

Feb. 13, 1945.

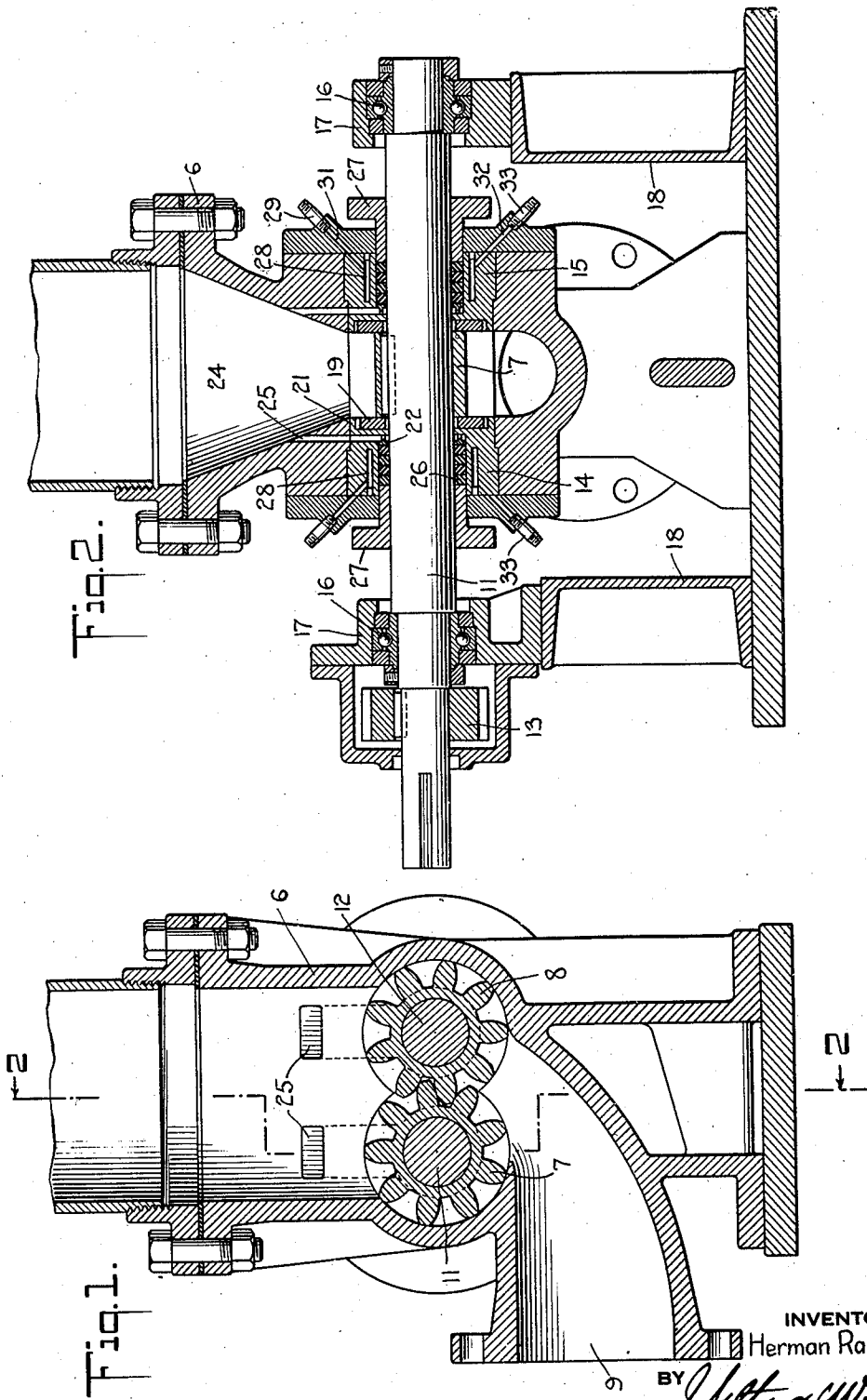
H. RAINALTER

2,369,249

PUMPING DEVICE

Filed Oct. 24, 1939

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INVENTOR

Herman Rainalter

BY

J. Kelly & C. W. Lewis
ATTORNEYS

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Fig. 5.

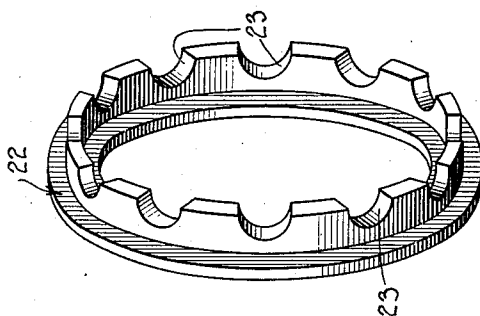


Fig. 4.

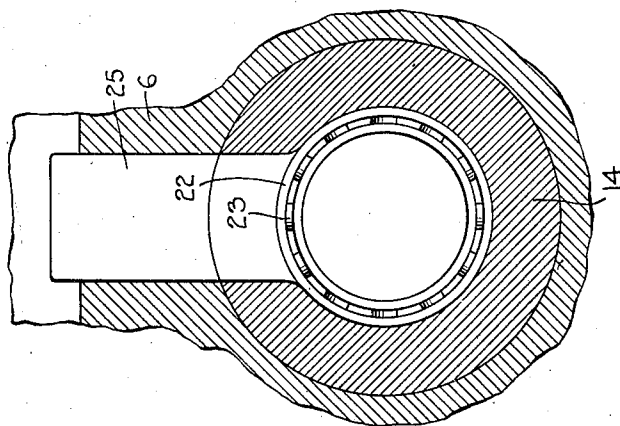
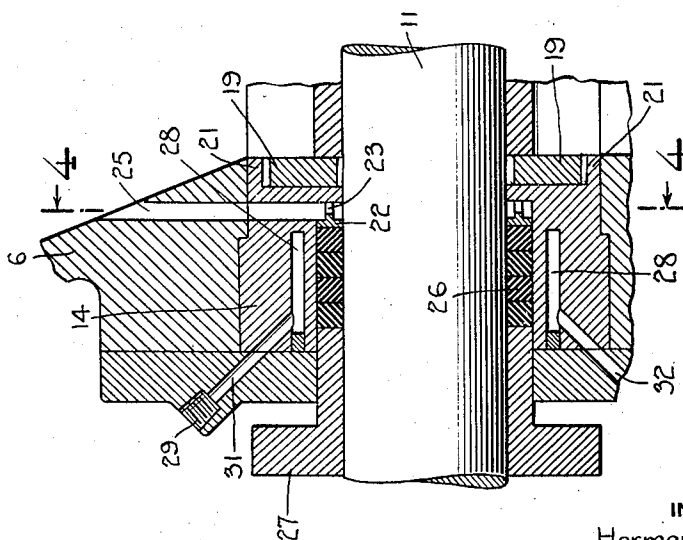


Fig. 3.



INVENTOR

Herman Rainalter

J. H. Kelly & C. W. Levinson
ATTORNEYS

UNITED STATES PATENT OFFICE

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PUMPING DEVICE

Herman Rainalter, Cumberland, Md., assignor to
Celanese Corporation of America, a corporation
of Delaware

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4 Claims. (Cl. 103—126)

This invention relates to fluid pumping devices and relates more particularly to pumping devices of the gear wheel type for delivering artificial silk spinning solutions under pressure without danger of leakage.

In pumping devices of this type, as heretofore commonly constructed, considerable difficulty was experienced due to leakage of solution from the pumping device. This leakage was due to the fact that the large clearance required between the end of the gland box and the shaft permitted the relatively easy entrance of solution to the packing. Moreover, the substantial deflection of the gear wheel shaft under the pressure load made it impossible for the packing to become "set." Under these conditions the spinning solution quickly penetrated the packing and when hardened by heat and pressure made the packings ineffective.

It is an object of this invention to provide a pumping device of the gear wheel type which will be free from the above mentioned and other disadvantages and which will be especially simple in construction and efficient in operation.

Another object of this invention is the provision of a pumping device having an improved arrangement for reducing the pressure on the packing and for substantially preventing leakage of solution to the gland.

Other objects of this invention, together with certain details of construction and combinations of parts, will be described in the specification and pointed out in the claims.

According to this invention a pumping device of the gear wheel type has inserted in the end of the gland box a ring closely fitted to the gear wheel shaft. Shaft deflection is taken care of by providing clearance between the edge of the ring and the seat. Any solution leaking through or around the ring is bled off to the suction side of the pump by means of an annular T-bar having openings therein communicating with a port through the gland box and pump casing, which port leads into the suction side of the pump. The T-bar is firmly fixed in the gland box and does not rotate. By these means the gland pressure is reduced from around 275 pounds per square inch (the pressure in pumps of prior construction) to 25 pounds per square inch when the pump pressure is approximately 400 pounds per square inch without loss in pump capacity. The packings have been found to hold quite well at the reduced pressure.

The accompanying drawings illustrate a preferred embodiment of this invention, it being

understood, however, that it is given merely by way of example and is in no way limitative.

Figure 1 is a vertical sectional view of the pumping device in accordance with this invention,

Figure 2 is also a vertical sectional view of the pumping device, taken on line 2—2 in Fig. 1,

Figure 3 is a detail view, on an enlarged scale, of the arrangement for preventing leakage of solution to the gland,

Figure 4 is also a detail view, taken on line 4—4 in Fig. 3, showing the T-bar in position in the gland box and communicating with the port in the pump casing, and

Figure 5 is an enlarged detail view of the T-bar.

Like reference numerals indicate like parts throughout the several views of the drawings.

Referring to the drawings, reference numeral 6 indicates the casing of a pumping device within which are mounted gear wheels 7 and 8 adapted upon rotation to force spinning solution or other liquid under pressure through the discharge opening 9. The gear wheels 7 and 8 are fixed to shafts 11 and 12, respectively, the shaft 11 being driven by any suitable driving means 13 extraneous to the pumping device. Gear wheel 7 rotates gear wheel 8 and shaft 12 on which the latter is mounted. The driven shaft 11 extends through the pump casing 6, passing through gland boxes 14 and 15, the construction of which will hereinafter be described. The ends of the shaft are carried in roller bearings 16 mounted in bearing housings 17 supported on suitable standards 18.

The arrangement for reducing leakage to and pressure on the glands will now be described, it being understood that this arrangement may be employed on one or all four of the glands of the pumping device. For simplicity, only one of the gland structures will be described and in this connection reference is particularly directed to Figs. 3, 4 and 5. Accordingly, a ring 19 of any suitable metallic material and having a close fit, i. e. a running fit, around shaft 11 is mounted in a seat 21 in the end of the gland box 14. There is a slight clearance between the edge of the ring and the wall of the seat 21 to take care of the deflection of shaft 11 under the pressure obtaining during the operation of the pumping device. Since the fit of the ring 19 around shaft 11 is a close fit and since there is clearance between the edge of the ring and the wall of seat 21, the ring may be considered a "floating" ring. However, there is substantially no rotation of the rings 19 due to the fact that the relatively high

pressure of the solution being pumped causes friction to be set up between the rings and seats 21, thus substantially preventing any relative movement between the rings and seats thereof. Behind seat 21 of the gland box there is fixed against rotation an annular T-bar generally indicated by reference numeral 22 which is provided with openings 23. Any solution or liquid leaking through or around ring 19 passes through the T-bar and is bled off into the suction side of the pump 24 by means of a port 25 extending through the gland box 14 and the pump casing 6. In bleeding off the liquid or solution leaking through the ring 19 by the pressure developed by the gear wheels the pressure on the gland is reduced to 25 pounds per square inch when the pump pressure is approximately 400 pounds per square inch and this is done in the present device without any loss in pump capacity. Behind the T-bar 22 is placed any suitable packing 26, the packing being held in position by means of gland nut 27.

Means are provided for cooling the packings in the glands comprising an annular opening 28 in each of the gland boxes which openings are supplied through nipples 29 connecting with ducts 31 with a cooling medium, said medium being discharged through ducts 32 and nipples 33 for recirculation as desired.

It is to be understood that the foregoing detailed description and drawings are given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a pumping device for delivering artificial silk spinning solutions or other liquids, means for forcing the spinning solution from the discharge opening of said pumping device under pressure including a positively driven gear wheel and an idler gear wheel mounted in the casing of said pumping device, a shaft for rotating said positively driven gear wheel, seats formed in said casing, rings having a close fit about said shaft and having a large diameter substantially equal to the diameter of the gear wheels mounted in said seats, said rings and said seats being so constructed and arranged that there is a slight clearance between the edges of said rings and the walls of said seats to permit of the deflection of said shaft under the pressure obtaining during the operation of said pumping device, gland boxes about said shaft, an annular member having openings therein and surrounding said shaft mounted in each of said gland boxes, and a duct connecting the openings in said annular member with the suction side of the pumping device.

2. In a pumping device for delivering artificial silk spinning solutions or other liquids, means for forcing the spinning solution from the discharge opening of said pumping device under pressure including a positively driven gear wheel and an idler gear wheel mounted in the casing of

said pumping device, a shaft for rotating said positively driven gear wheel, seats formed in said casing, rings having a close fit about said shaft and having a large diameter substantially equal to the diameter of the gear wheels mounted in said seats, said rings and said seats being so constructed and arranged that there is a slight clearance between the edges of said rings and the walls of said seats to permit of the deflection of said shaft under the pressure obtaining during the operation of said pumping device, gland boxes about said shaft, a stationary annular member having openings therein and surrounding said shaft fixed in each of said gland boxes, and a duct connecting the openings in said annular member with the suction side of the pumping device.

3. In a pumping device for delivering artificial silk spinning solutions or other liquids, means for forcing the spinning solution from the discharge opening of said pumping device under pressure including a positively driven gear wheel and an idler gear wheel mounted in the casing of said pumping device, a shaft for rotating said positively driven gear wheel, seats formed in said casing, rings having a close fit about said shaft and having a large diameter substantially equal to the diameter of the gear wheels mounted in said seats, said rings and said seats being so constructed and arranged that there is a slight clearance between the edges of said rings and the walls of said seats to permit of the deflection of said shaft under the pressure obtaining during the operation of said pumping device, gland boxes about said shaft, an annular member having openings therein and surrounding said shaft mounted between each bushing and gland box, and a duct connecting the openings in said annular member with the suction side of the pumping device.

4. In a pumping device for delivering artificial silk spinning solutions or other liquids, means for forcing the spinning solution from the discharge opening of said pumping device under pressure including a positively driven gear wheel and an idler gear wheel mounted in the casing of said pumping device, a shaft for rotating said positively driven gear wheel, seats formed in said casing, metallic rings having a close fit about said shaft and having a large diameter substantially equal to the diameter of the gear wheels mounted in said seats, said rings and said seats being so constructed and arranged that there is a slight clearance between the edges of said rings and the walls of said seats to permit of the deflection of said shaft under the pressure obtaining during the operation of said pumping device, gland boxes about said shaft, a stationary annular member having openings therein and surrounding said shaft fixed in each of said gland boxes, and a duct connecting the openings in said annular member with the suction side of the pumping device.

HERMAN RAINALTER.