

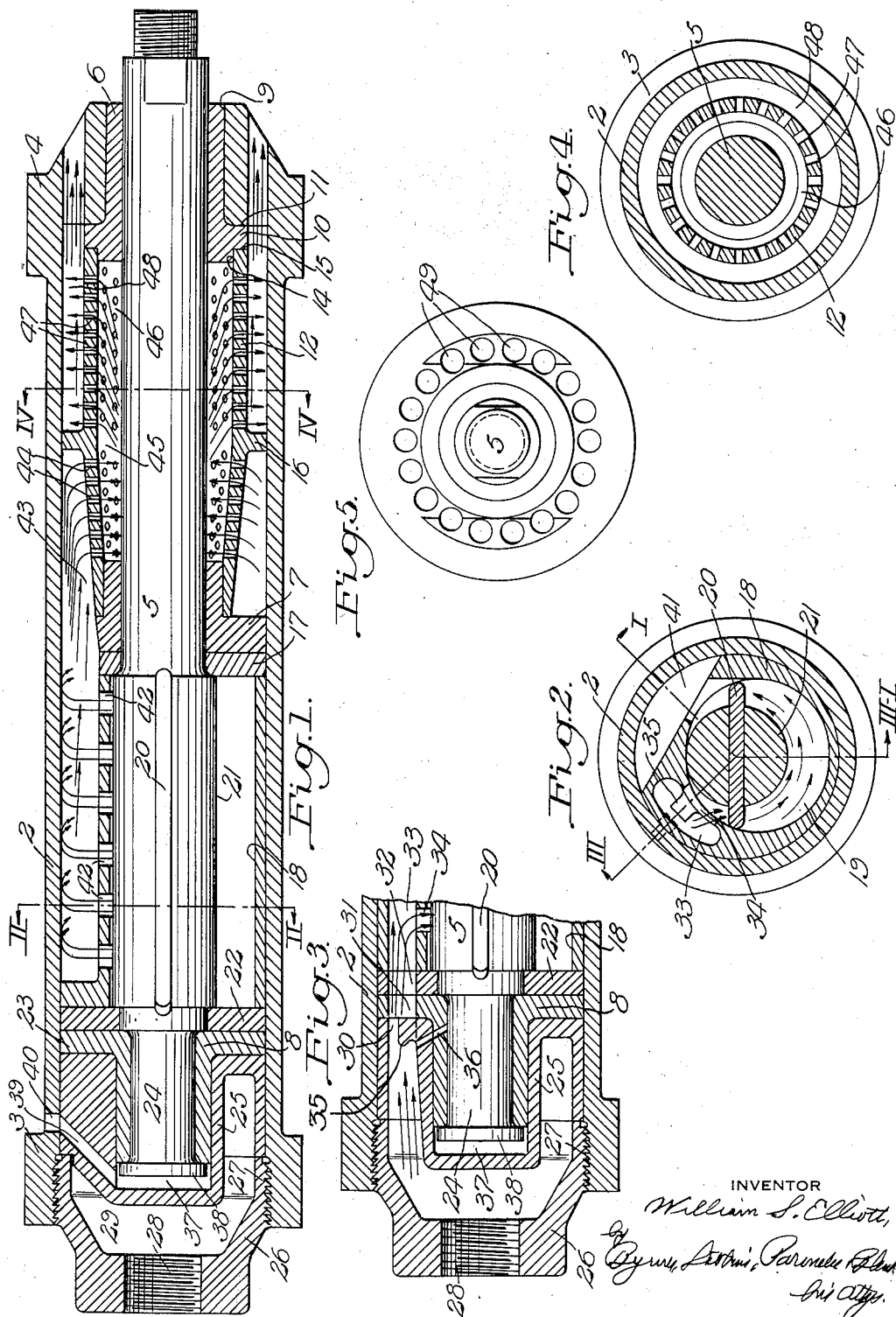
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MOTOR

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MOTOR

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The present invention relates broadly to rotary motors, and more particularly to motors of the fluid pressure or turbine type having a simple and compact construction such that the parts may be readily assembled or taken down for purposes of renewal or repair.

In motors of the general character herein contemplated, and as shown for example in my U. S. Patent 983,034 of January 31, 1911, the construction has been such as to permit the motor to be bodily moved through a tube to be cleaned with the cleaning element carried and operated by the motor. I have found that in many localities it is not possible to utilize the motor at the most convenient times due to the noise which is made by the escaping air. The present invention has for one of its objects the provision of a combined motor and muffler all disposed within a single shell or casing and possessing all of the necessary advantages with respect to compactness, size and accessibility of the parts.

In the accompanying drawing I have shown for purposes of illustration only, a preferred embodiment of my invention. In the drawing:

Figure 1 is a longitudinal sectional view through a combined motor and muffler embodying the invention, the section being taken along the line I—I of Figure 2 looking in the direction of the arrows, with the rotor in elevation;

Figure 2 is a transverse sectional view on the line II—II of Figure 1, looking in the direction of the arrows;

Figure 3 is a detail sectional view along the line III—III of Figure 2, looking in the direction of the arrows, the rotor being shown in elevation;

Figure 4 is a detail sectional view along the line IV—IV of Figure 1, looking in the direction of the arrows; and

Figure 5 is an end elevational view of the right hand end of the structure illustrated in Figure 1.

While the drawing illustrates a motor embodying my invention and especially adapted for use in operating boiler tube cleaning tools, it will be understood that the utility of the invention is not limited to the particular use to which reference has been made.

In accordance with the present invention, the motor comprises an outer casing or shell 2 formed at its opposite ends with heads or enlargements 3 and 4, respectively. If the motor is to be utilized for the purpose of operating cleaning tools, the motor being carried through the tubes with the tools, the casing or shell together with the heads, are preferably of cylindrical form, as shown; but for other purposes the shape of the casing or shell and the heads may be modified as desired. In the case of a boiler tube cleaner motor, the heads constitute guiding means for the motor in moving through the tubes and protect the main shell from contact with the interior of the tubes. In

such constructions the head 4 may be considered as the front head, having regard to the direction of movement of the motor, while the head 3 may be regarded as the rear head.

Disposed concentrically with the casing 2 is a rotor shaft 5 journaled in a front bearing 6, an intermediate bearing 7 and a rear bearing 8, all of which are preferably in the form of removable bushings.

The front bushing 6 is adapted to be slipped axially into position within a central opening 9 in the front end of the shell or casing 2 and is formed with a flange 10 seating against a shoulder 11 in the casing.

The front bushing 6 having been slipped into position by endwise movement through the casing, a perforated shell 12 is similarly applied. This shell at one end is adapted to fit over a projection 14 formed on the bushing 6 and bear against an inwardly facing shoulder 15 thereon. This constitutes a support for one end of the perforated shell. At its intermediate portion it is provided with a circumferentially extending flange 16 adapted to tightly engage the interior of the casing 2 and form both a bearing for the perforated shell and a substantially gas-tight closure between the outer casing and the perforated shell 12. At its inner end the shell 12 is shaped to provide a support for the intermediate bushing 7 which may be assembled with respect to the parts described upon a relative axial movement therebetween.

Bearing against the intermediate bushing 7 is a closure disk 17 shaped to constitute a closure for one end of a cylinder 18 fitting within the casing 2. This cylinder, as shown more particularly in Figure 2, provides a chamber 19 eccentrically disposed with respect to the axis of the shaft 5 and adapted to cooperate with a piston 20 extending transversely of and slidably mounted within a suitable opening in the rotor 21 preferably formed integrally with the shaft 5.

The opposite end of the cylinder 18 is closed by a second closure disk 22, similar to the disk 17 and adapted to be applied by relative axial movement. Bearing against the closure disk 22 is a flange 23 formed on the bushing 8. This bushing is preferably of the split type adapted to be fitted around the reduced neck 24 of the shaft so as to constitute a thrust bearing therefor. For supporting the split bushing 8 and holding the parts thereof in the desired relationship to the reduced neck 24 of the shaft, there is provided a cap member 25 which may be forced into position by a connector 26. This connector is provided with an externally threaded portion 27 adapted to be received by internal threads within the rear head 3 of the casing 2, and with an internally threaded opening 28

adapted to be connected to a suitable source of fluid under pressure.

The interior of the connector 26, and the rear end portion of the cap 25 are shaped to form an admission space or chamber 29 from which an admission port 30 in the cap leads to a similar port 31 in the rear bushing 8, which in turn aligns with a port 32 in the closure disk 22 communicating with a longitudinally extending inlet port 33 in the thickened wall of the cylinder 18. The inlet port 33 communicates with the piston chamber 19 through a plurality of cross ports 34 disposed lengthwise of the rotor.

Formed in and partially intersecting the port 30 is an undercut projection 35, as shown more particularly in Figure 3, which is adapted to receive lubricant carried by the fluid travelling through the port in the direction indicated by the arrows and deliver such lubricant through a passage 36 to the neck 24.

By reference more particularly to Figures 1 and 3 of the drawing, it will be noted that a space 37 is formed between the cap 25 and the collar 38 on the roll neck 24, which space communicates with an obliquely extending passage 39 connecting at its outer end with a discharge opening 40 in the wall of the casing and effective for preventing pressure accumulation within the cap such as would tend to subject the shaft to an undue end thrust.

The cylinder 18 may be provided with a longitudinally extending exhaust port as disclosed in my patent referred to, or may have one side thereof cut away, as indicated in Figure 2, to provide an exhaust port 41 communicating with the piston chamber 19 through a plurality of cross ports 42 similar to the admission ports 34.

In operation, driving fluid such as compressed air under the necessary pressure will be delivered to the chamber 29, from which it will pass by way of ports 30, 31, 32 and 33 to the cross ports 34 as indicated by the arrows in Figures 2 and 3. This pressure effective against the piston 20 will effect rotation of the shaft 5 in a counter-clockwise direction as viewed in Figure 2, until the shaft has rotated to such an extent as to uncover the cross outlet ports 42. The fluid discharged through these ports, and travelling lengthwise of the casing 2 as indicated by the arrows in Figure 1, will come into the zone 43 surrounding the rear end of the perforated shell 12. From this zone it will pass inwardly in divided condition through a plurality of perforations 44 into a zone 45 surrounding the shaft. It will thence travel longitudinally into an axially spaced zone 46 from which it will flow outwardly in distributed condition through a plurality of perforations 47 in the front end of the shell 12. Communicating with the space 48 around the perforations 47 is a series of axially extending outlets 49 uniformly disposed around the front bushing 9. It will be apparent that the intermediate circumferentially extending flange 16 prevents the used fluid from travelling directly from the space 43 to the space 48 without travelling the angular or tortuous path provided by the perforations 44 and 47. The annular chambers 43, 45 and 46 form an expansion chamber in which the air or other non-condensable elastic gases expand. Due to the path through which the fluid must travel, there is provided an efficient muffling or silencing. This permits the tool to be utilized as a unit at any

desired time, and under any usual conditions and in any locality without any danger of disturbing people in adjoining departments or in the neighborhood.

For sake of compactness, and in order to maintain the desired minimum overall diameter of the parts, the motor chamber and silencing chamber are preferably arranged in tandem. The present invention, however, contemplates the provision of a motor, and more especially a fluid operated motor, together with a silencer or muffler in a common casing. By reason of this construction the casing which encloses the motor also constitutes a casing for the muffler, thereby performing a dual function and keeping the exhaust fluid confined until it has been subjected to the desired silencing action. These novel features of construction give an advantageous operating condition for the reasons set forth.

While I have herein illustrated and described a preferred embodiment of my invention, it will be understood that changes in the construction, operation and relationship of the parts may be made without departing either from the spirit of my invention or the scope of my broader claims.

I claim:

1. A rotary tube cleaner motor employing a non-condensable elastic fluid and adapted to be moved through a tube to be cleaned and comprising a casing of a size approaching the internal diameter of the tube to be cleaned, a rotor in the casing, a connection for conducting a non-condensable elastic fluid to the rotor, an exhaust channel for the rotor and a muffler in tandem with the motor and movable therewith through the tube, said muffler having an expansion chamber arranged to receive the non-condensable elastic fluid from the motor exhaust channel.

2. A rotary tube cleaner motor having a rear connection to receive impelling fluid, an exhaust channel in its forward portion, and a muffler in tandem with the motor and in front thereof, said motor having a shaft extending forwardly through the muffler and adapted to receive a cleaning head in front of the muffler, the muffler having an expansion chamber to receive exhaust fluid from the exhaust channel of the motor.

3. A rotary tube cleaner motor adapted to be moved through a tube to be cleaned and comprising a generally cylindrical casing whose external diameter approaches the internal diameter of the tube to be cleaned, a rotor in the casing and means for conducting impelling fluid to and away from said rotor, and a muffler connected with the motor and movable therewith through the tube and having an expansion chamber adapted to receive the exhaust fluid from the motor.

4. A rotary tube cleaner motor adapted to be moved through a tube to be cleaned and comprising a generally cylindrical casing whose external diameter approaches the internal diameter of the tube to be cleaned, a rotor in the casing and means for conducting a non-condensable gaseous impelling fluid to and away from said rotor, and a muffler connected with the motor and movable therewith through the tube and having an expansion chamber adapted to receive the exhaust fluid from the motor and to discharge the same in gaseous form.

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