March 19, 1968 A. KOHLER 3,373,691

GEARWHEEL TYPE DISTRIBUTOR PUMP

Filed April 28, 1966

Fig.1

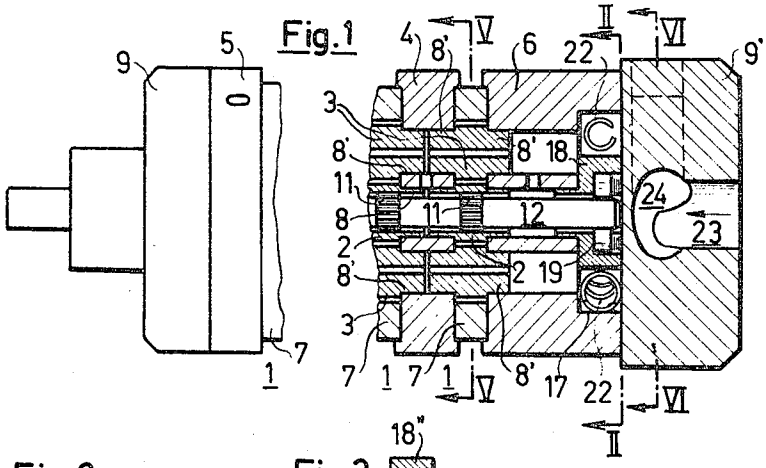


Fig.2

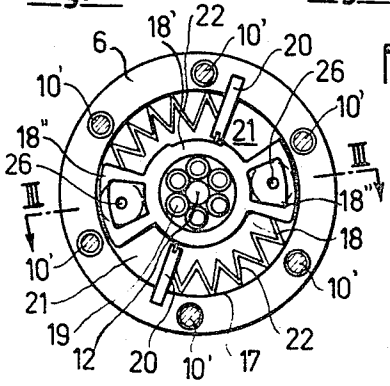
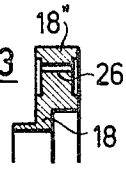


Fig.3



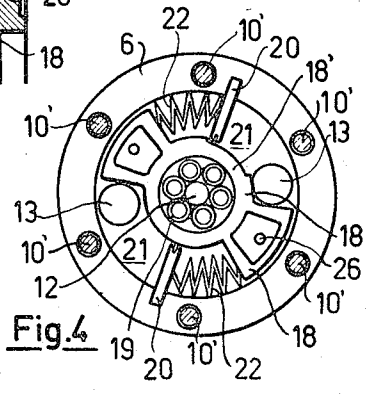


Fig.4

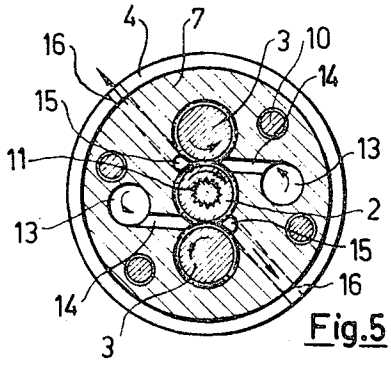
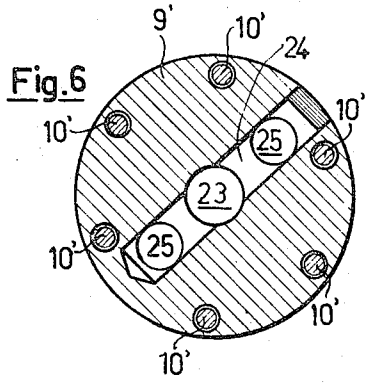


Fig.5

Fig.6



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GEARWHEEL TYPE DISTRIBUTOR PUMP

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4 Claims. (Cl. 103—118)

This invention relates to a gearwheel type distributor pump having at least two gearwheels, connected together in a rotationally fast manner, each of which is connected with at least one further gearwheel and forms with the latter a conveying element for at least one pressurized liquid consumer, said conveying elements having a common inflow chamber for the pressurized liquid to be distributed to the consumers.

The purpose of such a gearwheel type distributor pump is to distribute pressurized liquid, supplied by a pre-connected pump, in a predetermined ratio among the various consumers. The distributor pump is not to receive any power from the outside, but is driven by the pressurized liquid supplied by the pre-connected pump.

In such gearwheel type distributor pumps, however, it has been found that when pressurized liquid is supplied during stillstand of the distributor pump comparatively large clamping and frictional forces may occur, which make it difficult or even impossible to start the distributor pump.

It is the aim of this invention to ensure starting of a gearwheel type distributor pump of the hereinbefore described kind, and the invention is that the said pump is provided with a starting device operated by the supplied pressurized liquid.

An embodiment of a gearwheel type distributor pump according to the invention is shown by way of example in the drawing, wherein

FIG. 1 shows a gearwheel type distributor pump partly in side elevation and partly in section,

FIG. 2 shows a section on the line II—II in FIG. 1,

FIG. 3 shows a partial section on the line III—III in FIG. 2,

FIG. 4 shows the same section as FIG. 2, but with altered position of the starting device,

FIG. 5 shows a section on the line V—V in FIG. 1, and FIG. 6 shows a section on the line VI—VI in FIG. 1.

The gearwheel type distributor pump shown is similar to the multiple gearwheel pump disclosed in copending application Serial No. 540,882. It has a number of conveying elements 1 arranged axially in a row, each having a central gearwheel 2, and two further gearwheels 3 in engagement with said central gearwheel. Between the gearwheels 2, 3 of the individual elements 1, following each other in the axial direction, are bearing discs 4, and at the respective ends of the row of elements is bearing disc 5 and 6. The gearwheels 2, 3 lie in bores of intermediate discs 7, by which they are surrounded with only a slight clearance and are provided with journals 8 and 8' supported in corresponding bores of the bearing discs 4, 5, 6. The bearing discs 4, 5, 6, the intermediate discs 7 and a front disc 9 form the housing of the distributor pump and are held together by four screws 10 passing through in the axial direction. The other front discs 9' is secured to the bearing disc 8 by means of six screws 10'.

The middle gearwheels 2 with their journals 8 are arranged in axial alignment and have central bores and in these bores are provided with splines 11. A common shaft 12, passing through all the gearwheels 2, has splines corresponding to and engaging the splines 11 of the gearwheels 2. The gearwheels 2 are thus connected together by the shaft in a manner fast for rotation.

Two channels 13 passing through the bearing discs 4, 6 and the intermediate discs 7 in the axial direction form each a common inflow chamber for all the conveying elements 1 for the pressurized liquid to be distributed among the consumers. Recesses 14 (FIG. 5) in the intermediate discs 7 establish communication between the channels 13 and the inflow side of the conveying elements 1. In operation, the gearwheels rotate in the direction of the arrows in FIG. 5.

Grooves 15, machined in the intermediate discs 7, form the discharge chambers for the conveying elements. Two streams of liquid discharge from each conveying element 1 and are led through channels 16, provided in the bearing discs 4, to the consumer places, not shown, for example to the pressurized liquid pads of a hydrostatic bearing.

The shaft 12 is not provided with any drive from the outside, but it serves merely for the rotationally fast connection of the gearwheels 2. The latter are driven by the pressurized liquid supplied through the channels 13. Back-pressure difference between the individual consumers then implies an equalization of performance between the individual conveying elements through the shaft 12.

To ensure starting of the distributor pump on supply of pressurized liquid, a starting device is now arranged in a bore 17 of the bearing disc 6. This starting device has a driver 18 mounted co-axially with the gearwheels 2 connected together rotationally fast. This driver 18 is connected to the shaft 12 and hence also to the gearwheels 2 by a freewheel coupling 19 of known type, shown diagrammatically in FIGS. 2 and 4. The driver 18 is rotatable between two limit positions shown in FIGS. 2 and 4. It has a substantially cylindrical part 18' and two vanes 18", diametrically opposite one another. In the bore 17 are mounted two radially extending fixed partitions 20, reaching from the outside to the cylindrical part 18' of the driver 18 and there forming a seal, each of which partitions, together with a vane 18" of the driver 18, confines in the bore 17 a space 21 in the peripheral direction. Springs 22 urge the driver 18 to the limit position shown in FIG. 2.

The pressurized liquid, delivered by a pre-connected pump, not shown, and to be distributed, is supplied to the gearwheel distributor pump through a central opening 23 of the front disc 9', and enters a channel 24 (FIG. 6), extending transversely of the axis, and communicating through openings 25 with the space 21 (FIGS. 2 and 4).

As long as no pressurized liquid is supplied through the opening 23 to the gearwheel type distributor pump, the driver 18 will be held in the limit position shown in FIG. 2 by the springs 22 acting against the operational direction of rotation of the gearwheels 2. The channels 13 passing axially through the bearing discs 4, 6 and the intermediate discs 7 are then covered by the vanes 18" of the driver 18. If the pre-connected pump is set in operation, and at the same time the pressurized liquid to be distributed is pumped to the spaces 21, this liquid is unable at first to enter the channels 13. The vanes 18" of the driver 18, however, are now acted on by the pressurized liquid in the operational direction of rotation of the gearwheels 2, and the driver 18 rotates in the clockwise direction as soon as the pressure of the liquid has overcome the counteracting forces of the springs 22. The freewheel coupling then engages and drives the shaft 12. The driver 18 finally reaches the angular position shown in FIG. 4, in which the channels 13 are fully uncovered by the vanes 18", so that the pressurized liquid can pass unimpeded to the conveying elements 1. The starting device with the driver 18 is thus connected in front of the inflow chamber of the conveying elements 1, which chamber is formed by the channels 13, such that said starting

device prevents entry of the pressurized liquid into said inflow chamber until the gearwheels **2**, **3** of the pumping elements **1** have made a rotary movement.

After starting, the gearwheels **2**, **3** are rotated further by the supplied pressurized liquid itself, corresponding to the quantity of liquid passing through. The freewheel coupling **19** permits this rotation, even when the driver **18** is held fast in its limit position shown in FIG. 4.

To obviate unilateral axial pressure of the liquid on the vanes **18''** of the driver **18**, said vanes are provided with axial throughgoing bores **26** (FIGS. 2, 3, 4), which establish pressure equalization.

What is claimed is:

1. In combination a gearwheel type distributor pump comprising at least two conveying elements for the distribution of supplied pressurized liquid to a number of liquid consumers, each conveying element consisting of at least two gearwheels arranged to engage one another; housing means for rotatably supporting and for enclosing said gearwheels; said housing means defining a common inflow chamber for the pressurized liquid being supplied to said conveying elements and individual discharge channels for the delivery of the liquid to said consumers; means for rotatationally fast interconnecting a group of said gearwheels comprising one gearwheel of each conveying element; and an automatic starting device connected to said group of gearwheels and designed to be actuated by the pressurized liquid to be supplied to said inflow chamber so as to rotate said group of gearwheels in their operational direction of rotation.

2. The combination defined in claim **1** in which said starting device comprises a closure means arranged in front of said common inlet chamber of the conveying elements and constructed in such a manner that it prevents the pressurized liquid being supplied from entering into said inflow chamber until the conveying elements have been started.

3. The combination defined in claim **1** in which said starting device comprises a driver mounted coaxially with said group of gear wheels so as to be rotatable between two limit positions; a freewheel coupling for the connection of said driver with said group of gearwheels to rotate them in their operational direction of rotation; means for causing the pressurized liquid being supplied to drivingly act upon said driver in said operational direction of rotation to rotate it toward one of said limit positions; and spring means counteracting said action of the pressurized liquid upon said driver to hold it in the other limit position in the absence of pressurized liquid supply.

4. The combination defined in claim **3** in which the driver is constructed as a closure member in such a manner that in the limit position reached under spring action, it prevents entry of the pressurized liquid into the inflow chamber, and in the limit position reached against spring action, it releases fully the entry of the pressurized liquid into the inflow chamber.

References Cited

UNITED STATES PATENTS

2,243,978	6/1941	Reader	103—49
2,386,219	10/1945	Lauck	103—126
2,862,449	12/1958	Wyland	103—49
3,326,136	6/1967	Behm et al.	103—49

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