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(54) DISTRIBUTOR FOR A HEATING OR COOLING INSTALLATION

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DISTRIBUTEUR POUR UNE INSTALLATION DE CHAUFFAGE OU DE REFRIGERATION

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Description

[0001] The present invention relates to a distributor for a heating or cooling plant according to the preamble of patent claim 1.

[0002] Already known distributors of this type are designed to provide a specific flow, calculated as a percentage , through e.g. a radiator. Normally, the amount of the flow through the radiator is about 50 % of the total flow through a closed loop and in special cases it may be about 35 %.

[0003] In a loop with e.g. 6 radiators , in which loop further the difference in size between the radiators may be large, the flows through the smaller radiators (see Fig. 1) are in practice too large. Too large flows mean, that the heat emission increases and this means, that small radiators in a loop emit more energy than they are designed to do. This also means, that e.g. a larger radiator close to the end of the loop will function under conditions, which it is not designed for, i.e. with a too low average temperatur and a too small heat emission. As to the climate in the house, a room with a smaller radiator will be too hot, whereas a room with a larger radiator will be too cold.

[0004] The drawbacks mentioned above can be remedied by changing the pressure fall across the connected radiator valves. If the valve of a smaller radiator is choked, the flow through the radiator can be reduced , but then a much larger pressure fall (delta 2) across this portion of the loop results, since the flow through the bypass tube increases. A higher pressure fall (delta 2) results in the drawback, that the total flow through the loop decreases , the conditions for all parts of the loop thereby changing. The calculated values for capacities/ energy change och consequently also the room climate. If the loop is connected to a larger system, other parts of the system will also change, as soon as one or several valves are adjusted, e.g. choked, anywhere in the system.

[0005] US-A-3 618 855 relates to a radiator valve, in which the spindle is provided with a restriction cone. This cone is not controlled in any other way than through the spindle suspension in one of its ends, and consequently mounting variations, flow variations, vibrations etc. may occur.

[0006] By DE-A-2 355 064, there is previously known a similar construction as the afore-mentioned one. A cone is provided to act, in the bypass way, against a seat in order to throttle or shut off a bypass flow. Centering ribs are radially protruding from the said cone or the spindle carrying same for centering the latter within said seat.

[0007] One object of the present invention is to considerably counter-act and to eliminate , if possible completely, the above-mentioned drawbacks. Another object is to accomplish this with simple yet reliable means. A further object of the invention is to further develop this technical field in various respects.

[0008] These objects are met according to the invention by designing a distributor of the type described in the introduction mainly in such a way as is set forth in the characterizing clause of patent claim 1.

[0009] With the new construction the drawbacks, which are inherent in the already known solutions, are eliminated. A constant loop flow is obtained, irrespective of the percentage distribution to the radiators within the respektive distribution areas. The size of every area depends on the physical design of the distributor and the k-value of the radiator valve.

[0010] Thus, due to the invention the flow up to a radiator can be varied without influencing the total loop flow and consequently also not the conditions in the remaining radiators or other parts in a large flow system. One condition for this is that a radiator valve is used, which is connected in parallel with the restriction of the distributor and the k-value of which e.g. and preferably is less than 0.80.

[0011] An essential feature of the invention is that the restriction/ distribution function of the distributor is obtained by means of a control component, which comprises a polygonal, preferably triangular restriction cone. The design of the restriction cone results in a centering function of a spindle, also apart of the control component as well as the choking. The variation of the choking can be obtained by means of obliquely cut, suitably flat surfaces, which differ as to direction in relation to the cylindrical bypass flow through of the distributor housing.

[0012] Further, in connection with the change in the choking of the bypass a change in the choking of the radiator return simultaneously takes place, since the front or return-controlling restriction cone then also is moved in the axial direction. These features are the basis of the great functional value of the invention, i.e. that the simultaneous change of the two restriction sites is such, that the total flow through the two restriction elements can be maintained constant within practical limits for the application. In order not to allow the two flows, i. e. from the bypass flow through and the radiator return respectively, to influence each other negatively, it is suggested, that the distributor is provided with an interior, e.g. circular arc-shaped partition as well as the front value body of the spindle with a flange portion with a larger diameter , designed to choke the medium flows.

[0013] Additional features and advantages of the invention are set forth in more detail in the following description, reference being made to the enclosed drawings, which i.a. show a few preferable but not limiting embodiments :

Fig. 1 is a diagram showing a conventional single-tube heating plant;

Fig. 2 is a diagram showing a single-tube heating plant according to the invention ;

Fig. 3 is a diagram showing the previously obtained characteristics and the new characteristics accord-

ing to the invention as to the k-value of the system as a function of the distribution;
Fig. 4 is a mainly diametrical longitudinal cross-section of a distributor according to the invention;
Fig. 5a-d is a first embodiment of a control component according the invention, in a perspective as well as a lateral and two end views ; and
Fig. 6a-d are the corresponding views of a second embodiment of a control component according to the invention.

[0014] In the drawings, a new single-tube system 1 according to the present invention is shown in its entirety and a similar conventional system 2 and also a forward feed tube 3, a return tube 4 and a bypass tube respectively as well as radiators 5, radiator valves 6 och distributors 7.

[0015] Figs. 1, 2 and 3 are self-explanatory in combination with the introductory portion of the description.

[0016] The distributor according to the present invention , in its entirety designated 7, comprises according to Fig. 4 a housing 8 having an axial through hole 9, the one end of which is designed as a return inlet 10 and to which laterally a return outlet 11, a feed inlet 12 and a feed outlet 13 are connected. The latter is an example provided with a sealing cone 14 and a pressure nut 15 in order to connect a feed tube section to a radiator and a radiator valve respectively.

[0017] In hole 9, suitably from end 16, which is turned away from return inlet 10, a spindle control component 17 is inserted, the entry end of which comprises a value body 18 for restriction and where appropriate cut-off of return inlet 10 against a seat 19 in housing 8, located between return inlet 10 and return outlet 11. Feed inlet 12 and feed outlet 13 communicate freely with each other via a passage 20, which consists of conventional lateral walls as well as partially hole 9.

[0018] On spindle 21 of the control component a restriction cone 22 is mounted between the hole portion, which is connected to return outlet 11 and the hole portion, which is connected to passage 20, which restriction cone acts against a surrounding seat 23, which is a portion of the housing and suitably is a circular-cyindrical restriction, which jointly with feed inlet 12, return outlet 11 och the portions of hole 9, which connect the same to each other, comprise the bypass of the system.

[0019] Restriction cone 22 has a polygonal design with a circular-cylindrical shape, which preferably solely by slip fit, in exceptional cases having a slightly larger clearance, fits into seat 23, which like the restriction cone has a substantialextension length in the axial direction in such a way, that the latter always is guided by the seat irrespective of the restriction and cut-off position respectively. The polygonal design is preferably triangular in such a way, that three mainly flat surfaces 24 , having the same mutual angular distance along the circumference, intersect the cone starting from end surface 25, which is turned to value body 18 and at a somewhat smaller distance from spindle 21, e.g. 0.1-10 mm, preferably 1-4 mm in order to be located at the other end surface 26. 0.1-8 mm, preferably 0.5-2 mm from the spindle. Thus, the imaginary extensions of the surfaces intersect the spindle axis. Also, the surfaces can be divided into two parts 24' and 24", which enclose an angle of 150-179°, e.g. about 170°, said part 24" running in parallel to the spindle. Restriction cone end 25, which is turned to value body 18, can be provided with a shorter or smaller bevel 27 on all sides and the other end 26 with a similar, preferably larger bevel 29. However, surfaces 24 and bevels 27,29 leave behind guide ridges 30, which are portions of said originally completely existing cylinder, which means, that said ridges, arranged with e.g. a 120° angular distance along the circumference, allow a continual centering of the restriction cone regardless of the axial position of control component and hence an exceedingly evenly distributed flow in the circumferential direction through this portion of the bypass past the constriction cone.

[0020] A partition 31 is mounted in the housing between restriction cone 22 and value body 18 and is inserted in hole 9 in a radial direction with e.g. a few millimeters. It is designed to prevent, that the bypass flow and the return flow do not wrongly influence each other.

[0021] The control component comprises at its rear/exterior end a screw plug 32 with an external thread 33, by means of which it is screwed into the exterior end of hole 9, which end within this area is partially provided with an interior thread 40. Also, the plug is sealed by means of an O-ring 35, inserted in a groove 34, a barrier ring 36, mounted outside the plug: in a groove 37, and finally a screw cap 38 with a flat seal 28. Plug 32 is in its exterior free end provided with e.g. a hexagonal hole 39 for a tool (not shown).

Claims

1. A distributor (7) for a single-tube system (1,2) of a heating or cooling plant having a feed tube (3) and a return and bypass tube (4) as wells as heating or cooling elements (5) and valves (6) provided for said tubes and elements, said distributor (7) comprising a housing (8) with an axial, continuous hole (9), one end of which forms or is connected to a return inlet (10), while through the other end a spindle-shaped control component (17) is inserted into said hole, a return outlet (11), a feed inlet (12) and a feed outlet (13) being laterally connected to hole (9), the insertion end of said component (17) comprising a valve body (18) provided to choke or shut off said return inlet (10) against a seat (19) in said housing (8), which seat is located between the return inlet (10) and the return outlet (11), the spindle (21) of said control component (17) being provided with a restriction cone (22) between said return outlet (11) and said feed inlet (12), a flow passage (20) con-

necting said feed outlet (13) with said feed inlet (12) via said hole (9), said cone (22) acting against a surrounding seat (23), which preferably is part of said housing (8) and which preferably is designed as a circular-cylindrical restriction, which jointly with the feed inlet (12), the return outlet (11) and portions of the hole (9), which interconnect said feed inlet (12) and said return outlet (11), constitutes the bypass of the system, **characterized in that** the restriction cone (22) has a polygonal shape, preferably with a partly circular-cylindrical circumference, and fits itself solely through slip fit into said surrounding seat (23) which, like the restriction cone (22), has substantial length in axial direction in such a way, that the restriction cone itself always is guided by the seat irrespective of its choking or shut-off position.

2. A distributor according to claim 1, **characterized in that** the polygonal shape of said restriction cone (22) is triangular in cross-section.

3. A distributor according to claim 2, **c h a r a c t e r i z e d in t h a t** said polygonal shape includes three surfaces (24), which are located with the same angular distance along the circumference of the cone (22).

4. A distributor according to claim 2 or 3, **characterized in that** the originally existing or imaginary circular-cylindrical circumference remains in the form of axial guide ridges (30), which are located along the circumference with the same angular distance.

5. A distributor according to claim 3 or 4, **characterized in that** said surfaces (24) intersect the cone (22), starting from one cone end surface (25), which faces said valve body (18), at short distance from the spindle (21), i.e. 0,1-10 mm, preferably 1-4 mm, which surfaces terminate, at the other end surface (26) of the cone, at 0,1-8 mm, preferably 0,5-2 mm, from the spindle, and that at least some parts of said surfaces (24) intersect the spindle axis with imaginary extensions.

6. A distributor according to any of claims 3-5, **characterized in that** each surface (24) is composed of two partial surfaces (24', 24"), which include an angle of 150-179°, preferably about 170°, between each other, the one partial surface (24") preferably running in parallel with the spindle (21).

7. A distributor according to any of claims 3-6, **characterized in that** the restriction cone end (25), which faces said valve body, is provided with a shorter or smaller bevel (27), and that the other cone end (26) is provided with a suitably longer or larger bevel (29).

8. A distributor according to any of claims 1-7, **characterized in that** the housing (8), between the restriction cone (22) and the valve body (18), a partition (31) is formed, which radially projects into said hole (9) e.g. a few millimeters and is provided to separate, in this area, the bypass flow and the return flow.

9. A distributor according to any of claims 1-8, **characterized in that** the control component (17) at its rear/exterior end has a screw plug (32) with an exterior thread (33), by means of which it is screwed into said other end of said hole (9), which end partially is provided with an interior thread (40), that in a groove (34) in said plug an O-ring (35) is inserted as a seal and suitably a carrier ring (36) is mounted outside the plug in a groove (37) in the housing and that a screw cap (38) with a flat seal (28) locks the control component which, in the exterior end surface of the plug, suitable is provided with e.g. a hexagonal hole (39) for the insertion of a tool for the positional adjustment of the control component.

Patentansprüche

1. Verteiler (7) für ein Einrohrsystem (1, 2) einer Heiz- oder Kühlanlage mit einer Vorlaufleitung (3) und einer Rücklauf- bzw. Umgehungsleitung (4) sowie Heizkörpern bzw. Kühlelementen (5) und für genannte Leitungen und Elemente od.dgl. vorgesehene Ventile (6), wobei der Verteiler (7) ein Gehäuse (8) aufweist mit einer axialen, durchgehenden Öffnung (9), von der ein Ende an einen Rücklaufleitungseinlass (10) angeschlossen ist, während durch das andere Ende ein spindelförmiges Regelorgan (17) in genannte Öffnung eingesetzt ist, wobei ein Rücklaufleitungsauslass (11), ein Vorlaufleitungseinlass (12) und ein Vorlaufleitungsauslass (13) seitlich an die Öffnung (9) angeschlossen sind, wobei das Einführungsende genannten Regelorganes (17) einen Ventilkörper (18) besitzt, der dazu vorgesehen ist, den genannten Rücklaufleitungseinlass (10) gegen einen Sitz (19) in genanntem Gehäuse (8) zu drosseln oder zu unterbrechen, welcher Sitz zwischen dem Rücklaufleitungseinlass (10) und dem Rücklaufleitungsauslass (11) angeordnet ist, und wobei die Spindel (21) des genannten Regelorganes (17) mit einem Drosselkegel (22) zwischen genanntem Rücklaufleitungsauslass (11) und genanntem Vorlaufleitungseinlass (12) ausgestattet ist, eine Flusspassage (20) den genannten Vorlaufleitungsauslass (13) mit genanntem Vorleitungseinlass (12) über genannte Öffnung (9) verbindet, genannter Kegel (22) gegen einen umgebenden Sitz (23) wirkt, der vorzugsweise Teil des genannten Gehäuses (8) ist und vorzugsweise als eine zirkulärzylindrische Verjüngung ausgeführt

ist, die zusammen mit dem Vorlaufleitungseinlass (12), dem Rücklaufleitungsauslass (11) und Teilen der Öffnung (9), welche genannten Vorlaufleitungseinlass (12) und genannten Rücklaufleitungsauslass (11) miteinander verbinden, die Umgehungsleitung des Systemes darstellt, **dadurch gekennzeichnet, dass** der Drosselkegel (22) polygonale Form aufweist, vorzugsweise mit einem teilzirkulärzylindrischen Umfang, und nur durch Gleitpassung in den genannten umgebenden Sitz (23) einpasst, welcher wie auch der Drosselkegel (22) wesentliche Ausdehnung in axialer Richtung aufweist derart, dass der Drosselkegel selbst stets von dem Sitz geführt ist unabhängig von der Drossel- oder Unterbrechungslage.

2. Verteiler nach Anspruch 1, **dadurchgekennzeichnet, dass** die polygonale Form des genannten Drosselkegels (22) im Querschnitt dreieckförmig ist.

3. Verteiler nach Anspruch 2, **dadurch gekennzeichnet, dass** genannte polygonale Form drei Flächen (24) einschliesst, welche unter dem gleichen Winkelabstand entlang des Umfanges des Kegels (22) angeordnet sind.

4. Verteiler nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** der ursprünglich vorkommende oder imaginäre zirkulärzylindrische Umfang in Form von axialen Führungsrippen (30) verbleibt, welche entlang dem Umfang unter dem gleichen Winkelabstand angeordnet sind.

5. Verteiler nach Anspruch 3 oder 4, **dadurch gekennzeichnet, dass** genannte Flächen (24) den Kegel (22) schneiden, ausgehend von einer Kegelendfläche (25), welche dem genannten Ventilkörper (18) zugewendet ist, auf kurzem Abstand von der Spindel (21), nämlich 0,1-10 mm, vorzugsweise 1-4 mm, welche Flächen an der anderen Endfläche (26) des Kegels enden auf 0,1-8 mm, vorzugsweise 0,5-2 mm, von der Spindel, und dass wenigstens einige Teile der genannten Flächen (24) die Spindelachse mit imaginären Verlängerungen schneiden.

6. Verteiler nach wenigstens einem der Ansprüche 3-5, **dadurch gekennzeichnet, dass** jede Fläche (24) aus zwei Teilflächen (24', 24") zusammengesetzt ist, welche einen Winkel von 150-179°, vorzugsweise angenähert 170°, zwischen sich einschliessen, und dass die eine Teilfläche (24") vorzugsweise parallel zur Spindel (21) verläuft.

7. Verteiler nach wenigstens einem der Ansprüche 3-6, **dadurch gekennzeichnet, dass** das Drosselkegelende (25), welches dem Ventilkörper zugewendet ist, mit einer kürzeren oder schmaleren Fase (27) versehen ist, und dass das andere Kegelende (26) mit einer vorzugsweise lägeren oder grosseren Fase (29) versehen ist.

8. Verteiler nach wenigstens einem der Ansprüche 1-7, **dadurch gekennzeichnet, dass** in dem Gehäuse (8) zwischen dem Drosselkegel (22) und dem Ventilkörper (18) eine Trennwand (31) ausgeführt ist, welche radial in genannte Öffnung (9) einragt, z.B. einige wenige Millimeter und dazu vorgesehen ist, den Umgehungsleitungsfluss und den Rücklaufleitungsfluss voneinander in diesem Bereich zu trennen.

9. Verteiler nach wenigstens einem der Ansprüche 1-8, **dadurch gekennzeichnet, dass** das Regelorgan (17) an seinem hinteren/äusseren Ende einen Schraubpfropfen (32) mit einem Aussengewinde (33) besitzt, mittels welchem er in das genannte andere Ende der genannten Öffnung (9) eingeschraubt ist, welches Ende teilweise mit einem Innengewinde (40) ausgestattet ist, dass in eine Nut (34) in genanntem Pfropfen ein O-Ring (35) eingesetzt ist als eine Dichtung und vorzugsweise ein Sperring (36) ausserhalb des Pfropfens in eine Nut (37) im Gehäuse eingeführt ist, und dass ein Schraubdeckel (38) mit einer Plandichtung (28) das Regelorgan verschliesst, welches in der äusseren Endfläche des Pfropfens vorzugsweise mit z.B. einem Sechskantloch (39) ausgestattet ist für die Einführung eines Werkzeuges für eine Lagenänderung des Regelorganes.

Revendications

1. Distributeur (7) pour un système monotube (1, 2) d'une installation de chauffage ou de refroidissement comportant un tube d'alimentation (3) et un tube de retour et de dérivation (4), ainsi que des éléments de chauffage ou de refroidissement (5) et des vannes (6) prévues pour lesdits tubes et lesdits éléments, ledit distributeur (7) comprenant un logement (8) dans lequel est pratiqué un trou axial continu (9) dont une extrémité forme ou est reliée à une entrée de retour (10) tandis que, via l'autre extrémité, un composant de commande (17) en forme de tige est inséré dans ledit trou, une sortie de retour (11), une entrée d'alimentation (12) et une sortie d'alimentation (13) étant reliées latéralement au trou (9), l'extrémité d'insertion dudit composant (17) comprenant un corps de vanne (18) prévu pour étrangler ou pour mettre hors circuit ladite entrée de retour (10) contre un siège (19) dans ledit logement (8), ledit siège étant situé entre l'entrée de retour (10) et la sortie de retour (11), la tige (21) dudit composant de commande (17) étant munie d'un cô-

ne de restriction (22) entre ladite sortie de retour (11) et ladite entrée d'alimentation (12), un passage d'écoulement (20) reliant ladite sortie d'alimentation (13) à ladite entrée d'alimentation (12) via ledit trou (9), ledit cône (22) agissant à l'encontre d'un siège périphérique (23) qui de préférence fait partie dudit logement (8) et qui de préférence est conçue sous la forme d'une restriction cylindrique circulaire qui, de manière conjointe avec l'entrée d'alimentation (12), la sortie de retour (11) et des portions du trou (9) qui relient l'une à l'autre ladite entrée d'alimentation (12) et ladite sortie de retour (11), constitue la dérivation du système, **caractérisé en ce que** le cône de restriction (22) possède une forme polygonale, de préférence avec une circonférence en partie cylindrique circulaire, et vient s'insérer uniquement par glissement dans ledit siège périphérique (23) qui, au même titre que le cône de restriction (22), possède une longueur substantielle en direction axiale de telle sorte que le cône de restriction proprement dit est toujours guidé par le siège, sans prendre en compte sa position d'étranglement ou de mise hors circuit.

2. Distributeur selon la revendication 1, **caractérisé en ce que** la forme polygonale dudit cône de restriction (22) est triangulaire en coupe transversale.

3. Distributeur selon la revendication 2, **caractérisé en ce que** ladite forme polygonale englobe trois surfaces (24) qui sont disposées avec la même distance angulaire le long de la circonférence du cône (22).

4. Distributeur selon la revendication 2 ou 3, **caractérisé en ce que** la circonférence cylindrique circulaire imaginaire ou existant à l'origine subsiste sous la forme de nervures de guidage axial (30) qui sont disposées le long de la circonférence avec la même distance angulaire.

5. Distributeur selon la revendication 3 ou 4, **caractérisé en ce que** lesdites surfaces (24) coupent le cône (22), en commençant à une surface terminale (25) du cône qui est opposée audit corps de vanne (18), à une courte distance de la tige (21), c'est-à-dire de 0,1 à 10 mm, de préférence de 1 à 4 mm, lesdites surfaces se terminant à l'autre surface terminale (26) du cône, à une distance de 0,1 à 8 mm, de préférence de 0,5 à 2 mm de la tige, et en ce qu'au moins certaines parties desdites surfaces (24) coupent l'axe de la tige avec des extensions imaginaires.

6. Distributeur selon l'une quelconque des revendications 3 à 5, **caractérisé en ce que** chaque surface (24) est composée de deux surfaces partielles (24', 24") qui forment un angle inclus de 150 à 179°, de préférence d'environ 170°, entre elles, la première surface partielle (24") s'étendant de préférence parallèlement à la tige (21).

7. Distributeur selon l'une quelconque des revendications 3 à 6, **caractérisé en ce que** l'extrémité (25) du cône de restriction, qui est opposée audit corps de vanne, est munie d'un chanfrein plus court ou plus petit (27), et en ce que l'autre extrémité (26) du cône est munie d'un chanfrein plus long ou plus grand (29) comme il se doit.

8. Distributeur selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que**, dans le logement (8), entre le cône de restriction (22) et le corps de vanne (18), est formée une paroi de séparation (31) qui fait saillie en direction radiale dans ledit trou (9), par exemple sur une distance de quelques millimètres et qui est prévue pour séparer dans cette zone l'écoulement de dérivation et l'écoulement de retour.

9. Distributeur selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** ledit composant de commande (17) à son extrémité arrière/externe possède un bouchon à visser (32) muni d'un filet de vis extérieur (33) à l'aide duquel il est vissé dans ladite autre extrémité dudit trou (9), ladite extrémité étant munie en partie d'un filet de vis intérieur (40), en ce qu'un joint torique (35) est inséré dans une rainure (34) pratiquée dans ledit bouchon, pour faire office de joint étanche, et, de manière appropriée, une bague de support (36) est montée à l'extérieur du bouchon dans une rainure (37) pratiquée dans le logement, et en ce qu'un recouvrement à visser (38) muni d'un joint étanche plat (28) bloque le composant de commande qui, dans la surface terminale externe du bouchon, est muni de manière appropriée par exemple d'un trou hexagonal (39) pour l'insertion d'un outil destiné au réglage de la position du composant de commande.

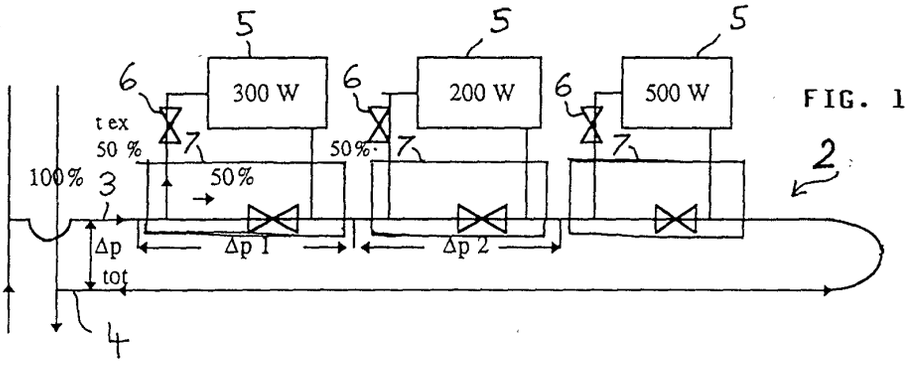
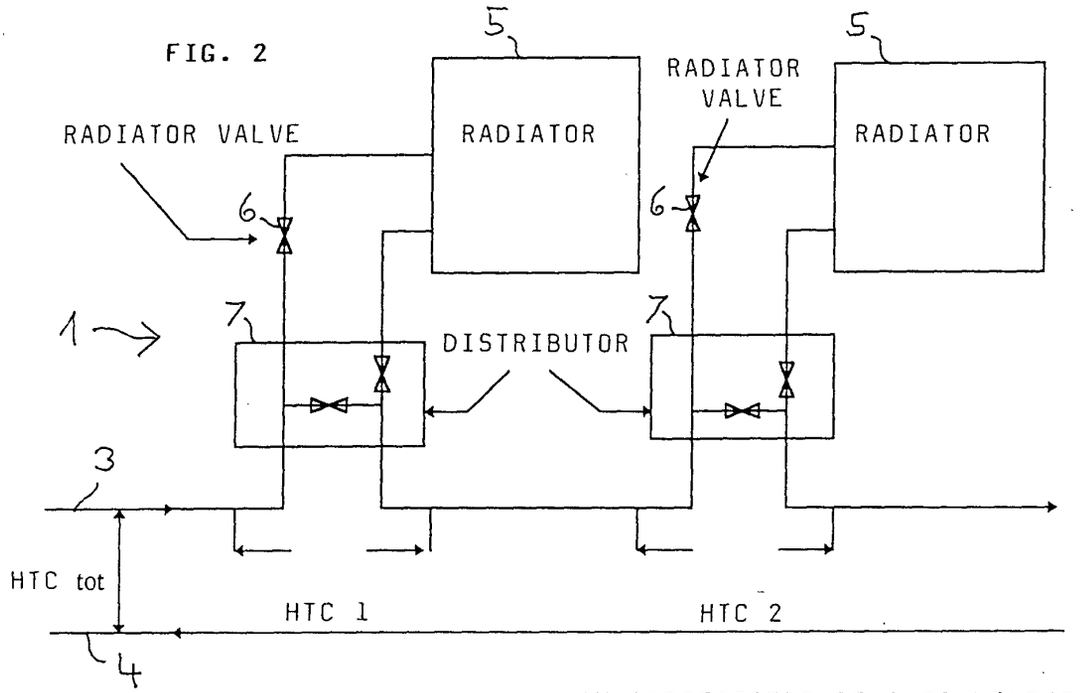


FIG. 1

FIG. 2



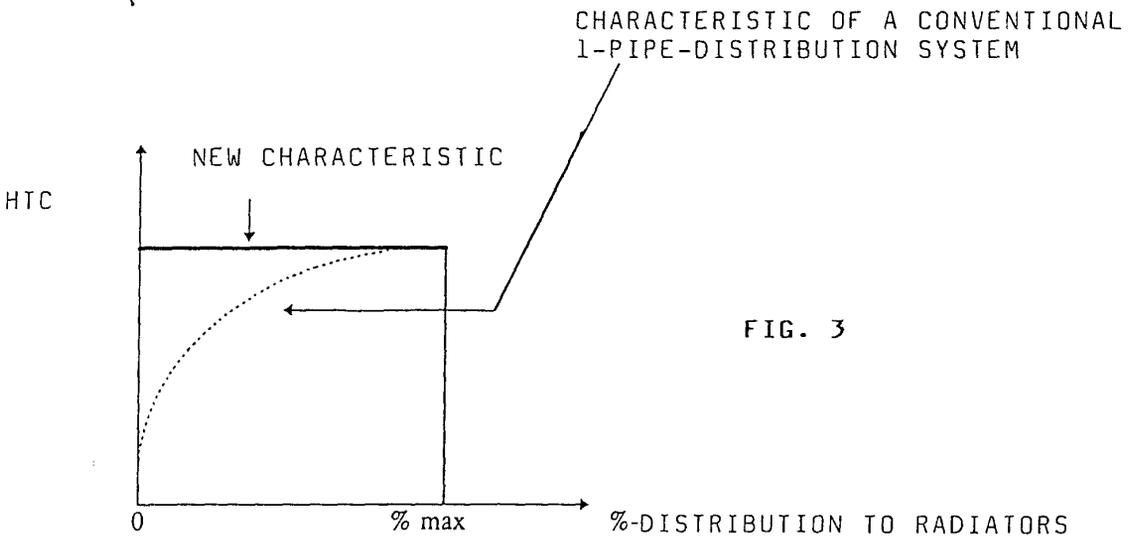
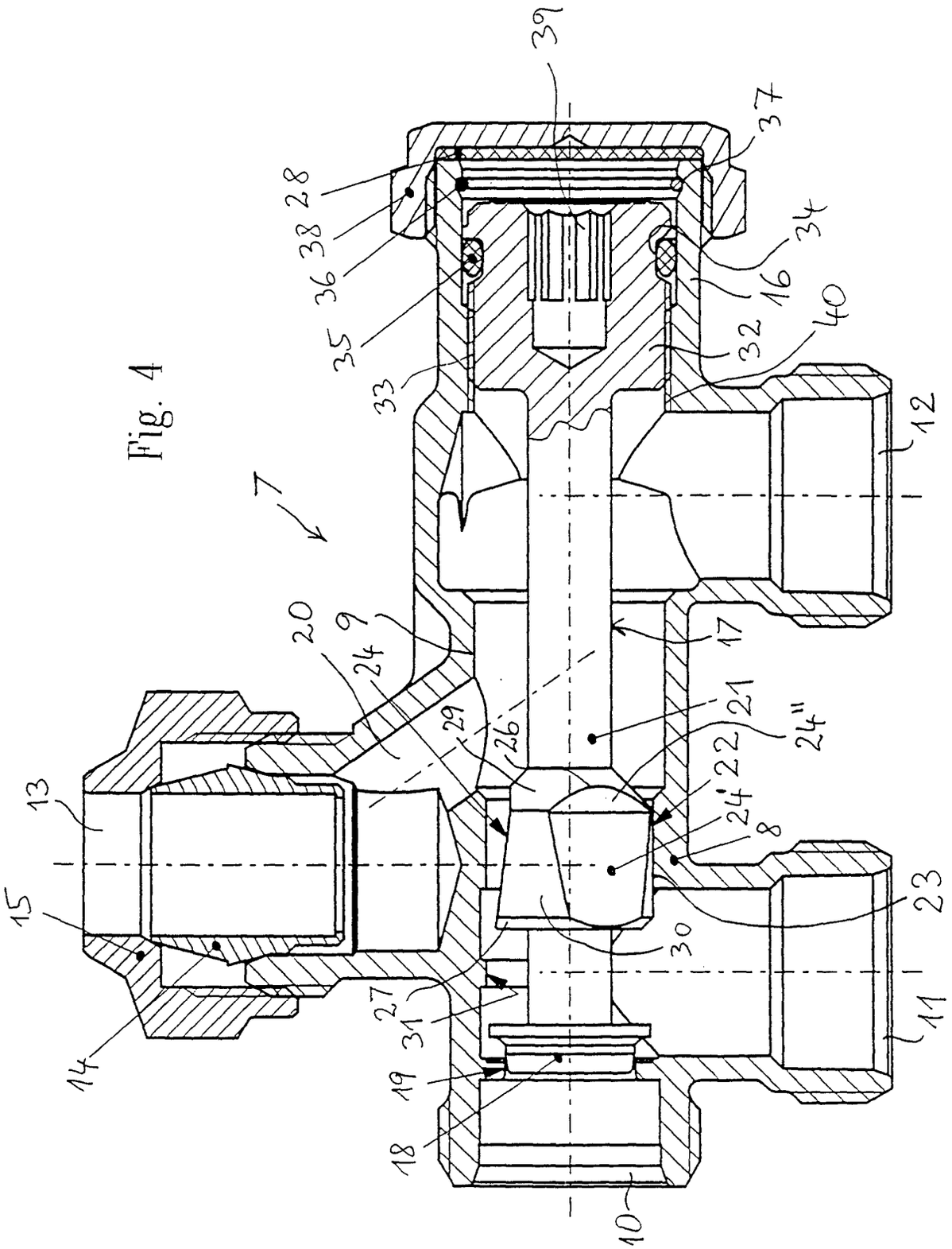


FIG. 3

HEAT TRANSMISSION COEFFICIENT AS FUNCTION OF DISTRIBUTION


39
37
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36
35
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16
32
40
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9
24
17
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26
21
24"
22
24'
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13
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23
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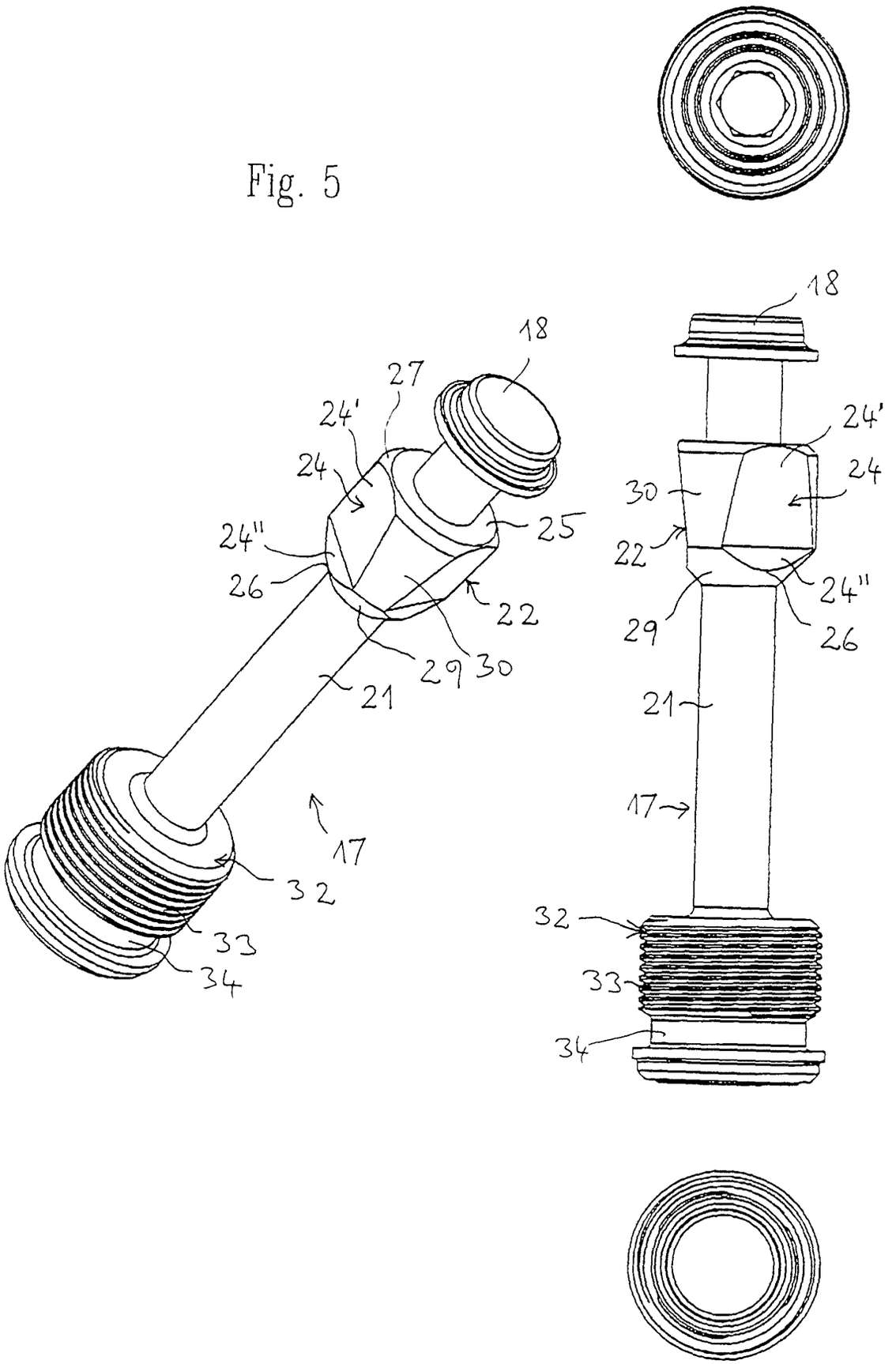
27
31
14
19
18
11
10

Fig. 4

Fig. 5


18
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24'
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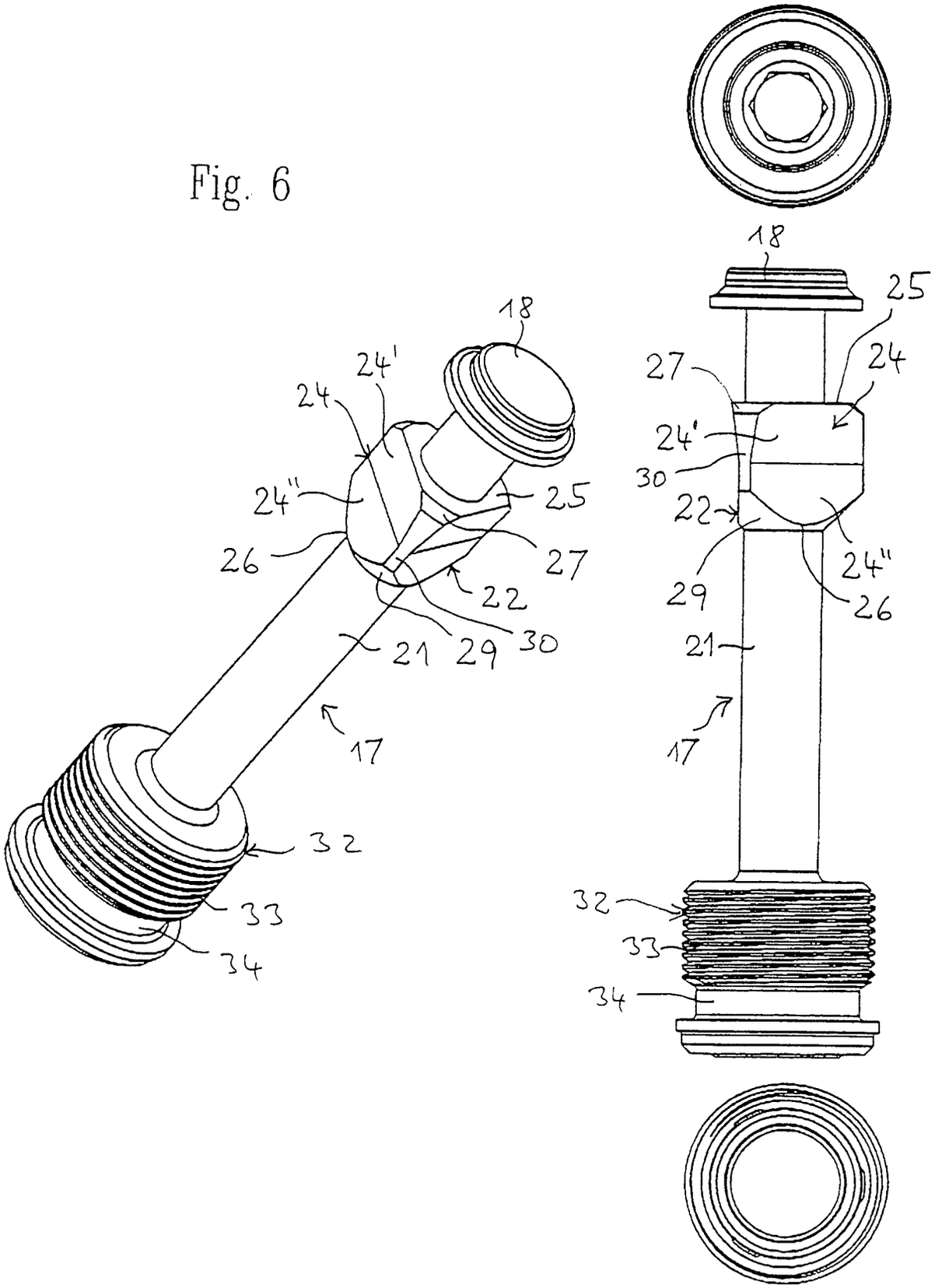
Fig. 6


18
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