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(54) Polishing machine.

(57) A polishing machine for mould plungers which comprises means (26) for mounting a plunger (28) and rotating it, at least one means (30) for bringing a polishing head (34) into contact with the plunger surface to be polished, and means (22) for relatively traversing the plunger and the polishing head with respect to one another whereby to effect longitudinal polishing. The means for bringing the head into contact with the surface is a fluid operated cylinder (30) whereby to the head pressure is maintained substantially constant, e.g. by means of a pressure regulator connected in the outlet or exhaust of the cylinder.

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POLISHING MACHINE

This invention relates to a polishing machine and in particular relates to a machine for polishing mould plungers.

Metal moulds, for example moulds for glassware, especially those employed in the "press and blow" process, are provided with mould plungers. The external face of a mould plunger is required to be smoothly polished. It has been found that rotary polishing of such plungers is not satisfactory in that experience has shown the bottles produced on equipment having rotary polished plungers are not as good as bottles produced with longtitudinally polished plungers. This is because normal round polished plungers have circumferential machine marks which do not permit an easy pressing into and retraction out of hot glass. The glass surface in contact with the plunger will be damaged and the resistance to pressure of the glass end-product will be greatly reduced.

Longitudinally polished plungers, on the other hand, eliminate circumferential machine marks and provide a much improved glass product. However, of course, longitudinal polishing of a plunger is not as easy to set up as rotary polishing, which can be achieved quite simply on apparatus such as a lathe. One proposed form of longitudinal polishing apparatus is the "SONICAM RS4" machine in which a plurality of spring-biased arms carrying abrasive ends are reciprocated over a slowly rotating plunger held on a chuck. While this machine produces better results than round polished plungers, it is difficult to control, especially on plungers differing greatly in thickness throughout their length. By the nature of the Sonicam machine the greatest pressure is applied to the portions of the plunger of greatest thickness and thus the honing effect may not accurately follow the desired plunger profile.

The invention seeks to provide a form of polishing machine improved in the above respects.

According to the present invention there is provided a polishing machine for mould plungers which comprises means for mounting a plunger and rotating it, at least one fluid operated means for bringing a polishing head into contact with the plunger surface to be polished, and means for relatively traversing the plunger and the polishing head with respect to one another whereby to effect longitudinal polishing.

It will be appreciated that while the plunger and cylinder are mounted for relative rotation, the rotation is relatively slow, and the principal polishing action is carried out by traversing the polishing head in a reciprocating manner with respect to the longitudinal axis of the plunger. In a preferred form of the apparatus of the invention the fluid operated means is kept stationary and the plunger is mounted for longitudinal reciprocation in order to traverse to and fro past the polishing head. The means for achieving this may conveniently be a double acting fluid operated cylinder.

The fluid operated cylinder may be a hydraulic or pneumatic cylinder, and is preferably the latter. By connecting a pressure regulator to the outlet or exhaust, the pressure in the cylinder can be maintained constant so that the pressure applied to the polishing head also remains constant irrespective of the extension of the polishing head from the cylinder, ie. irrespective of the thickness of the portion of the plunger being polished. This ensures that the polishing action applied to the surface to be polished is uniform regardless of the shape of that surface.

Preferably there is more than one fluid operated cylinder provided with polishing heads, and three such cylinders with associated polishing heads have been found to be useful in practice, preferably distributed equi-distantly around the plunger. The cylinder or cylinders may conveniently be mounted on a rotary table capable of rotating slowly around the plunger so as to provide the relative rotary movement to move the reciprocating polishing heads successively to fresh areas of the plunger being polished.

The invention will be described further, by way of example, with reference to the accompanying drawing, in which:

Figure 1. is a diagrammatic elevational view of an apparatus in accordance with the invention;

Figure 2. is a top plan view of the rotary table;

Figure 3. is an elevational view of a suitable control panel.

Referring to the drawings, a polishing apparatus generally designated 10 comprises a rotary table 12 mounted on a suitable framework (not shown) for rotation by means of a drive belt 14 and motor 16. The table 12 has a central orifice 18 of sufficient size to receive the largest plunger which it is desired to polish. Below the table 12 is a tank 20 containing oil for facilitating the polishing process. Above the table 12 is mounted a double-acting pneumatic cylinder 22 having an operating rod 24 terminating in a chuck or the like 26 to which can be attached a mould plunger 28 to be polished. Mounted on the table 12 are three pneumatically operated cylinders 30 each of which has an associated oilstone slide 32 for bringing a polishing head 34 in the form of an oilstone into contact with the plunger 28 to be polished.

The pneumatic circuits to each of the cylinders 30 share a regulated air supply with an exhaust pressure regulator to ensure a constant air pressure to within +3 p.s.i. The polishing heads 34 are controlled by the cylinders 30 and for rigidity are supported in the slides 32. They have a typical movement range of 2" which will allow a 4" diameter component to be honed. The oilstone setting position is not critical since the cylinders will compensate for length variations. In operation the plunger to be polished 28 is affixed to the chuck 26 of the cylinder 22. The cylinder 22 is then caused to reciprocate in turn causing the plunger 28 to traverse past the oilstone heads 34 relatively quickly. Pressure is applied to the cylinders 30 which, via the slides 32, cause the heads 34 to bear against the plunger 30 and apply a honing or polishing action thereto in a substantially longitudinal direction. Each reciprocation of the plunger 28 causes it to dip into the tank 20 and pick up oil to lubricate the honing stones. The motor 16, geared down to 4 r.p.m., operates through the drive belt 14 at a reduction of 4:1 thereby driving the rotary table assembly at 1 r.p.m. This ensures that fresh surface portions of the surface of the plunger 28 are brought into contact with the three oilstones 34 as the latter reciprocate over its surface.

The stroke length and stop positions of the cylinder 22 can be set by means of the adjustable pneumatic stops or, preferably, electronic proximity switches 36. The rotation of the table and adjustment of the start and stop cycles can be monitored by the operator by means of the control panel illustrated in Figure 3. The panel also gives an indication of the number of strokes of the cylinder 22 and it monitors the air pressure by means of a pressure gauge to ensure that the oilstones 34 are supplied with a constant pressure.

Since the pressure applied to the oilstones through the cylinders 30 is constant, independent of the position of the oilstone with respect to the central axis of the apparatus, the polishing pressure does not depend on the thickness of the plunger 28 at any point. Thus a typical plunger shape as illustrated in Figure 1 will be polished evenly. The relatively slow rotation of the table (1 r.p.m.) ensures that the polishing effect is overwhelmingly in the longitudinal direction and no circumferential machine marks are left on the plunger 28. The control panel may be employed to program a set number of strokes for a given plunger after which the machine will stop.

The apparatus of the invention provides a simple and effective way of producing extremely accurate honing and/or polishing of mould plungers in the longitudinal direction.

Claims

1. A polishing machine for mould plungers which comprises means for mounting a plunger and rotating it, at least one means for bringing a polishing head into contact with the plunger surface to be polished, and means for relatively traversing the plunger and the polishing head with respect to one another whereby to effect longitudinal polishing characterised in that the means for bringing the head into contact with the surface is a fluid operated cylinder whereby to the head pressure is maintained substantially constant.

2. A machine according to claim 1 in which the plunger and cylinder are mounted for relative rotation, the rotation being relatively slow so that the principal polishing action is carried out by traversing the polishing head in a reciprocating manner with respect to the longitudinal axis of the plunger.

3. A machine as claimed either of claims 1 or 2 in which the fluid operated means is kept stationary and the plunger is mounted for longitudinal reciprocation in order to traverse to and fro past the polishing head.

4. A machine as claimed in claim 3 in which the means for achieving the longitudinal reciprocation is a double-acting fluid operated cylinder.

5. A machine as claimed in any of claims 1 to 4 in which the fluid operated cylinder is a hydraulic or pneumatic cylinder.

6. A machine as claimed in any of claims 1 to 5 in which the pressure is maintained constant by connecting a pressure regulator to the outlet or exhaust of the the pressure in the cylinder can be maintained constant so that the pressure applied to the polishing head also remains constant irrespective of the extension of the polishing head from the cylinder.

7. A machine as claimed in any of claims 1 to 6 in which there is more than one fluid operated cylinder provided with a polishing head.

8. A machine as claimed in claim 7 in which three such cylinders with associated polishing heads are provided, distributed equidistantly around the plunger.

9. A machine as claimed in claim 8 in which the cylinder or cylinders are mounted on a rotary table capable of rotating slowly around the plunger so as to provide the relative rotary movement to move the reciprocating polishing heads successively to fresh areas of the plunger being polished.

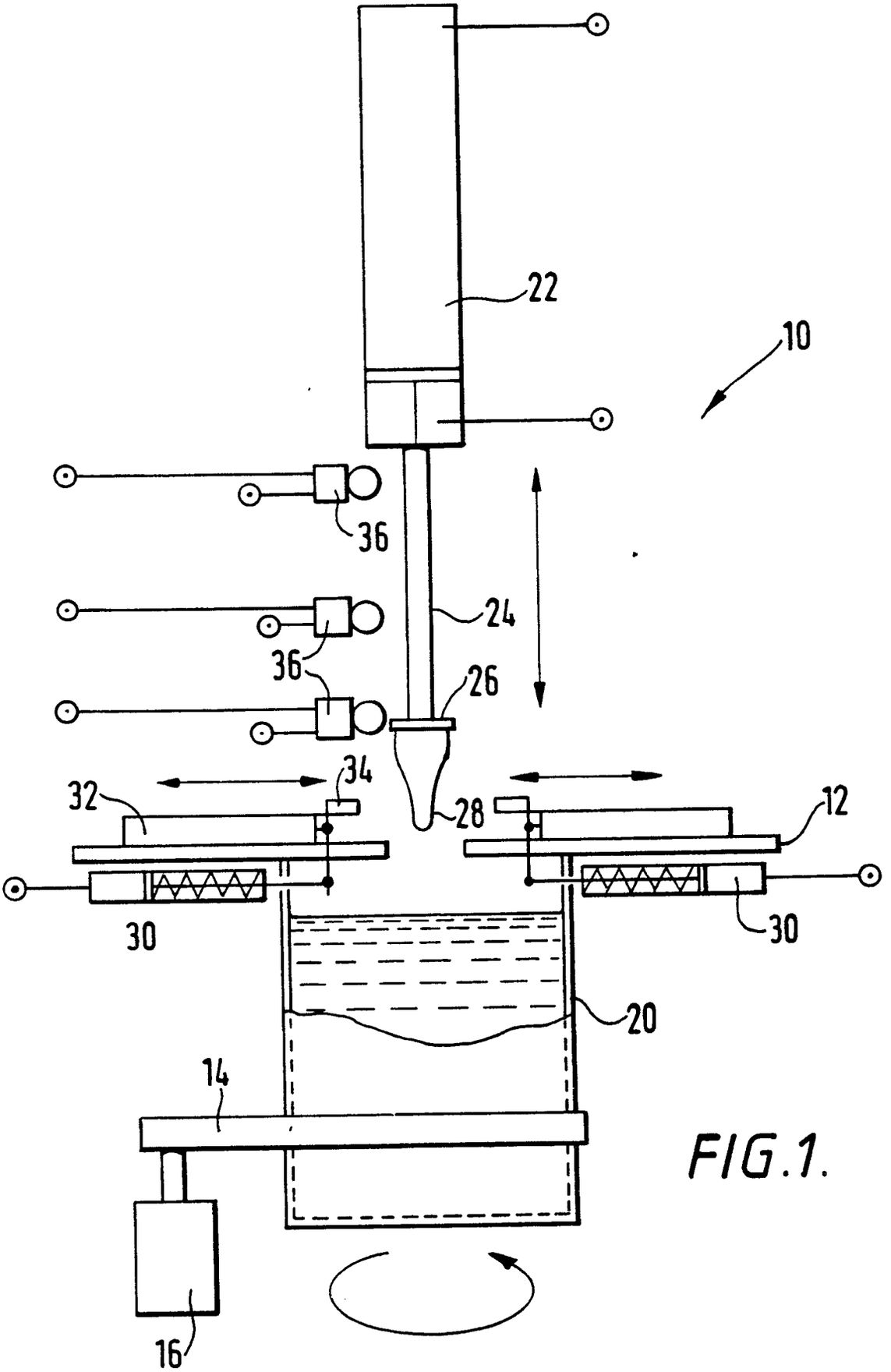

FIG.1.

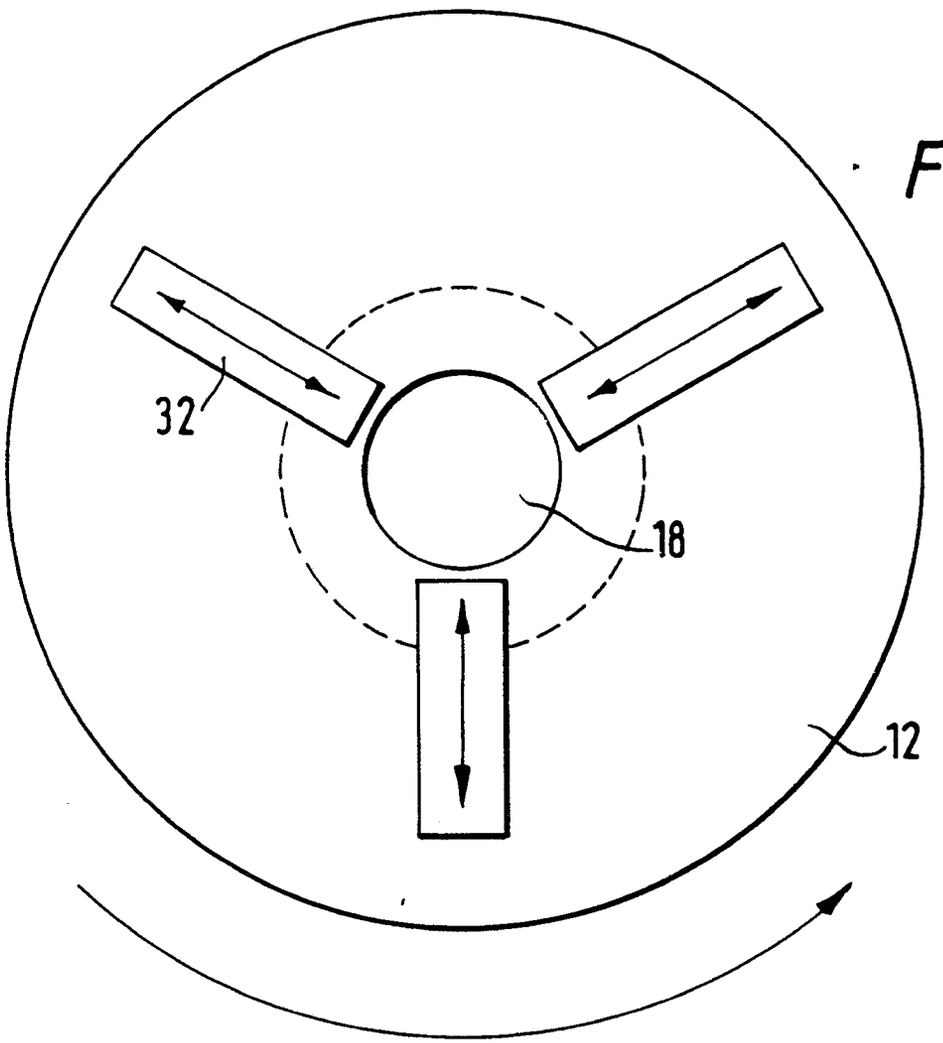

FIG.2.

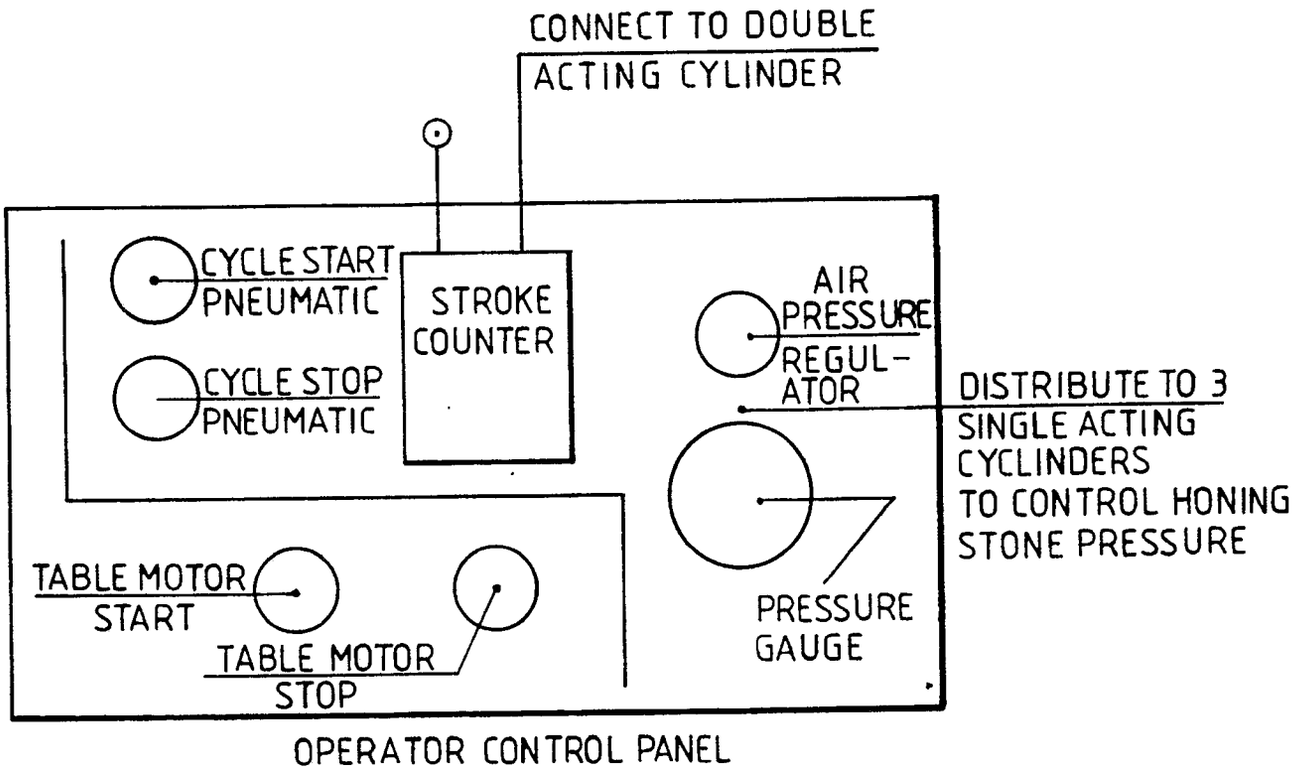
CONNECT TO DOUBLE ACTING CYLINDER
CYCLE START PNEUMATIC
CYCLE STOP PNEUMATIC
STROKE COUNTER
AIR PRESSURE REGUL-ATOR
DISTRIBUTE TO 3 SINGLE ACTING CYCLINDERS TO CONTROL HONING STONE PRESSURE
TABLE MOTOR START
TABLE MOTOR STOP
PRESSURE GAUGE
OPERATOR CONTROL PANEL

FIG. 3A.

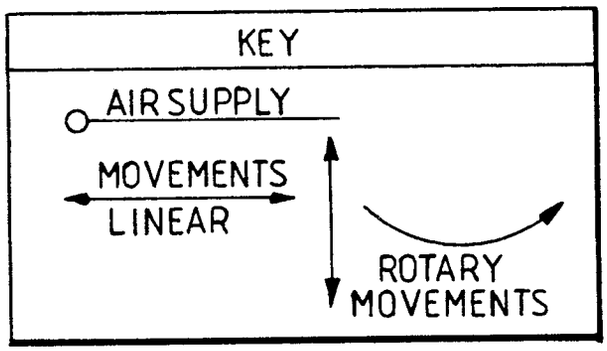
KEY
AIR SUPPLY
MOVEMENTS LINEAR
ROTARY MOVEMENTS

FIG. 3B.