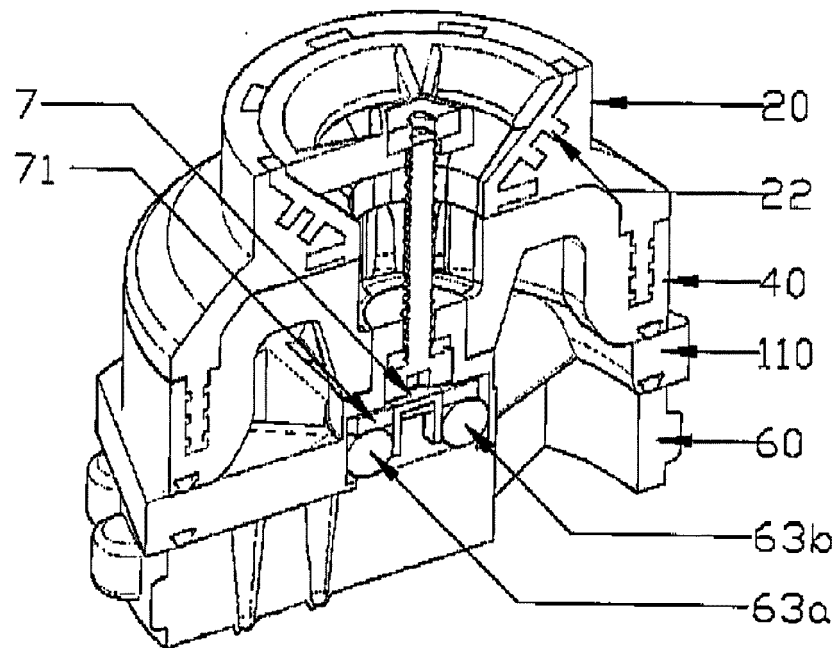


FIGURE 4A

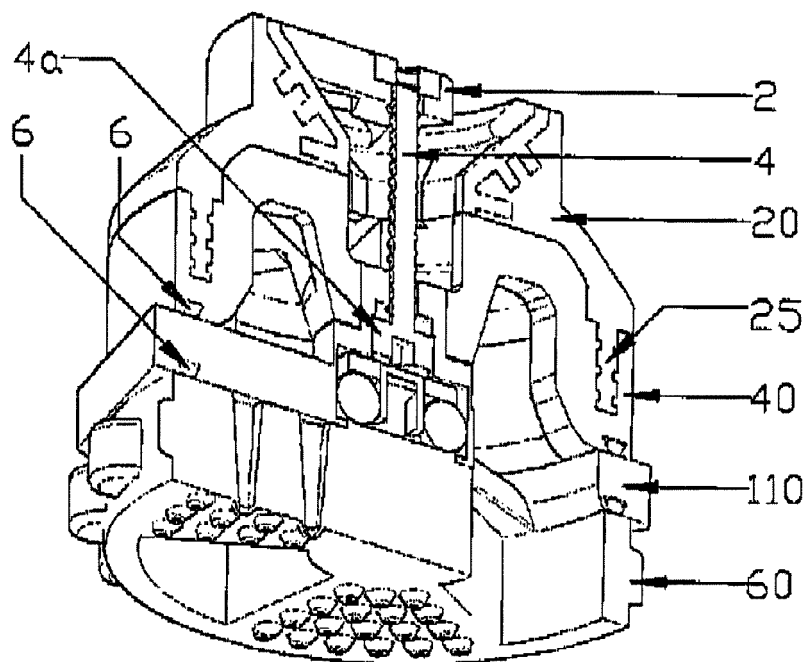


FIGURE 4B

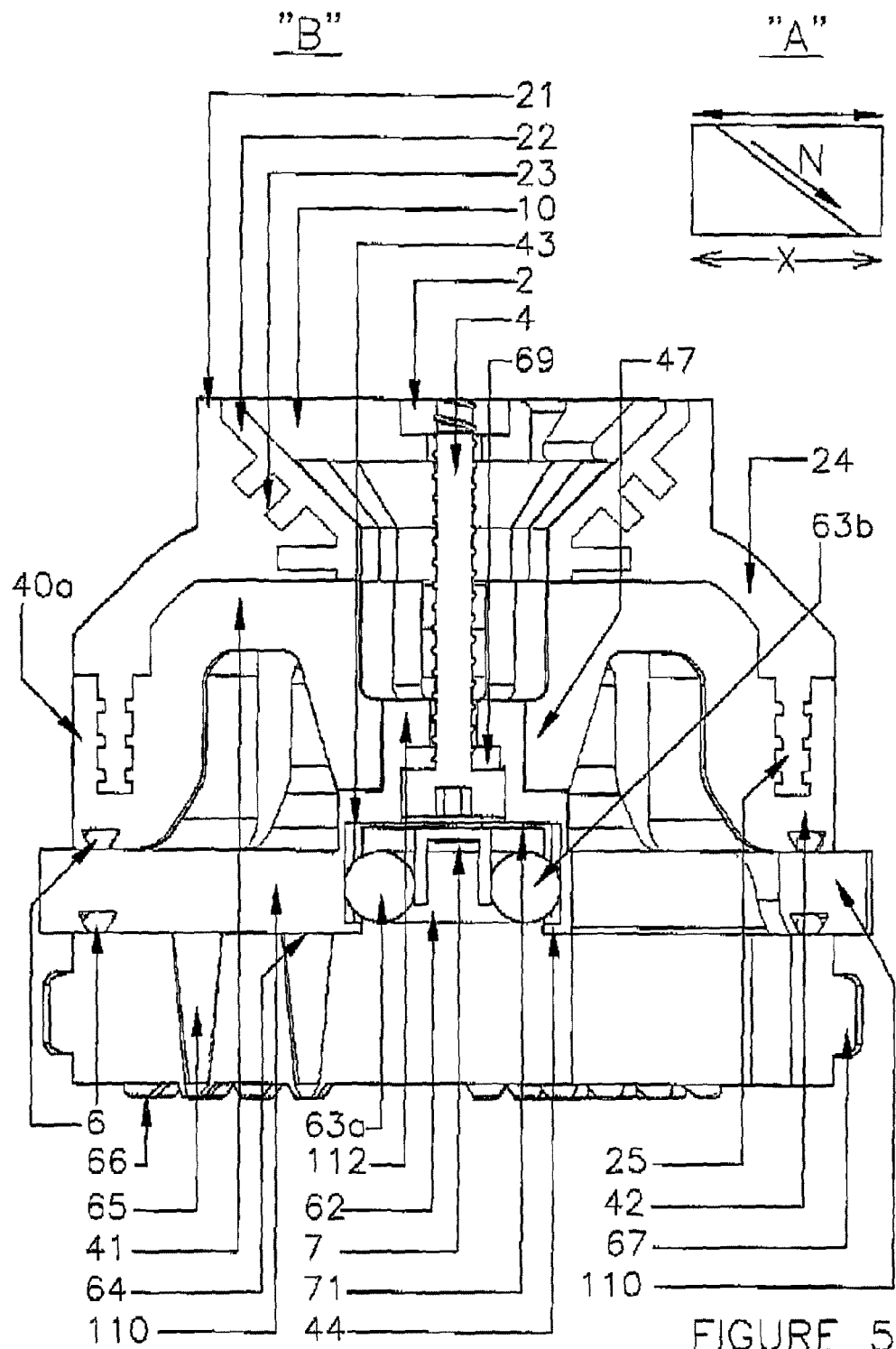


FIGURE 5

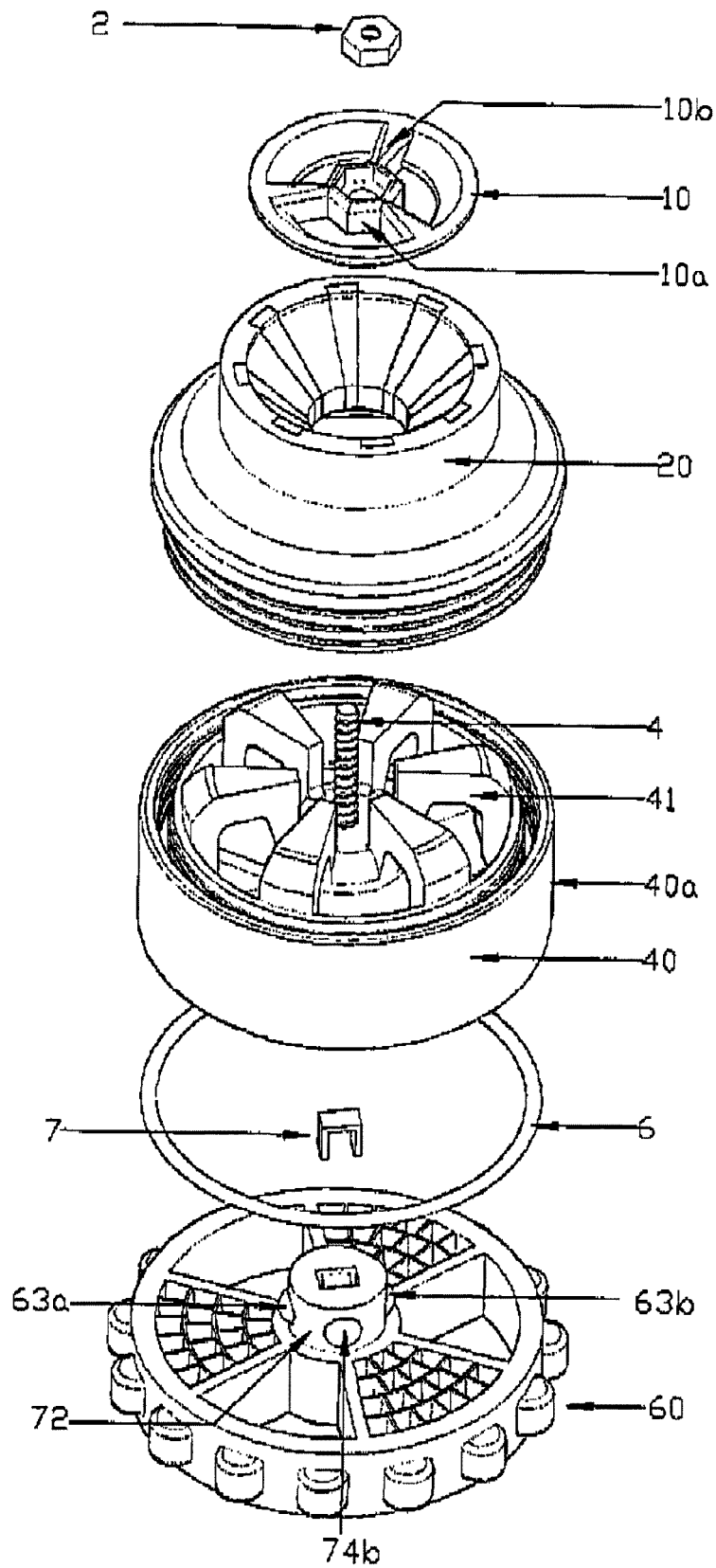
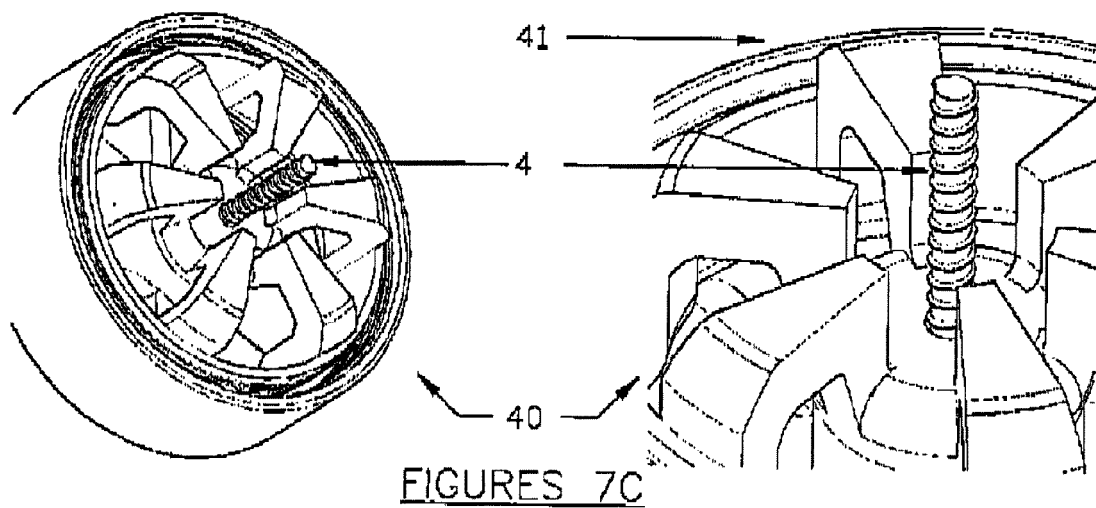
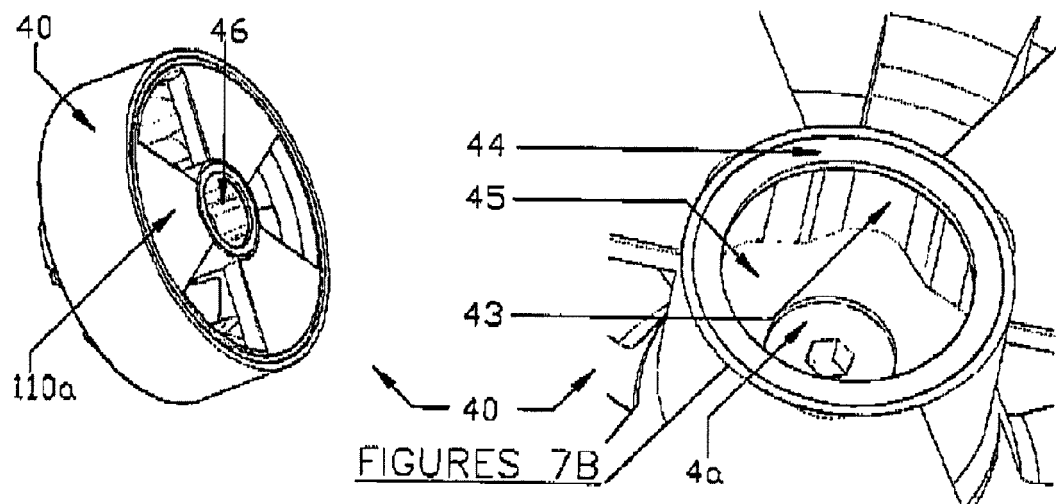
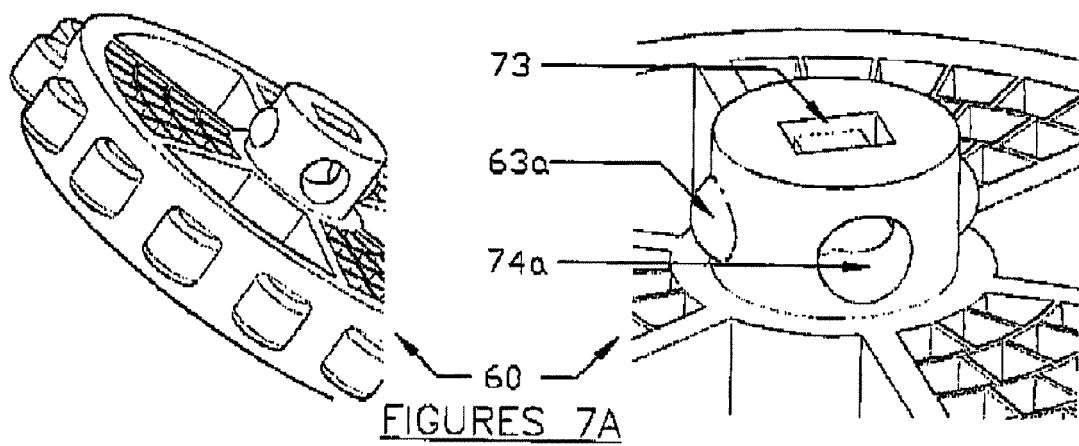
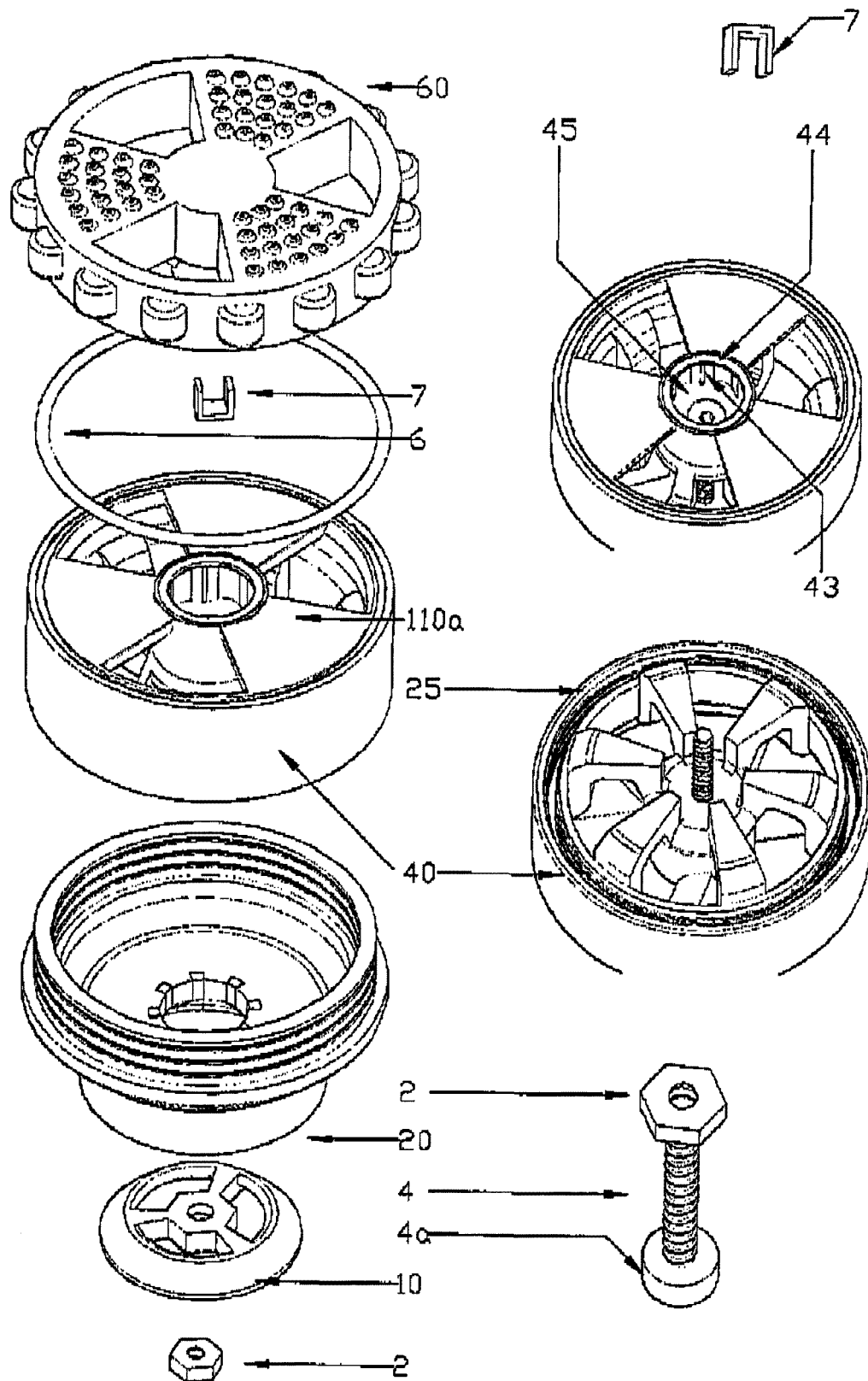


FIGURE 6





FIGURES 8

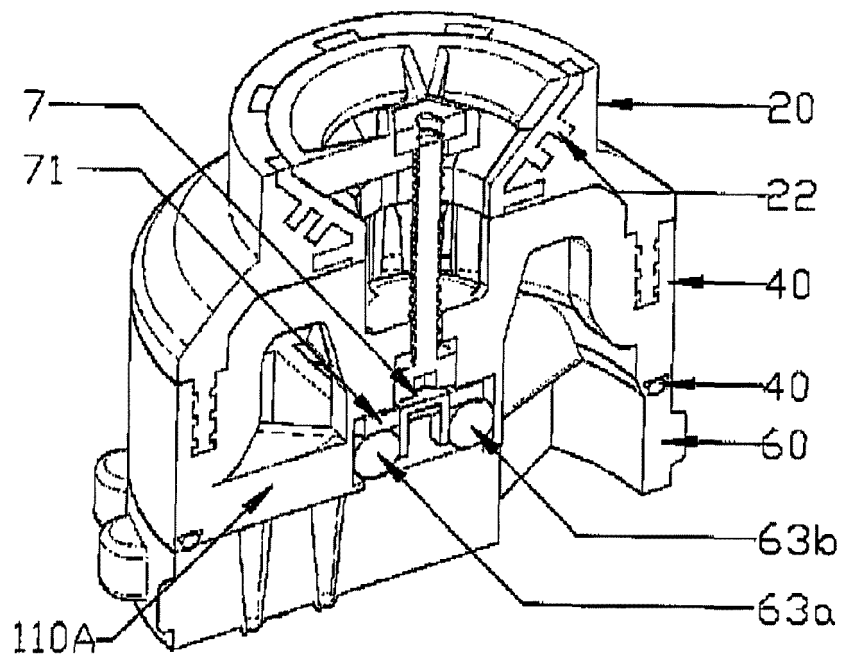


FIGURE 9A

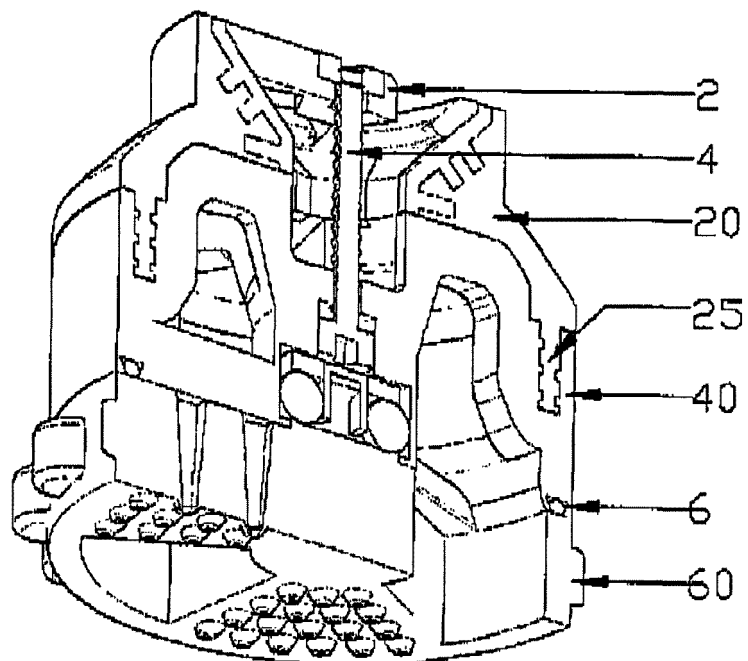
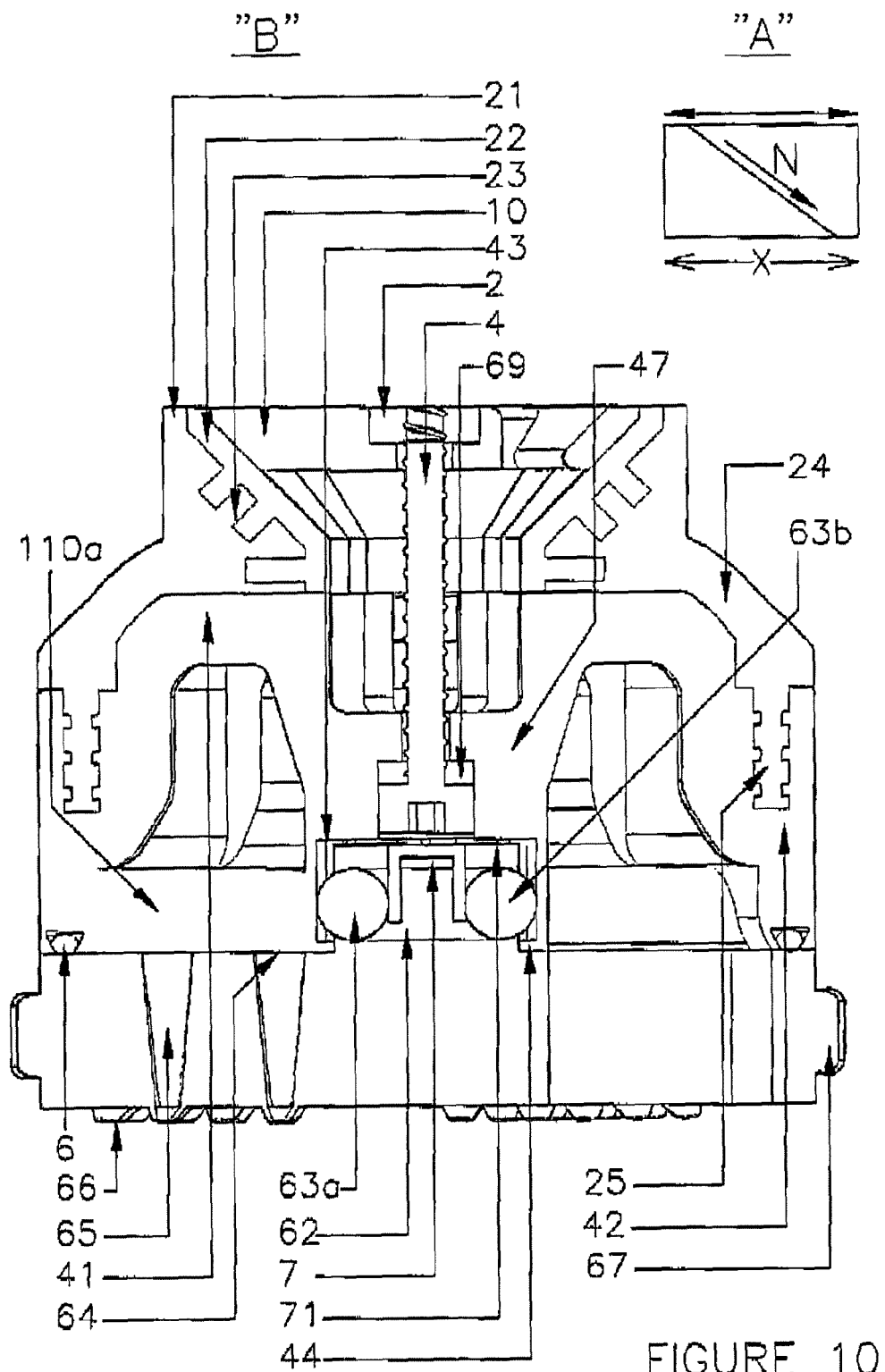


FIGURE 9B



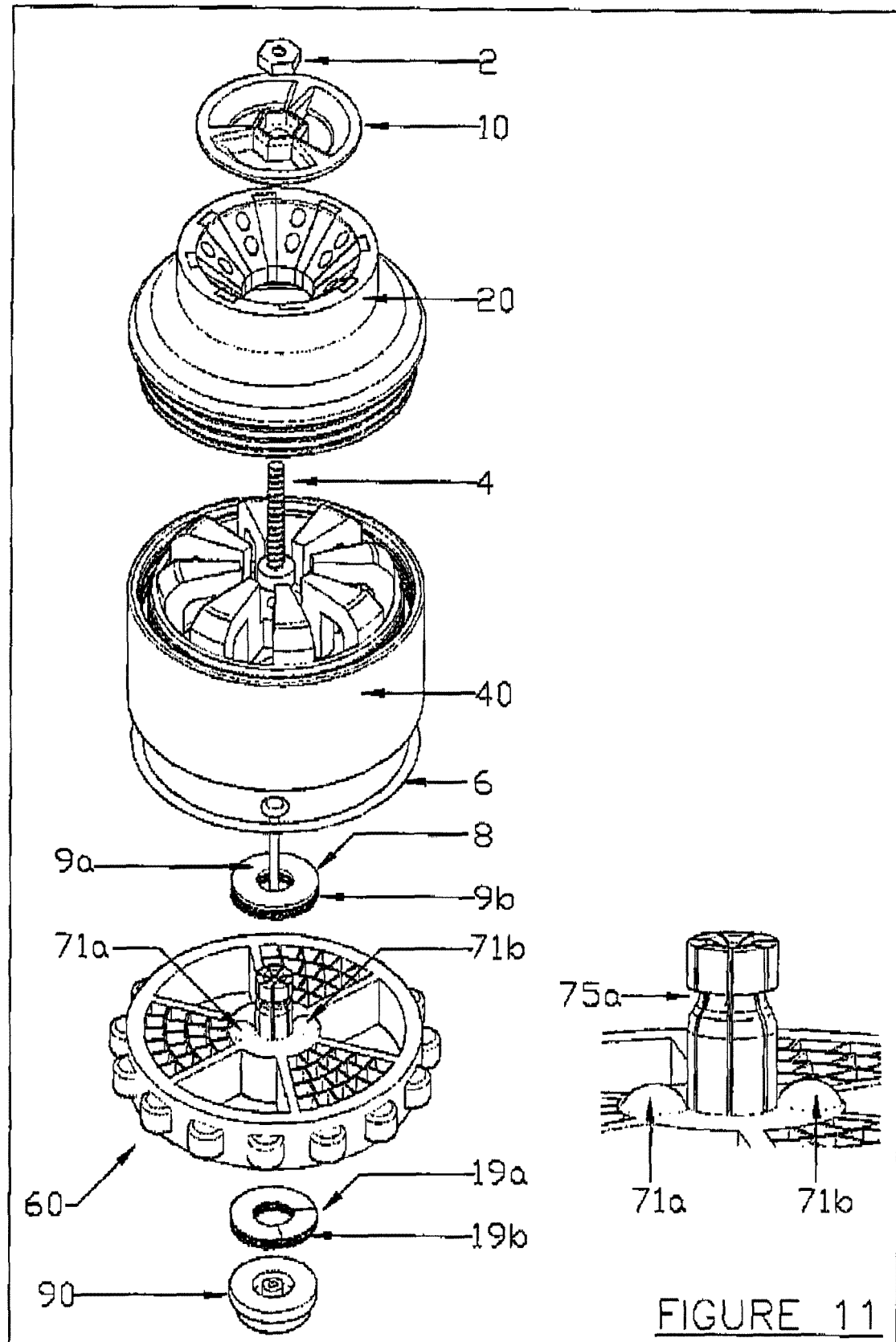


FIGURE 11

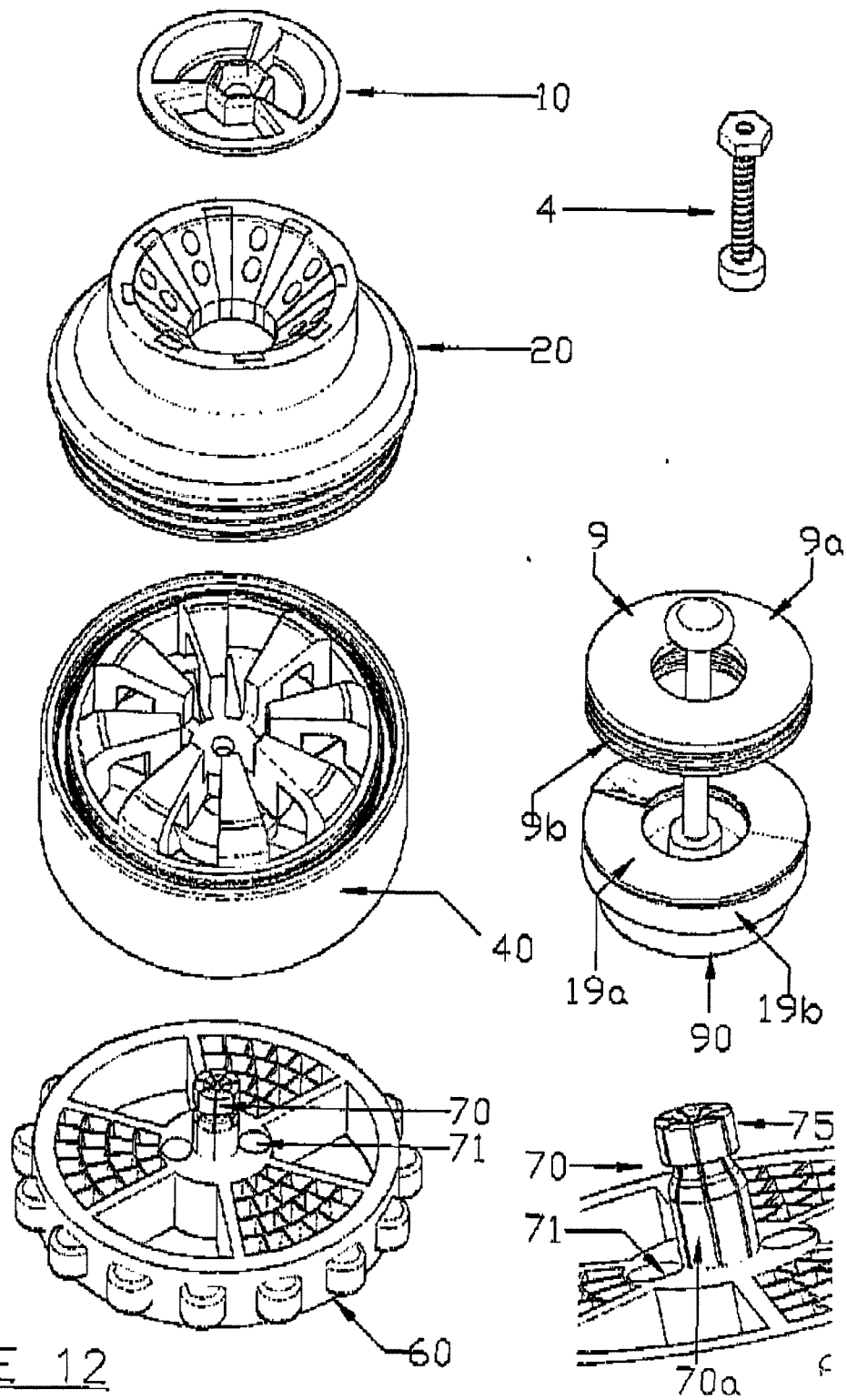


FIGURE 12

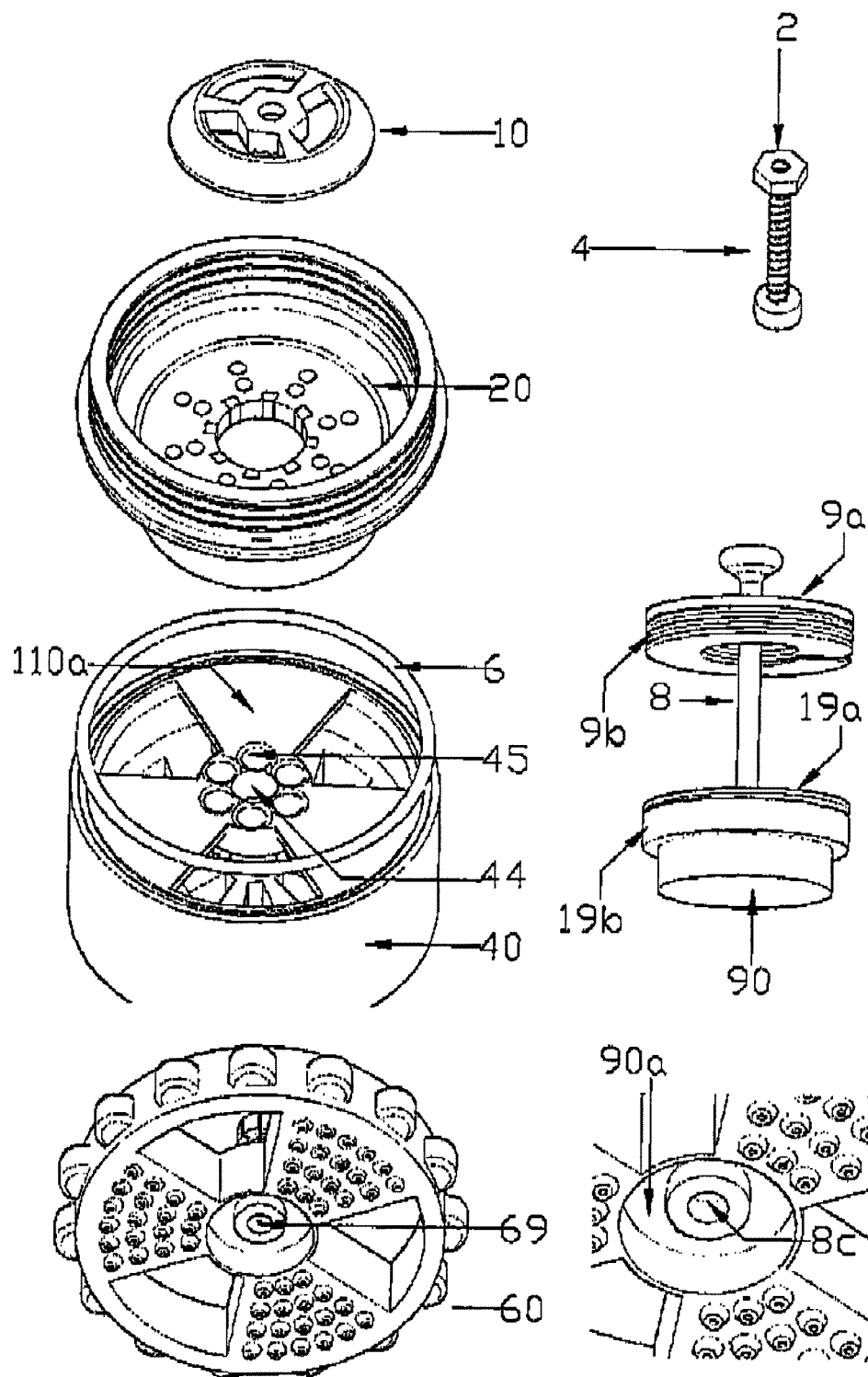
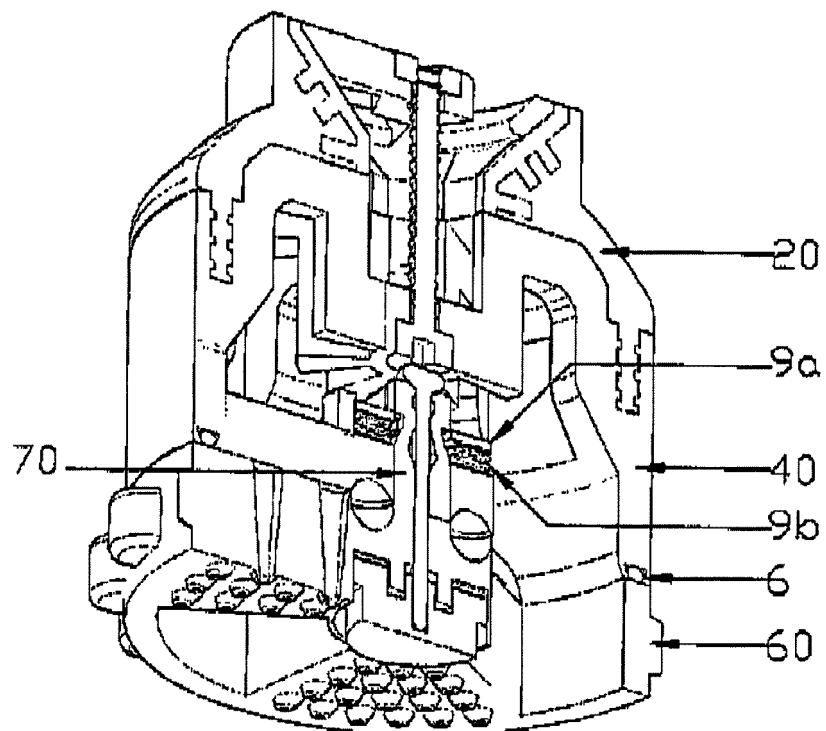
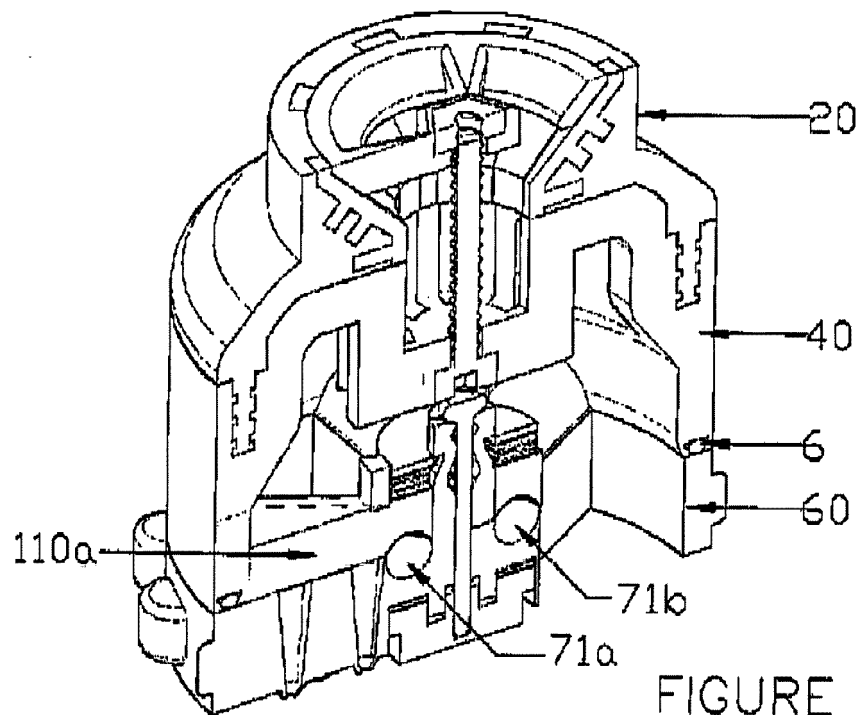
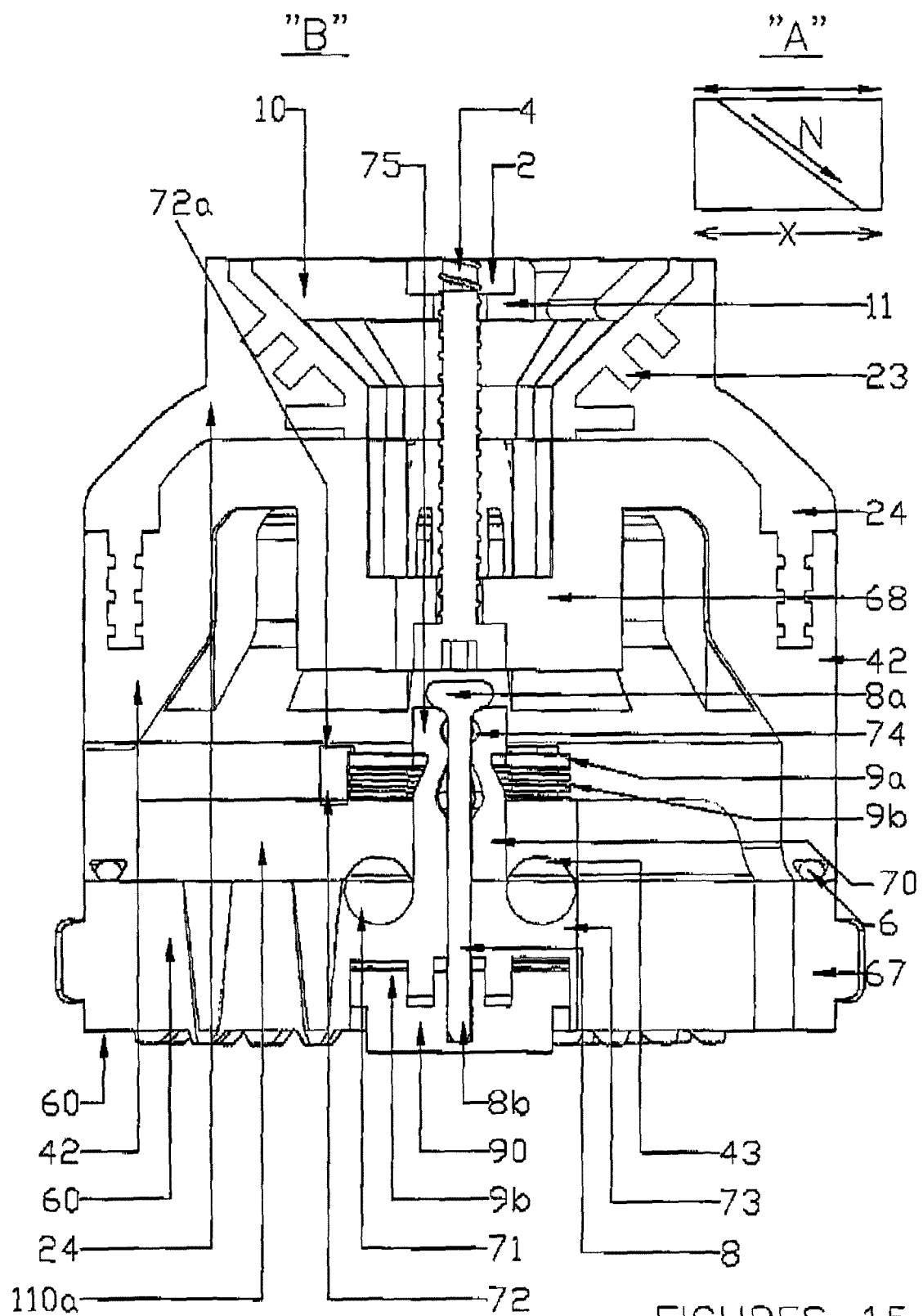


FIGURE 13





FIGURES 15



PARTIAL EUROPEAN SEARCH REPORT

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

EP 14 25 0029

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 33 44 614 A1 (MANNESMANN & KEPPEL [DE]) 20 June 1985 (1985-06-20) * abstract *	1-4	INV. E03C1/084
X	EP 0 190 965 A1 (PRESTO ROBINETS SA [FR]) 13 August 1986 (1986-08-13) * the whole document *	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			E03C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do
not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

1

EPO FORM 1503 03.82 (P04E07)

Place of search	Date of completion of the search	Examiner
Munich	21 November 2014	Flygare, Esa
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		



**INCOMPLETE SEARCH
SHEET C**

Application Number
EP 14 25 0029

5

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Claim(s) completely searchable:
1-14

Claim(s) not searched:
15

Reason for the limitation of the search:

In accordance with the statement of the applicant filed per Fax on 11.11.2014, claim 15 as filed is cancelled and not to be searched.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 25 0029

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-11-2014

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			FR 2576939 A1 08-08-1986

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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