July 19, 1966 L. O. DAY ET AL 3,261,510

APPARATUS FOR DISPENSING ABRASIVE COMPOUND UPON THE SURFACE OF A ROTATABLE LAP PLATE OF A LAPPING MACHINE

Filed Jan. 27, 1965 2 Sheets-Sheet 1

Fig. 1.

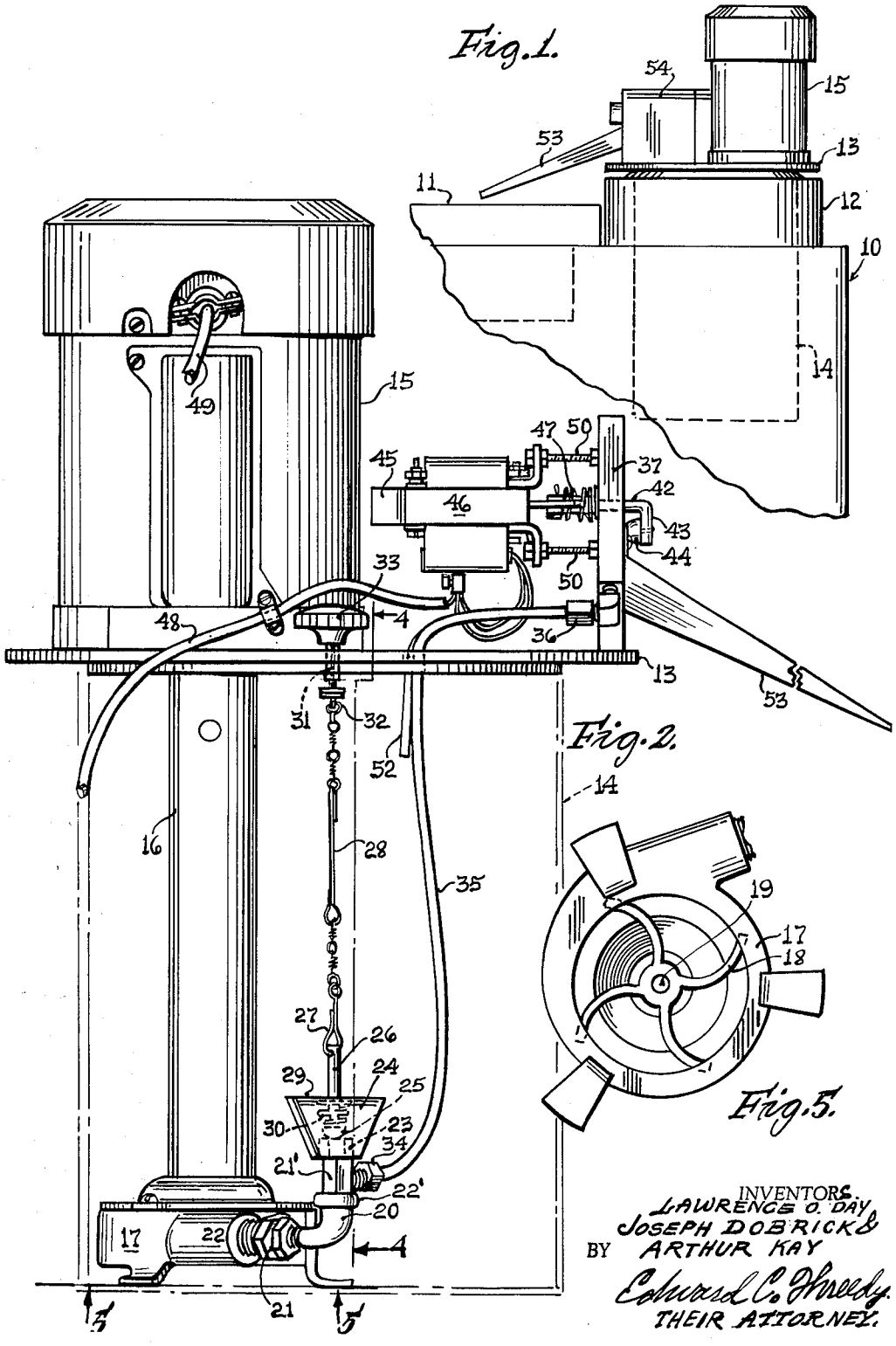


Fig. 2.

Fig. 5.

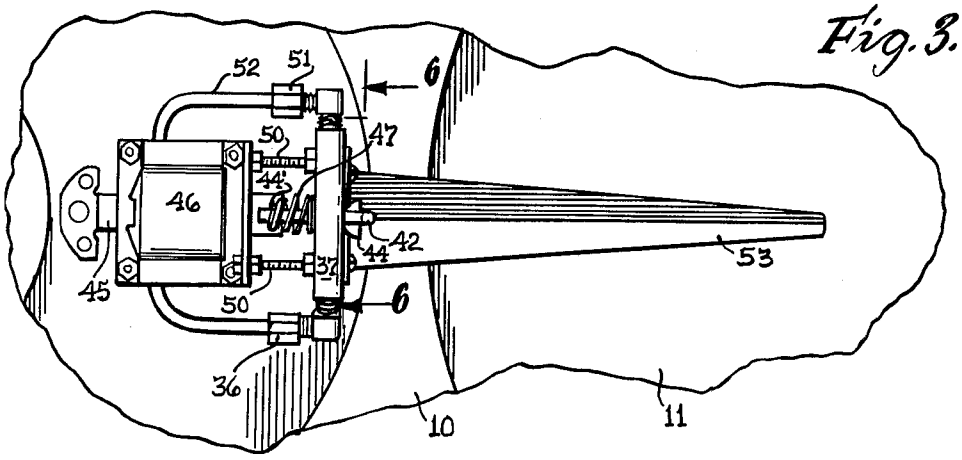
INVENTORS.
LAWRENCE O. DAY
JOSEPH DOBRICK &
BY ARTHUR KAY
Edward C. O'Meedy
THEIR ATTORNEY.

July 19, 1966 L. O. DAY ET AL 3,261,510

APPARATUS FOR DISPENSING ABRASIVE COMPOUND UPON THE SURFACE OF A ROTATABLE LAP PLATE OF A LAPPING MACHINE

Filed Jan. 27, 1965 2 Sheets-Sheet 2

Fig. 3.



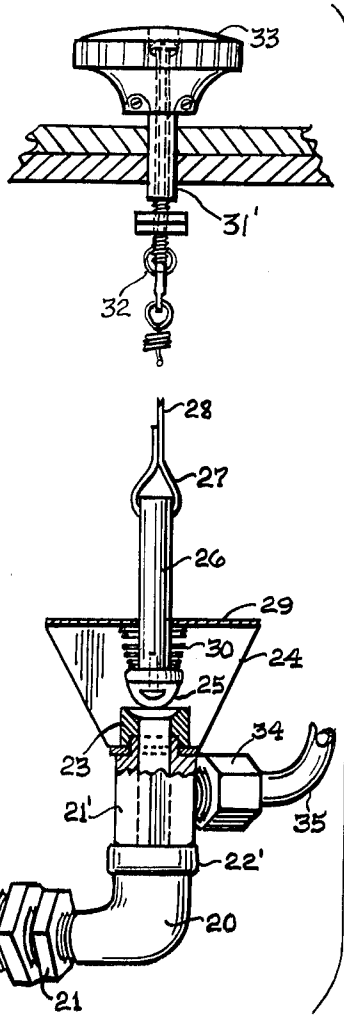


Fig. 4.

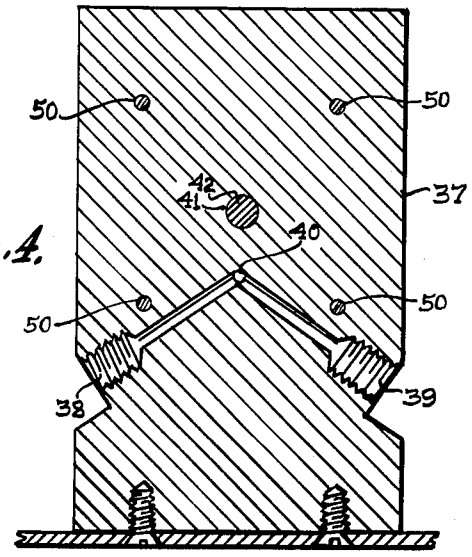


Fig. 6.

INVENTORS.
LAWRENCE O. DAY
JOSEPH DOBRICK &
BY ARTHUR KAY.
Edward A. Ahrens
THEIR ATTORNEY.

United States Patent Office

3,261,510

Patented July 19, 1966

3,261,510

APPARATUS FOR DISPENSING ABRASIVE COMPOUND UPON THE SURFACE OF A ROTATABLE LAP PLATE OF A LAPPING MACHINE

Lawrence O. Day and Joseph Dobrick, Chicago, and Arthur Kay, Evanston, Ill., assignors to Spitfire Tool & Machine Co., Inc., Chicago, Ill., a corporation of Illinois

Filed Jan. 27, 1965, Ser. No. 428,453
7 Claims. (Cl. 222—318)

Our invention relates to new and useful improvements in an apparatus for dispensing abrasive compound upon the surface of a rotatable lap plate of a lapping machine.

A principal object of this invention is to provide a simple and effective arrangement for supplying an abrasive compound to the lap of a rotatable lapping machine.

Another object of this invention is to provide a novel and effective arrangement for maintaining a continuous circulation of an abrasive compound within a supply tank, thus maintaining the abrasive compound in a flowable state as well as for returning to the tank the excess amount of abrasive compound over that being delivered to the lap of a rotatable lapping machine.

Another and equally important object of the invention is to provide a simple and effective by-pass means for controlling the amount of abrasive compound being pumped to the point of delivery to the rotatable lap plate of a lapping machine.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

FIG. 1 is a fragmentary perspective view of a lapping machine showing the invention associated therewith;

FIG. 2 is an elevational view of the invention;

FIG. 3 is a fragmentary plan view of a lapping machine showing the invention mounted in relation thereto;

FIG. 4 is a part sectional detail view of a by-pass valve controlling mechanism taken substantially on line 4—4 of FIG. 2;

FIG. 5 is a bottom plan view taken substantially on line 5—5 of FIG. 2;

FIG. 6 is an enlarged sectional detail view taken substantially on line 6—6 of FIG. 3.

In the drawings, 10 indicates a lapping machine which includes a motor-driven rotatable lap plate or disc 11.

On the lapping machine 10 is a supporting ring 12. Mounted on this ring 12 is a cover plate 13 which provides a cover for a supply tank 14 containing a predetermined amount of abrasive compound. Carried by the cover plate 13 is a motor housing 15 within which is arranged a conventional motor (not shown). Extending from the motor housing 15 is a tube 16 within which the shaft of the motor within the housing 15 operates. The lower end portion of the tube 15 terminates into an impeller housing 17 within which is arranged an impeller 18 mounted on the motor shaft 19 which operates within the tube 16.

An elbow 20 has one end portion 21 connected to an outlet 22 provided by the impeller housing 17. The other end of the elbow 20 is connected to a T 21' providing a right angle extension 22'. The T 21' has fixed thereto a valve seat 23. Between the valve seat 23 and the T 21' is a U-shaped bracket 24. A valve head 25 is adapted to engage the valve seat 23. The valve head 25 is formed on one end portion of a stud 26 having connected thereto as at 27 a flexible link 28. Between the bight portion 29 of the bracket 24 and the valve head 25 is an expansion

spring 30 which normally urges the valve head 25 into engagement with the seat 23.

Threaded within a thread-bearing sleeve 31' which projects through an opening in the plate 13, is a shaft 31 to which one end portion 32 of the flexible link 28 is connected. The exterior of the shaft 31 carries a finger knob 33, by means of which the shaft 31 may be threadably adjusted to vary the distance between the valve head 25 and the valve seat 23. Such structure provides a by-pass valve and mixing of abrasive in the tank 14 and regulates the flow of the abrasive compound.

The threaded extension 22' is connected as at 34 to a conduit 35 which has connection as at 36 to a valve block 37 in communication with one of two diverging passages 38 and 39 formed in the valve block 37 and communicating with a common outlet opening 40 providing a valve seat. The valve block 37 has formed therein an opening 41 through which reciprocates a shaft 42 having an angled end portion 43 carrying a valve head 44 which is adapted to control the passage of abrasive compound through the outlet 40.

The shaft 42 has connection as at 44' with the armature 45 of an electromagnetic coil 46. The shaft 42 and its valve head 44 are normally disposed in closed position under the action of a spring 47. The electromagnetic coil 46 is connected in circuit with the power line (not shown) which operates the electric motor for rotating the lap plate 11. The arrangement is such that the electromagnetic coil 46 becomes energized simultaneously with the energization of the motor which rotatae the lap plate 11. When the electromagnetic coil 46 is energized, the armature 45 thereof will be moved to the right as viewed in FIG. 2, resulting in opening the passage through the outlet 40. The armature 45 is supported from the valve plate 37 by means of bolts 50 (FIGS. 2 and 6). A suitable coupling 51 connects one end of a return conduit 52 to the passage 39.

There is secured to the valve structure 37 a tapered chute 53 which receives the abrasive compound through the outlet 40 and delivers it to the surface of the lap plate 11.

To complete the invention, a suitable enclosure 54 may be provided for the electromagnetic coil 46 and valve block 37.

In operation, the tank 14 is filled with a suitable lapping abrasive compound. This is accomplished by removing the combination supporting plate and cover 13 and pouring the abrasive compound into the tank 14. Upon receiving a proper amount of abrasive compound within the tank 14, the cover plate is placed upon the tank with the impeller disposed adjacent the bottom thereof. The cover plate 13 is positioned relative to the tank 14 so as to properly dispose the chute 53 over the rotatable lap plate 11. Then the motor within the motor housing 15 is energized to start the operation of the impeller 18. Simultaneously with the energization of the motor which rotates the lap plate 11, the electromagnetic coil 46 is energized, projecting the armature 45 thereof to the right, moving the valve head 44 from closed position with respect to the outlet 40. The impeller 18 will force the abrasive compound up through the conduit 35 through the passage 38, at which point a certain amount of the abrasive compound will flow through the outlet 40 onto the chute 53 and be delivered by the latter onto the surface of the lap plate 11. Such of the abrasive compound which does not flow through the outlet 40 because of excess volume will flow back into the tank through the return conduit 52.

To regulate the amount of abrasive compound being pumped through the conduit 35, the operator adjusts the

valve head **25** relative to the valve seat **23**, thus providing a by-pass for a certain amount of abrasive compound.

It will be seen, therefore, that as long as the impeller **18** is in operation, abrasive compound will be delivered through the conduit **35** to the chute **53** from the outlet **40**. Such of the abrasive compound which is in excess of the amount which can pass through the opening **40** will return by way of the return conduit **52** to the tank **14**. A certain amount of the abrasive compound will be by passed into the tank **14**. This arrangement assures that only the required amount of abrasive compound is delivered to the rotatable lap plate **11**, avoiding the use of more abrasive compound than is required for the lapping operation.

When the motor which rotates the lap plate **11** is deenergized, the electromagnetic coil **46** will simultaneously be deenergized therewith. This deenergization of the electromagnetic coil **46** will move the armature **45** to the left as viewed in FIG. 2, to bear the valve head **44** against the delivery outlet **40** and close passage therethrough. As the motor within the housing **15** is still operating, the impeller **18** will force the abrasive compound through the conduit **35**, and as the outlet **40** is closed by the valve head **44** the abrasive compound will return to the tank **14** through the return conduit **52**. By this arrangement there will be a continuous circulation of the abrasive compound from and back into the tank, thus constantly agitating the abrasive compound, preventing grit or the like contained in such compound from settling at the bottom of the tank and keeping the compound in a well-mixed condition. The advantage of this arrangement can be appreciated since it is generally the practice in the art to provide in the motor circuit for rotating the lap plate **11** a timing switch which times the operation of the lapping plate **11**. At the terminus of the operation of the lap plate **11** by action of this timing switch, the result will be the closing of the outlet opening **40** by the valve head **44**, thus diverting the abrasive compound back into the tank **14** through the return conduit **52**, with the result that a continuous circulation through the conduits **35** and **52** results while the lap plate remains inoperative. This continued circulation under the foregoing conditions constantly maintains the conduits **35** and **52** in a clean condition, preventing any grit or the like from becoming confined in the conduits, thus blocking or diminishing the flow of abrasive compound therethrough.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to protect by Letters Patent is:

1. An apparatus for dispensing an abrasive compound upon a rotatable lap plate of a lapping machine comprising

(a) a supply tank containing the abrasive compound to be dispensed,

(b) a motor carried by said tank and having a shaft depending into said tank,

(c) impeller means carried by said shaft at the inner end thereof,

(d) valve means carried by said tank and including opposite diverging passages having a common outlet opening providing a valve seat,

(e) a valve head for said opening including a shaft movable transversely of the valve means,

(f) an electromagnetic element having an armature connected to said valve shaft to move said valve head into and from closing position with respect to said opening,

(g) a conduit connected with said impeller means and one of said passages,

(h) a second conduit connected with the other of said passages and said tank to allow excess abrasive compound to return to said tank from said passages when said valve head is in open position with respect to said opening and to allow free circulation of the abrasive compound through said conduits from and into said tank when said valve head is in closed position with respect to said opening.

2. An apparatus for dispensing a lubricant upon a rotatable lap plate of a lapping machine comprising

(a) a supply tank containing the abrasive compound to be dispensed,

(b) a cover for said tank,

(c) a motor carried by said cover and having a shaft depending into said tank,

(d) impeller means carried by said shaft at the inner end thereof,

(e) valve means carried by said cover and including opposite diverging passages having a common outlet opening providing a valve seat,

(f) a valve head for said opening including a shaft movable transversely of the valve means,

(g) an electromagnetic element carried by said cover and having an armature connected to said valve shaft to move said valve head into and from closing position with respect to said opening,

(h) a conduit connected with said impeller means and one of said passages,

(i) a second conduit connected with the other of said passages and said tank to allow excess abrasive compound to return to said tank from said passages when said valve head is in open position with respect to said opening and to allow free circulation of the abrasive compound through said conduits from and into said tank when said valve head is in closed position with respect to said opening.

3. The apparatus of claim **2** further characterized by the inclusion of a by-pass valve in said first-mentioned conduit between said impeller means and said one passage.

4. The apparatus of claim **3** in which said by-pass valve has means for regulating the amount of flow of abrasive compound to be by-passed thereby.

5. The apparatus of claim **2** further characterized by the inclusion of a chute associated with said valve means for guiding the flow of abrasive compound from said valve means to said lap plate.

6. The apparatus of claim **3** further characterized by the inclusion of a chute associated with said valve means for guiding the flow of abrasive compound from said valve means to said lap plate.

7. The apparatus of claim **4** further characterized by the inclusion of a chute associated with said valve means for guiding the flow of abrasive compound from said valve means to said lap plate.

References Cited by the Examiner

UNITED STATES PATENTS

2,307,019	1/1943	Cebik	51—267
2,434,771	1/1948	Mueller et al.	222—318

RAPHAEL M. LUPO, *Primary Examiner.*

H. S. LANE, *Assistant Examiner.*