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Fig. 1

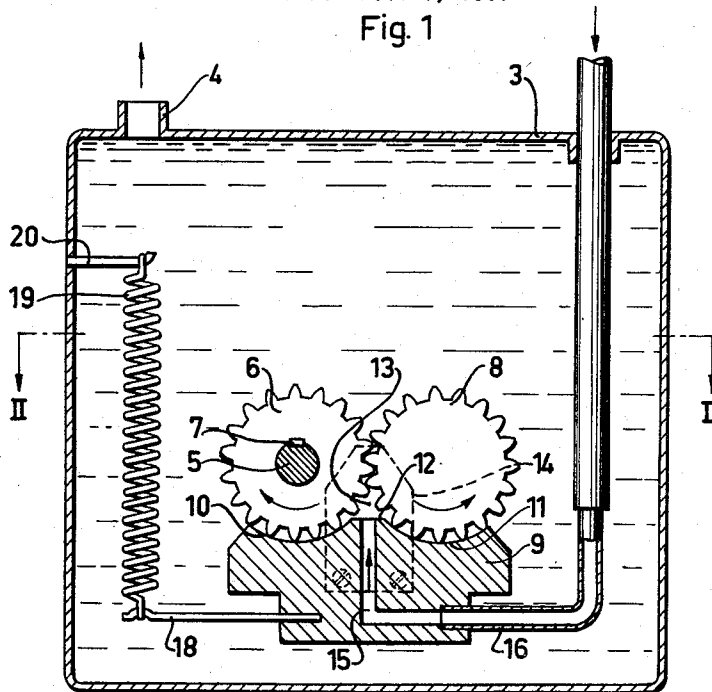
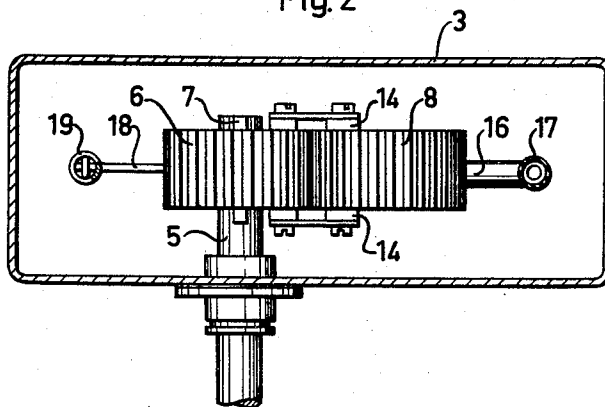


Fig. 2



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2 Claims. (Cl. 103-126)

The invention relates to gear pumps useful for pumping gases, liquids and suspensions of any kind but particularly adapted for continuous supply of predetermined minor amounts of gases or liquids to a medium or to various indicating or regulating apparatuses.

A gear pump suitable for such purposes comprises two cooperating gear wheels and a block mounted on the suction side of the pump in radial engagement with both wheels by means of surfaces which are curved in conformity to the peripheries of the wheels and extend along arcs, each corresponding to at least one pitch. Flexible flaps are fixed to the block to extend along both sides of the wheels beyond the point of engagement between the teeth, thereby closing the ends of a space formed between the block and the wheels. Further, an inlet to the space is provided through the block. Such a pump which must be immersed in a liquid to operate satisfactorily, has in comparison with conventional gear pumps the advantage that the wear is reduced or will be of minor influence upon the capacity of the pump. The problems of wear are especially of great importance when pumping water or aqueous solutions of chemicals.

The invention has now for its object further to improve the gear pump indicated above in such a way that a possible wear will under no circumstances have any influence upon the capacity of the pump. Another object is to provide a gear pump particularly useful for measuring instruments, where, of course, a high degree of accuracy is desired. For these purposes the pump according to the invention has one of its gear wheels mounted on a driving shaft as is usually the case, while the other gear wheel is loosely put in place, where it is retained substantially by means of the difference in pressure between the suction side and the pressure side of the pump as well as by forces generated during the rotation.

Though not absolutely necessary within the idea of the invention, it is, however, to prefer to shape or arrange the block in such a way that the loose wheel is supported in about correct position when the pump does not operate, whereby the pump will always be ready to start without any preparatory measures. This may be achieved by providing the block with a supporting surface positioned vertically below the centre of gravity of the loose wheel. Thus, according to an embodiment more closely described hereinafter, the axes of the gear wheels are located in about the same horizontal plane and the block is resiliently supported to engage the wheels from below.

In the drawings:

Figure 1 shows a vertical section through an embodiment of the pump according to the invention immersed in a vessel.

Figure 2 shows the pump as seen from above.

3 designates a vessel provided with an outlet pipe 4 at its top and intended to be wholly or partly filled with a liquid. A horizontal shaft 5 coupled to a driving motor, not shown, is by means of a packing box introduced through one wall of the vessel. The shaft end extending

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within the vessel carries a gear wheel 6 connected to the shaft by means of a key-groove connection 7 in such a way that it is free to move in axial direction.

A gear wheel 8 cooperating with the gear wheel 6 is loosely put in place and supported by a block 9 suspended in a device described below. The block has two surfaces 10, 11 curved in conformity to the peripheries of the gear wheels and separated from each other by an intermediate, plane surface portion 12 which is substantially parallel to a plane through the axes of the two wheels. As already mentioned, the two curved surfaces 10, 11 must extend along arcs each corresponding to at least one pitch, but at least the surface 11 engaging the free gear wheel 8 should preferably be dimensioned to retain said gear wheel 8 in its place when the pump is not in operation. For that purpose the surface 11 must obviously extend beyond a vertical plane through the axis of the wheel 8.

The block 9 has exactly the same width as the gear wheels. A space 13 formed between them and the plane surface 12 of the block is closed at both ends by means of flaps 14 secured to the sides of the block and extending upwards somewhat beyond an imaginary line connecting the centres of the two wheels. The flaps 14 are made of a flexible, elastic material, for instance rubber, to enable them to tightly engage the side surfaces of the wheels.

The block 9 contains a throughgoing channel 15 opening into said space 13. The inlet end of the channel is connected to a tube 16 projecting in the longitudinal direction of the block. The other end of said tube is bent upwards at right angles and connected to a flexible hose 17 adapted to supply a gas from a source. The hose is introduced through and secured to the upper wall of the vessel and depends vertically therefrom to support the connected end of the block. A rod 18 projects from the opposite end of the block and has its outer end connected to a weak helical spring 19 which depends from a bracket 20 mounted higher up at the inner side of the vessel. Thus, the block is suspended in its place exclusively by means of the hose 17 and the spring 19 and is thereby kept resiliently pressed against the gear wheel 6 mounted on the shaft 5. As appears from Figure 2, the tube 16 and the rod 18 are preferably directed along the central line of the block, thus effecting a balanced suspension. Of course, both ends of the block may be suspended in springs, or pressure springs resting on the bottom of the vessel may be provided to support the block. In both cases the hose may depend in a loose coil.

When the driving motor is started so that the gear wheels are caused to rotate in the directions indicated by arrows in Figure 1, the driving gear wheel 6 presses the loose gear wheel 8 downwards against the supporting block surface 11. When engaging said surface the wheel 8 strives to displace the block to the right in Figure 1, but as the driven gear wheel 6 subjects the block to an equally great force in opposite direction the block remains stationary and, instead, the free wheel will get a tendency to perform a rolling movement in direction to the left in Figure 1. Evidently, the resultant of the two forces acting on the wheel 8 will be directed along a line extending through the centre of said wheel obliquely downwards to the left in Figure 1.

As soon as the rotation has been started a difference in pressure will arise between the space 13 formed at the suction side of the pump and the surrounding vessel 3, whereby the flexible side flaps 14 are pressed against the side surfaces of the wheels to effect a perfect sealing. The flaps also contribute in guiding the free gear wheel 8 laterally. Although not shown in the drawing, either the suction conduit 15, 16, 17 or the outlet 4 of the vessel may contain a restricted passage to provide a greater difference in pressure between the suction side and the

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pressure side of the pump. Thus, a restricted passage in the suction conduit causes a lower pressure in the space 13, while a restricted passage in the outlet 4 causes an overpressure in vessel 3. Of course, such an increased difference in pressure provides for a more effective leak-proof seal between the flaps and the end surfaces of the wheels, and besides it also causes the free wheel 8 to be pressed against the driving wheel 6 and the supporting surface 11 of the block by a force acting substantially in the same direction as the above-mentioned resultant force. As the wheel 8 is not subjected to any forces of an opposite direction, it remains in its place during the rotation without any tendency of displacement. The pressure of the wheel 8 against the coacting pump elements will be insignificant, which contributes to reduced wear. Above all, however, the effect is obtained that a possible wear of the teeth of any of the wheels does not cause an increased clearance that would change the capacity of the pump. The free wheel adjusts its position automatically in relation to the driving wheel.

It is suitable to make the block of a material somewhat softer than that of the wheels, whereby most of the wear will occur on the arcuate contact surfaces of the block. Such a wear has no great importance, as the block is always kept resiliently pressed against the teeth of the wheels.

As mentioned above, the wheel 6 mounted on the driving shaft 5 is movable in axial direction. Thus, the construction will be resilient in all directions without any forced guidance of any of the coacting parts in relation to the other ones, and therefore the whole pump can of its own accord adjust itself in the desired operative position.

What I claim is:

1. A gear pump comprising two enmeshed gear wheels having their axes located in approximately the same horizontal plane, a block resiliently supported in engagement only with the lower peripheral portions of both wheels, said block having two spaced surfaces each curved in conformity with the peripheries of one of the wheels and each extending along an arc corresponding to at least one pitch, said block having a width substantially equal to the axial dimension of said wheels, said block and the peripheries of said gear wheels defining a space, flexible flaps projecting from the block along both sides of the wheels beyond the point of engagement between the teeth and closing the ends of said space formed between the block and the wheels, said block having at least one inlet to said space through the block, the wheel to be driven being floatingly placed on the respective curved surface on the block, a shaft in driving connection with the other of said wheels and rotatable to rotate said other wheel in a direction for causing a reduced pressure to be created within

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said space relative to the pressure of the medium surrounding said gear pump, whereby the floating wheel is retained in engagement with the curved space of said block as well as with said other wheel by the difference in pressure prevailing between the inlet and the outlet sides of the pump.

2. A gear pump comprising two enmeshed gear wheels having their axes located in approximately the same horizontal plane, a block suspended for resilient movement in all directions and engaging only the lower peripheral portions of both wheels, said block having two spaced surfaces each curved in conformity with the peripheries of the wheels, each of said surfaces extending along an arc corresponding to at least one pitch and occupying only a fraction of the wheel periphery, said block having a width substantially equal to the axial dimension of said wheels, said block and the peripheries of said gear wheels defining a space, flexible flaps projecting from the block along both sides of the wheels beyond the point of engagement between the teeth and closing the ends of said space formed between the block and the wheels, said block having at least one inlet to this space through the block, a shaft in driving connection with one of the wheels and adapted to be rotated so that the parts of the peripheries of said gear wheels move along said block away from said said space to cause a reduced pressure in said space relative to the pressure of the medium around said gear pump, said shaft connected wheel being mounted on said shaft for movement in the axial direction of the shaft, the other wheel being floatingly mounted on its curved block surface where it is retained by the difference in pressure prevailing between the inlet and outlet sides of said pump.

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