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(54) **Hydraulically-driven oscillating mechanism, particularly for a fire-fighting monitor.**

(57) In a mechanism to provide automatic traverse oscillation for a fire-fighting monitor 1 water is tapped off from the main supply pipe 9 which feeds the monitor and passed to a Pelton-wheel turbine 14. The runner of the turbine is connected *via* a gearbox 17 to a drive wheel 18, to which a crank arm 19 is pinned. The other end of the crank arm 19 is linked to a shaft 21, so that as the wheel 18 is driven to rotate by the turbine the shaft 21 is caused to oscillate. The shaft 21 is engageable through a concentric clutch assembly 22 with a drive gear 23/28 in mesh with a ring gear 24 keyed to the hollow axle 6 by which the monitor head 2 is both supported and fed with water from pipe 9. When the clutch 22 is engaged, therefore, the monitor head 2 is automatically oscillated to traverse its jet through a predetermined arc. The clutch 22 can be disengaged manually by lifting the cover 33 on the top of the assembly, thereby to interrupt the drive from the shaft 21 to the gear 23/28 *via* an associated socket member 25. The head 2 can then be rotated by hand to a new position and the clutch re-engaged so that the head now oscillates in a new sector of the horizon. Likewise the clutch can be disengaged to permit manual override of the oscillating mechanism at any time.

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Fig.1.

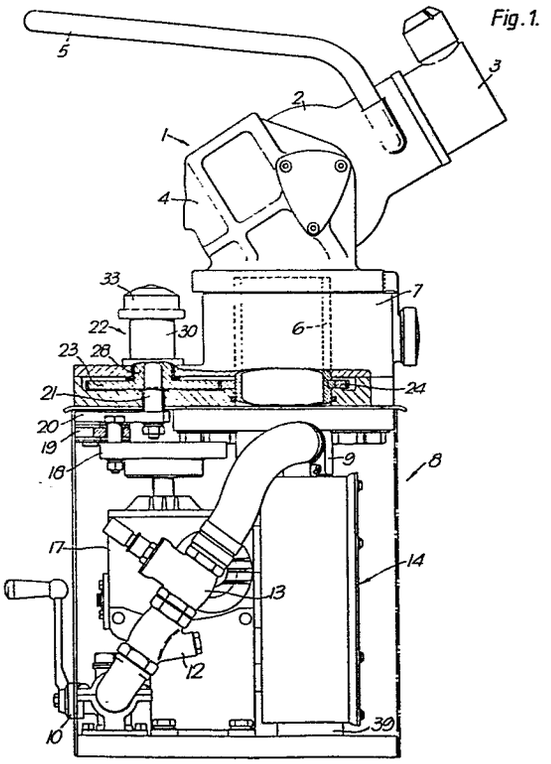
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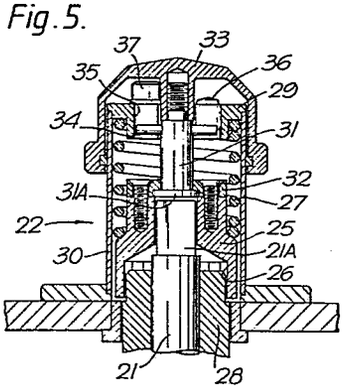
Fig.5.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Hydraulically-driven oscillating mechanism, particularly for a fire-fighting monitor

The present invention relates to an hydraulically-driven oscillating mechanism and particularly, though not exclusively, is concerned with a mechanism for traversing from side-to-side in an oscillatory angular manner the nozzle of a fire-fighting monitor or the like liquid-projecting device. It is known to provide fire-fighting monitors with mechanisms of this kind so that the monitor can be set up with its nozzle automatically swinging through a predermined arc to play a jet of water or foam from side-to-side over a desired target area. One such mechanism comprises a Pelton-wheel driven by water taken from the main supply to the monitor, the wheel being connected through a speed-reducing gearbox to a crank which is linked at its other end to the structure bearing the monitor nozzle, so that the rotation of the Pelton wheel is transmitted by the crank into oscillatory angular motion of the nozzle.

In one aspect the present invention seeks to provide an hydraulically-driven mechanism for producing oscillatory angular motion of a monitor nozzle or other device and which in a preferred embodiment may employ a primary

transmission similar to that described above, but furthermore where the sector of the horizon (or other plane in which the angular motion is produced) in which the device operates can be readily adjusted without altering the spatial disposition of the mechanism as a whole.

Accordingly in this aspect the invention resides in a mechanism comprising an hydraulically-driven motor and a mechanical transmission for connecting the motor to a driving member whereby operation of the motor produces oscillatory angular motion of said driving member, which is characterised by clutch means through which such oscillatory angular motion of the driving member is transferred to a driven member, the clutch means being selectively operable to disengage the driven member from the driving member to permit rotation of the driven member independently of the driving member, and adapted to permit re-engagement of the driven member with the driving member in different relative angular positions thereof.

In use of a mechanism according to the invention the driven member can be connected e.g to the nozzle of a fire-fighting monitor to oscillate that nozzle from side-to-side through a predetermined arc and thereby play fire extinguishant over a corresponding area. If it is then desired to change the direction of the nozzle to cover an area not within its existing arc the clutch means can be operated to disengage the drive from the motor to the nozzle and permit the nozzle and said driven member to be rotated into a new position, whereupon re-engaging the drive will recommence ocillation of the nozzle through a new arc angularly displaced from the previous arc.

In a preferred arrangement the clutch means comprises a polygonal socket member and a polygonal spigot member, one such member comprising or being in driving connection with said driving member and the other comprising or being in driving connection with said driven member, these members normally being biased into engagement to permit angular drive transmission from one to the other but being selectively disengageable to permit relative rotation between them. With this arrangement the two clutch members can be engaged in a plurality of discrete relative angular positions determined by the faces of the polygonal spigot and socket, so as to set the driven member to oscillate the nozzle or other device in a corresponding number of angularly displaced sectors.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation, partly in section, of a mechanism according to the invention set up to oscillate the nozzle of a fire-fighting monitor;

Figure 2 is a rear elevation, partly in section, of the mechanism of Figure 1;

Figure 3 is a front elevation, with some parts broken away, of the mechanism of Figure 1;

Figure 4 is a plan view, with certain parts removed, of the mechanism of Figure 1;

Figure 5 is a vertical section through the clutch employed in the mechanism of Figures 1 to 4; and

Figure 6 is a plan view, with the cover removed, of the clutch of Figure 5.

Referring to Figure 1, there is shown a fire-fighting monitor 1 which in the illustrated embodiment is of the spherical head type and which in particular may be constructed as described in our published United Kingdom patent application No 2071527A. Briefly, this monitor comprises a head 2 which carries a nozzle via an outlet fitting 3 and which is borne in a housing 4 for pivotal movement about a horizontal axis so as to adjust the angular elevation or depression of the nozzle. In the illustrated embodiment this adjustment is efected manually for which purpose a handle-bar 5 is provided. The assembly of the head 2 and housing 4 is also rotatable as a whole about a vertical axis so as to permit the nozzle to be traversed angularly from side-to-side, to this end the assembly being fast on the upper end of a hollow vertical axle 6 which is borne rotatably in a fixed body 7 and which also serves to lead water to the head 2 in use of the monitor. Associated with the monitor is a mechanism 8 (Figures 1 to 4) which is arranged automatically to oscillate the axle 6 through a predetermined angle (and with it the head 2 and the nozzle carried thereby), so as to play repeatedly from side-to-side the jet of water or foam which is discharged by the monitor. This mechanism will now be described.

Beneath the monitor is a main water supply pipe 9, fed from below and arranged to deliver water into the rotatable axle 6. A branch flow is also taken from this pipe and delivered via a shut-off valve 10, non-return valve 11, filter 12 and throttle valve 13 to a Pelton-wheel motor (turbine) 14, of which the jet nozzle 15 and

runner 16 are seen in Figure 3. The Pelton-wheel is driven to rotate at high speed by the supplied water, and its rotation is transmitted by a speed-reducing gearbox 17 to a drive wheel 18. As most clearly seen in Figure 4 a crank arm 19 is pinned eccentrically to the wheel 18 and the arm 19 is pinned at its other end to a shorter drive arm 20 fast with a shaft 21. The shaft 21 constitutes the input member of a clutch 22 mounted behind the monitor 1 and, as will be seen, its axis is parallel to that of the axle 6. It will also be appreciated that the effect of the linkage between the wheel 18 and the shaft 21 is to impart to the shaft an oscillatory angular motion as the wheel 18 rotates, the amplitude of which is determined by the throw of the arm 19 and the effective length of the arm 20. In normal operation the oscillatory motion of the shaft 21 is transmitted through the clutch to a drive gear 23 coaxial with the shaft (but not keyed or otherwise secured in driving relationship to the shaft except through the clutch parts as described below), and this gear is in mesh with a ring gear 24 keyed to the axle 6 so that as the gear 23 oscillates so also does the axle 6.

Referring now particularly to Figure 5, the upper end 21A of the shaft 21 is of square cross-section and engages in a complementary hole in a member 25 which also defines a downwardly-facing polygonal (eg hexagonal) socket 26. Normally this socket member is biased downwardly by a spring 27 so as to engage over a complementary spigot 28 integral with the drive gear 23, and in this condition the member 25 serves to transmit the oscillatory motion of the shaft 21 to the gear 23. The biasing spring 27 for the socket member 25 is, as shown, compressed between the member 25 and a ring

member 29 held in the end of a fixed cylindrical casing 30. The socket member 25 can, however, be slid upwardly on the square end of the shaft 21 so as to disengage from the spigot 28. To this end there is provided a stem 31 which is located relative to the socket member 25 by means of a ring 32 screwed to the top of the socket member and engaging over a flange 31A at the lower end of the stem, so as to permit relative rotary movement between the member 25 and stem 31. At its upper end the stem 31 is secured to a cover 33 in the form of a control knob and which is axially and rotatably slidable on the casing 30. By lifting the cover 33 by hand, therefore, the stem 31 lifts the socket member 25 out of engagement with the spigot 28 and the oscillatory drive from the shaft 21 to the axle 6 is thereby interrupted.

The stem 31 also carries a cross-pin 34 which, when the clutch is engaged, lies within a complementary slot 35 in the member 29 (ie as shown in full line in Figure 6). By means of the relative rotational connection between the socket member 25 and the stem 31 the stem is permitted to remain stationary in this position even though the socket member, which is at all times in driven engagement with the shaft 21, continually oscillates. In this way, the oscillation of the socket member is not transmitted to the cover 33 which is therefore safe to manipulate to disengage the clutch without having to shut down the Pelton-wheel 14.

When the cover 33 is lifted to disengage the clutch it can be retained in the disengaged condition by turning the cover anticlockwise (as viewed in Figure 6) to rest the pin 34 on the upper surface of the member 29 between the heads of two screws 36 and 37 (ie as shown in broken

line in Figure 6). The screw 36 has a round head to assist in moving the pin 34 over it when the cover is turned manually, but will resist clockwise displacement of the pin from its 'parked' condition when the cover is released. The screw 37 has a cylindrical head to resist anticlockwise displacement of the pin 34 from its "parked" condition and to provide that the cover 33 can only be turned in a single sense when engaging or disengaging the clutch.

While the socket member 25 remains disengaged from the spigot 28 by operation of the clutch as described above, the gear 23 can be rotated relative to, and independently of, the shaft 21 and the rest of the preceding transmission. When, therefore, the apparatus has been set up to oscillate the monitor nozzle through a certain horizontal sector and it is subsequently desired to change the sector within which the nozzle operates it is not necessary to shift the entire apparatus to point the nozzle in the appropriate new direction; rather the clutch 22 is operated to disengage the drive from the shaft 21 to the gear 23, and the monitor head 2 and casing 3 can then be pivoted by manipulation of the handle-bar 5 to place the nozzle into the new sector in which it is desired to operate, in so doing the gear 23 being rotated by the gear 24 fast with the axle 6 into a new direction; rather the clutch 22 is operated to angular position relative to the shaft 21. Re-engaging the clutch thereafter re-establishes the drive between the shaft 21 and gear 23, so that the nozzle is driven to oscillate through the same angle as before, but in a sector angularly displaced from that previously.

With polygonal spigot and socket clutch parts as described above, the nozzle can be made to operate in any one of a number of discrete sectors of the horizon, the number of sectors being determined by the number of possible relative angular positions of engagement between the spigot 28 and socket 25, or in other words between the gear 23 and shaft 21. It will also be appreciated that the clutch 22 can be operated to disengage the gear 23 from the shaft 21 whenever it is desired to override or shut down the automatic oscillating mechanism and traverse the monitor nozzle manually or by some alternative control system.

The amplitude of the automatic oscillation of the nozzle is open to variation as well as its sectoral disposition. Thus the drive wheel 18 is provided with a plurality of holes 38 (in the illustrated embodiment, five) as seen in Figure 4, to receive the pinned connection of the crank arm 19. These holes are at different radii from the axis of rotation of wheel 18 so that variation in the throw of the arm 19, and thereby in the amplitude of oscillation, can be achieved by disconnecting the arm from one hole 38 and reconnecting it to another. In one particular arrangement constructed in accordance with the Figures a range of from 60^{o} to 100^{o} of arc in 10^{o} increments is provided for the nozzle oscillation by this means.

The frequency of oscillation of the nozzle can also be varied by variation of the speed of the Pelton-wheel, and this is achieved by controlling the water pressure to the Pelton-wheel by means of the throttle valve 13. In one embodiment arranged to work with a maximum flow through the pipe 9 of 2275 litres/minute at a maximum pressure of 20.5 bar, the pressure of water tapped off

to the Pelton-wheel is controlled between 3.5 and 14 bar to give an oscillatory frequency range of from 3 to 15 cycles per minute. The water supplied to the wheel drains from the motor through an outlet 39 (Figure 1). However, the maximum water consumption of the motor is only in the region of 55 litres/minute which is a negligible proportion of the total flow to the monitor.

A further inlet to the Pelton-wheel water circuit is provided by a T-piece 40 located between the non-return valve 11 and filter 12. This inlet is normally blanked off but can be connected to a suitable water supply when it is desired to test the Pelton-wheel and the rest of the oscillatory mechanism without having to discharge water from the monitor itself, ie without having to supply the pipe 9.

CLAIMS

1. A mechanism comprising an hydraulically-driven motor (14) and a mechanical transmission (18,19,20) for connecting the motor (14) to a driving member (21) whereby operation of the motor (14) produces oscillatory angular motion of said driving member (21); characterised by clutch means (22) through which such oscillatory angular motion of the driving member (21) is transferred to a driven member (23), the clutch means (22) being selectively operable to disengage the driven member (23) from the driving member (21) to permit rotation of the driven member (23) independently of the driving member (21), and being adapted to permit re-engagement of the driven member (23) with the driving member (21) in different relative angular positions thereof.

2. A mechanism according to claim 1 characterised in that the clutch means (22) comprises a polygonal socket member (25) and a polygonal spigot member (28), one such member (25) comprising or being in driving connection with said driving member (21) and the other (28) comprising or being in driving connection with said driven member (23), these members (25,28) normally being biased into engagement to permit angular drive transmission from one (25) to the other (28) but being selectively disengageable to permit relative rotation between them (25,28).

3. A mechanism according to claim 1 or claim 2 characterised in that the driven member (23) is borne coaxially with, and circumjacent to, the driving member (21); and wherein the clutch means (22)

includes a socket member (25) in permanent driving connection with, but slidable upon, a portion (21A) of the driving member (21), and means (31,33) for shifting the socket member (25) upon the driving member (21) between positions in which it (25) respectively engages with and disengages from the driven member (23).

4. A mechanism according to claim 3 characterised in that the shifting means comprise a manually operable member(31,33) with which the socket member (25) engages with rotational freedom relative thereto.

5. A mechanism according to claim 3 or claim 4 charactersed by means (34,36,37) for retaining the shifting means (31,33) in a position in which the socket member (25) is disengaged from the driven member (23).

6. A mechanism according to any preceding claim characteised in that the motor (14) comprises a Pelton-wheel (16) and said transmission includes a crank (19,20) linked to the driving member (21) whereby rotation of the Pelton-wheel (16) is transmitted into oscillatory angular motion of the driving member (21).

7. A mechanism according to claim 6 characterised by means (38) for varying the effective throw of the crank (19,20) thereby to vary the amplitude of the motion of the driving member (21).

8. The combination of a fire-fighting or the like monitor (1) with a mechanism (8) in accordance with any preceding claim, where the nozzle (3) of the monitor

(1) is borne by means (6) in driving connection (24) with said driven member (23) thereby to transfer oscillatory angular motion from the driven member (23) to the nozzle (3).

9. A combination according to claim 9 characterised in that in use a portion of a stream of water supplied (9) to the monitor for discharge therefrom is diverted (10) to said motor (14) to drive the same.

Fig. 1.

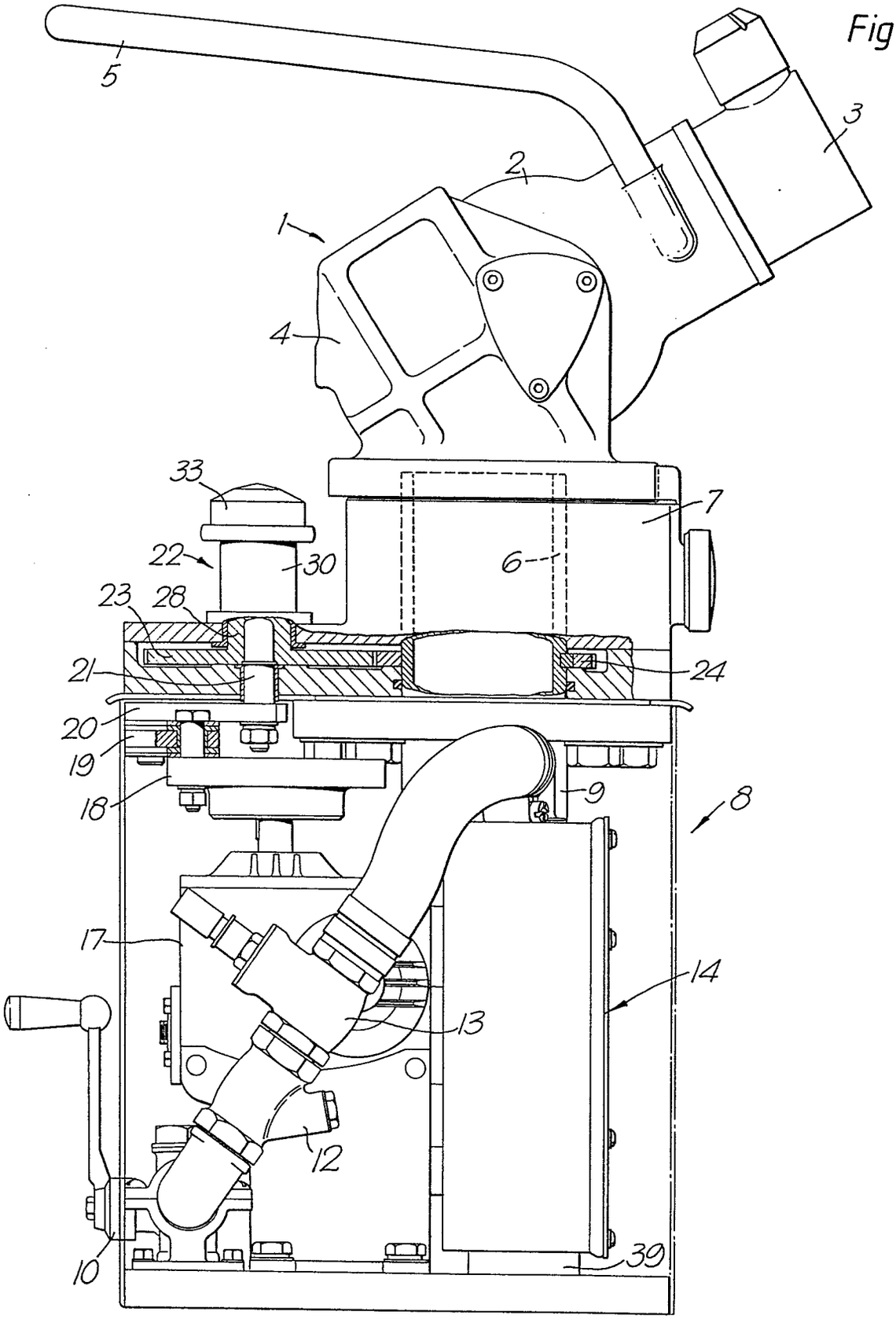
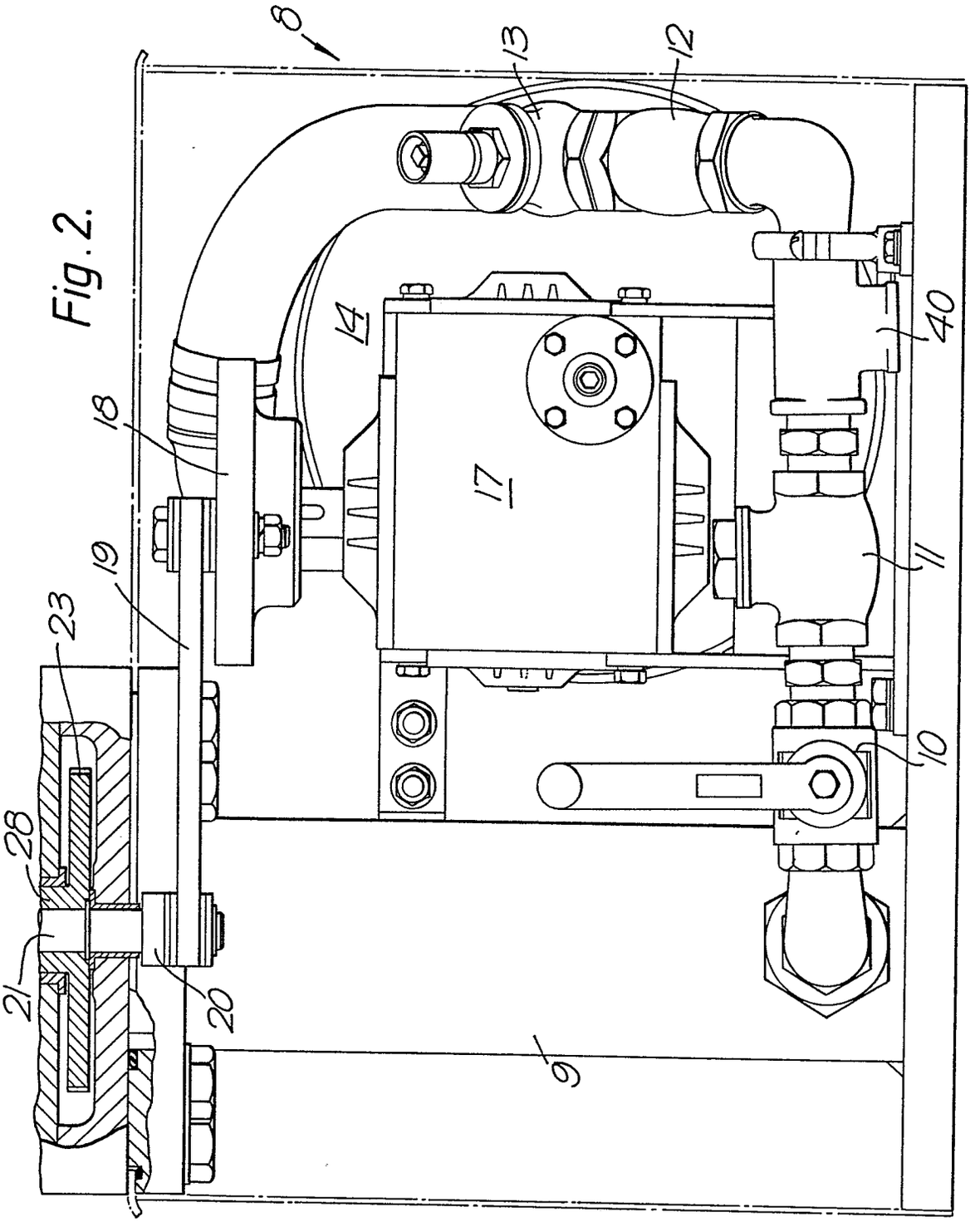


Fig. 2.



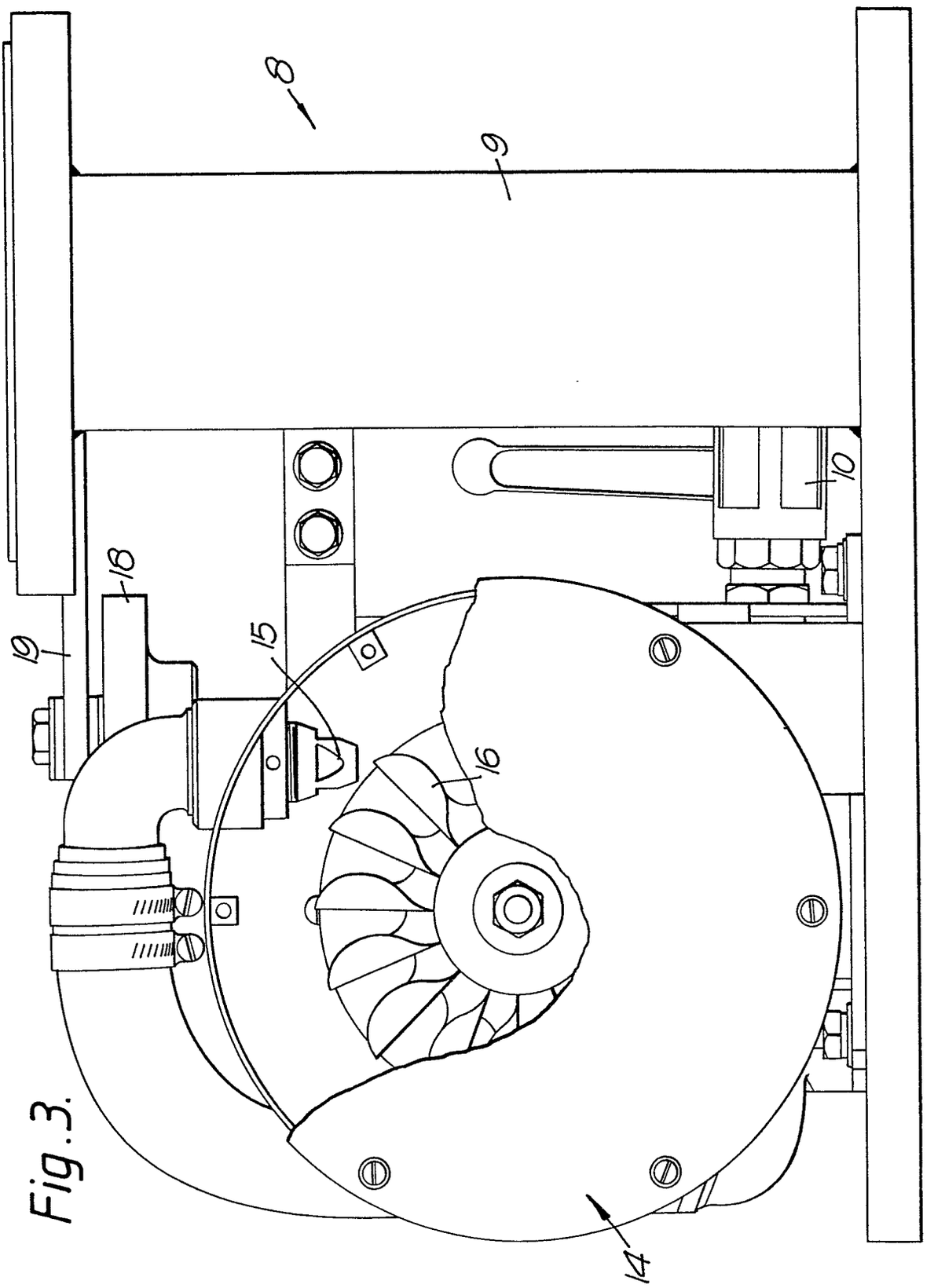


Fig.3.

Fig. 4.

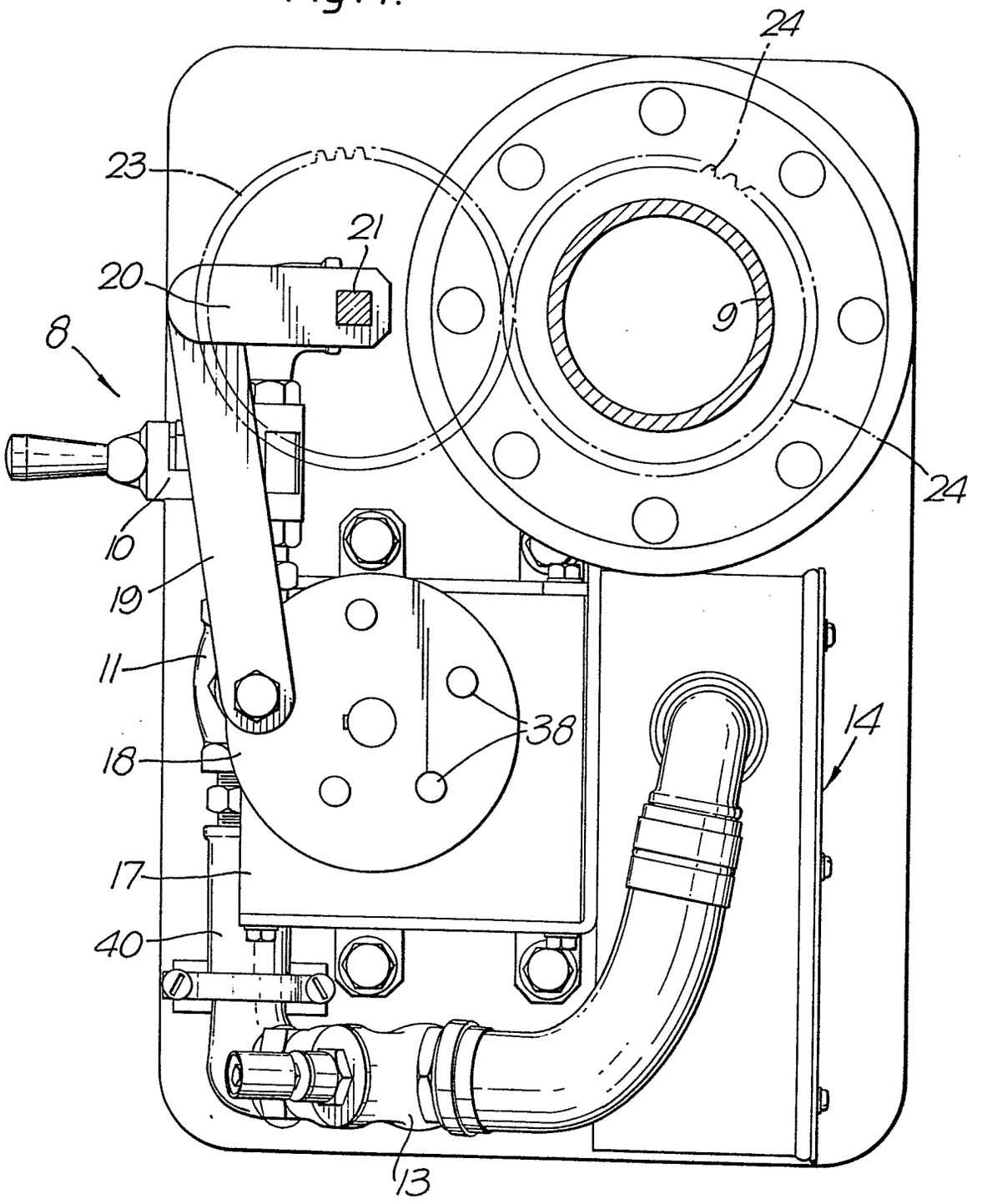


Fig. 5.

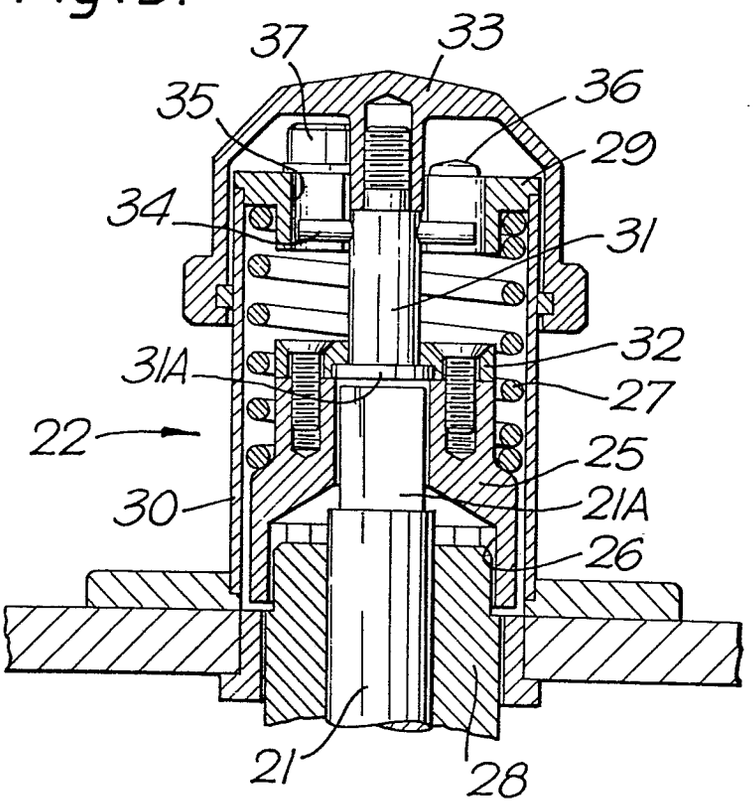

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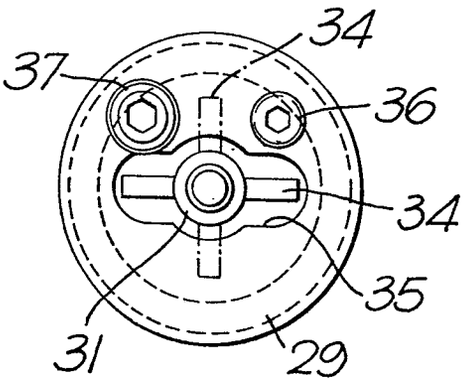
Fig. 6.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