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(54) **Machine for automatic and simultaneous grinding of head valves for internal combustion engines**

(57) This invention concerns a machine for automatic and simultaneous grinding of head valves for internal combustion engines.

The machine in question consists of a special swinging framework (9) supporting the heads which during operation are positioned in front of a series of actuators (15) which clamp and rotate all the valves on the head in alternating directions.

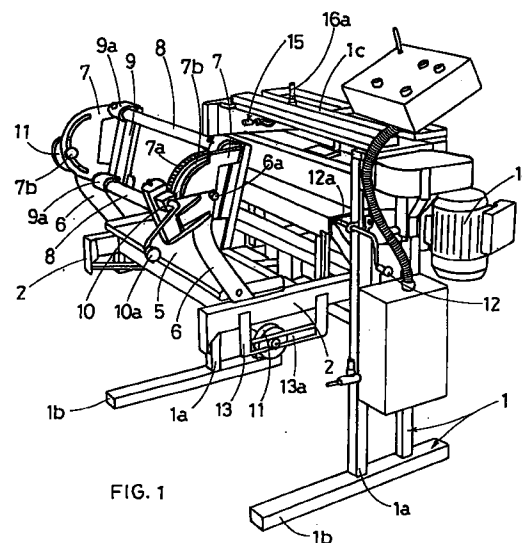


FIG. 1

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Description

This patent application concerns a machine for automatic and simultaneous grinding of head valves for internal combustion engines.

The machine in question is an authentic and absolute novelty since this operation has to date been carried out manually, grinding one valve at a time.

It is common knowledge to technicians in the automobile sector that when grinding valves, each element is rotated alternatively around its own axis rubbing within a housing to which an abrasive paste is applied so as to produce a light scouring action on the rubbing surfaces which are honed and modelled against each other, ensuring a perfect and hermetical mechanical seal between the valve head and the housing.

This operation is performed by an operator using a conventional hand drill whose shaft rotates alternatively in the two rotation directions and ends with a special sleeve clamp which clamps the stem of the valve.

The main purpose of this invention is to design a machine which automatically and simultaneously grinds the head valves in a combustion engine.

Another scope of the invention is to realise a machine for the automatic and simultaneous grinding of valves which is simple and inexpensive to manufacture and extremely practical and versatile.

The machine in question consists essentially of a supporting bridge framework whose upper cross beam has a series of actuators which clamp and rotate all the valves on the head in alternating directions.

This framework supports a pair of horizontal shelves at the front on which a slide rests, said slide being characterised by two opposing upright side arms which support a special bearing frame for the engine heads that oscillates 180° around a horizontal axis.

This special frame consists of an opposing pair of vertical semicircular plates with centre hub which houses the respective pin at the top of the upright arms, said pair of opposing plates being connected by means of a parallel pair of horizontal bars whose function is to support and guide several sliding blocks each consisting of a sturdy metal rectangular plate equipped at the bottom with a pair of sleeves complete with internal bushings which are fitted and slide along the pair of bars.

The upper surface of each sliding block having a series of parallel upside down "T" shaped grooves in which a conventional device or tool for locking the head above said sliding blocks is fitted.

Once the head has been positioned and locked into place on said sliding blocks and once the same have been locked on the two support and guiding bars, the special frame is turned over by about 90° so that the resting surface of the above pair of bars passes from horizontal loading lock position to vertical working position where the head is turned and moved closer to the upper cross element of the bridge frame where a series of actuators are positioned which clamp and alternately

rotate all the valves on the heads fixed on the special frame.

Each actuator consists essentially of a body which supports a through shaft terminating frontally with a clamp that secures the stem of the valve, and an arm for rapid mounting and stopping of the same on the cross element of the bridge framework which also houses a horizontal rack by means of which all the actuators mounted on said cross member are driven.

Said rack performs alternating strokes thanks to a conventional driving crank system, positioned at one of the two ends of the upper cross member of the bridge framework, next to which the electric motor operating said driving crank system is flanged.

For major clarity the description of the machine according to the invention continues with reference to the enclosed drawings which are intended for purposes of illustration and not in a limiting sense, in which:

- fig. 1 is a front three-quarter perspective and schematic view of the machine in question;
- fig. 2 is a back three-quarter perspective and schematic view of the machine in question;
- fig. 3 is an axonometric view of one of the actuators mounted on the upper cross-element of the bridge framework of the machine. For major graphic clarity, some components shown in figure 1, such as the electric motor, the control board and some covers are not shown in figure 2.

With reference to the above figures, the machine in question consists of a supporting framework (1) realised with welded tubular metal profile sections which are essentially bridge shaped and consist of an opposing pair of legs (1a) fitted with feet (1b) and an upper cross member (1c). Said framework being designed to act as a cantilevered support for a pair of horizontal shelves (2) projecting frontally from the end of a slide (3) housed between the legs (1a) where the same slides vertically in tracks (4) fitted on the interior of the legs (1a).

Above the pair of shelves (2) there is a second slide (5) from whose ends project two identical opposing upright arms (6) having at the top a frame which supports the heads whose valves are to be ground.

Said frame consists of an identical pair of opposing vertical plates (7) fixed integrally by means of a parallel pair of bars (8) which act as support and track for several sliding blocks (9) on which the motor heads are placed and fixed.

In order to oscillate said frame about a horizontal axis, each of its end plates (7) has a semicircular profile and centre hub which houses the pin (6a) at the top of each of the two upright arms (6); a device (10) for capsizing the special frame is fitted externally to one of the arms (6), said device (10) consisting of a crank (10a) which rotates in alternating directions, as required, an engaging reel having a semi-circular geared profile (7a) obtained on the edge of one of the plates (7) which is

thus rotated with respect to its pivot pin.

It is evident that when plate (7) rotates, the entire special frame also rotates in that said plate (7) is solidly connected to plate (7) opposed by means of the pair of bars (8) inserted between the same.

The two plates (7) being characterised by two semi-circumference curved perimeter slots (7b) housing a freely sliding retractable pin with enlarged head which is an integral part of a conventional pneumatic clamp (11) fixed on each arm (6) and designed to block the head-supporting frame once the same has been capsized into the required position by means of the capsizing crank (10a).

It should be noted that the heads can easily be positioned and stopped above the sliding blocks (9) by blocking the special frame for as long as necessary in a horizontal position, in other words, so that the resting plane of the bars (8) is horizontal.

It should also be noted that the sliding blocks (9) are equipped at the bottom with couplings (9a) which slide and can be stopped along the bars (8) while the upper face of said slides has a series of upside down "T" shaped grooves designed as anchorage and clamping housings for the tools and means (of the type generally used on toolholder slides of tooling machines) by means of which the heads are fixed above the sliding blocks (9).

In order to slide the first slide (3) along the tracks (4), it is necessary to turn a crank (12) fitted at the end of a driving shaft (12a) having a horizontal axis, which extends on the front of the supporting framework (1) bridging the legs (1a); thanks to driving gears, the rotation of the shaft (12a) produced by crank (12) drives the slide (3) by means of a conventional mechanical drive.

Externally to the shelves (2), there are two brackets (13) with a rectilinear and horizontal slot (13a) in which a retractable pin with enlarged head slides freely, the same being an integral part of a pneumatic clamp (11) designed to stably lock the slide (5) on the shelves (2) similar to the above, fixed on the arms (6).

This second slide (5) is operated manually.

Externally to one of the legs (1a) of the framework (1) an electric motor (14) is flanged, said electric motor (14) being provided to operate a pulley (14a), which in turn operates a typical driving crank system (not shown in the enclosed drawings), used to pull in alternating strokes a rack (not shown in the enclosed drawings) positioned under the upper cross-element (1c) of the framework and from which all the actuators (15) installed along said cross-element are driven.

With particular reference to fig. 3, each actuator consists of a tapered tubular body (16) supporting a through shaft (17) on which a reel (18) which engages the above rod rack, is splined in an intermediate position.

At the front end of said shaft (17), a conventional sleeve clamp (20) is connected by means of a universal joint (19) which clamps and holds the stem of a valve.

Said shaft (17) terminates at the back with an

enlarged head (17a) against which a precompressed spring (21) rests, said spring (21) being fitted on the shaft and positioned between its head (17a) and the body (16) in order to constantly push the shaft in an axial direction, and holding the same in its reversed position at the end of the stroke.

A radial arm (16a) projects from the body and fits and stops in a slot (not shown in the drawings) extending longitudinally for the entire length of the upper cross-element (1c) of the framework (1).

A pair of nuts (16b) can be screwed on the arm (16a) to fix the arm quickly and firmly in the slot on the cross-element (1c).

With particular reference to fig. 2, attention is drawn to the fact that the back of the cross-member (1c) has a horizontal rod (22a) which is part of a small frame (22) lying on a vertical plane and oscillating about a horizontal axis parallel to the cross-element (1c); said small frame (22) is in fact pivoted idly between an opposing pair of shelves (23) projecting on the back of the framework (1) and fixed on the legs (1a) of the latter.

Oscillation of said frame (22) about its pivoting pins is performed by means of pneumatic cylinders (24) having a horizontal axis, mounted on the framework (1) and connected to an appendix (23b) of the above frame (22).

By rotating said frame (22), it is possible to take its rod (22a) against and away from the enlarged back head (17a) of the shafts (17) of the actuators (15), which, when required, may thus be made to slide axially forwards, overcoming the opposing force of the springs (21).

The forward movement of said shafts (17) is in fact useful during the initial clamping phase of the valve stem and in its successive detachment from the housing thereby allowing the operator to apply a layer of abrasive paste, but is even more useful during the actual grinding phase to draw the head of the valve away from its housing occasionally to thus momentarily interrupt grinding.

Claims

1. A machine for the automatic and simultaneous grinding of head valves of internal combustion engines, characterised by:

- a supporting framework (1) consisting of welded tubular metal profile sections and an opposing pair of legs (1a) equipped with respective feet (1b) and an upper cross-element (1c);
- a pair of horizontal shelves (2) projecting frontally from the end of a first slide (3) housed between the legs (1a) of the framework (1) and sliding vertically in tracks (4) fitted on the interior of the legs (1a);
- a second slide (5) sliding above the pair of shelves (2) and having at its ends two identical

and opposing upright arms (6) at the top of which a special head-holder frame is supported;

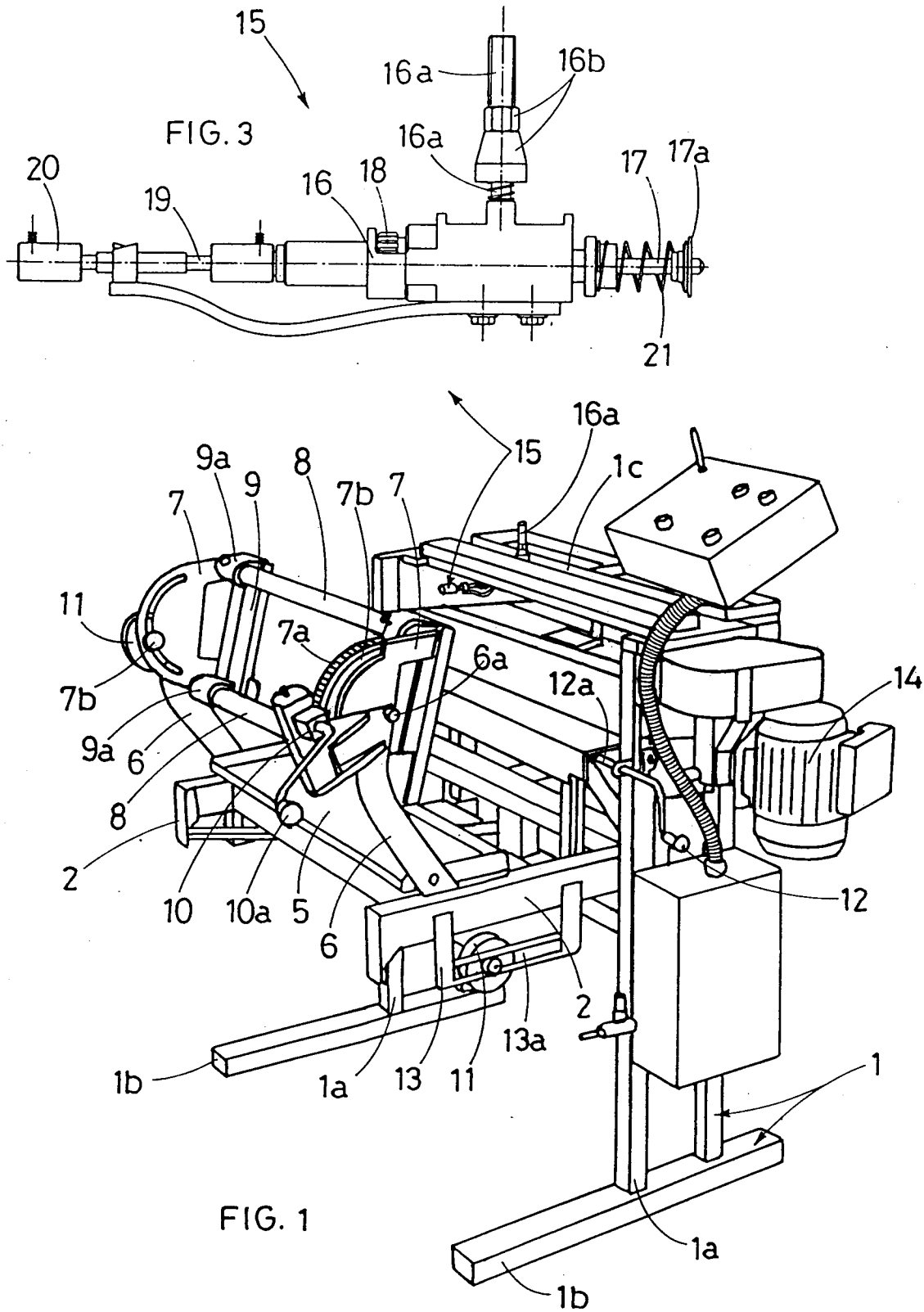
- a special head-holder frame, consisting of an opposing pair of identical vertical plates (7) joined integrally by means of a parallel pair of bars (8) which support and guide a number of sliding blocks (9) having a semi-circular profile and centre hub for housing a special pin (6a) at the top of each of the two upright arms (6) outside to one of which is mounted a device (10) for capsizing a special frame, consisting of a crank (10a) which rotates an engaging reel having a semi-circular geared profile (7a) obtained on the edge of one of the plates (7);
- an electric motor (14) flanged on the exterior of one of the legs (1a) of the framework (1) and operating a pulley (14a) which in turn operates a typical driving crank system which pulls a rack in alternating horizontal strokes, said rack being positioned below the upper cross-element (1c) of the framework (1) and from which all the actuators (15) installed along said cross-element are driven;
- a series of actuators (15) each consisting of a tapered tubular body (16) which supports a through shaft (17) along which a reel (18) is splined and on the front end of which a conventional sleeve clamp (20) is connected by means of a universal joint (19) which clamps and holds the stem of a valve; said shaft (17) terminates at the back with an enlarged head (17a) against which a precompressed spring (21) rests, said spring (21) being fitted on the shaft and positioned between its head (17a) and the body (16) from which a radial arm (16a) projects, said arm (16a) being equipped with a pair of nuts (16b); means also being provided for temporarily stopping the slide (5) with respect to the shelves (2) and the special frame with respect to the relevant supporting arms (6).

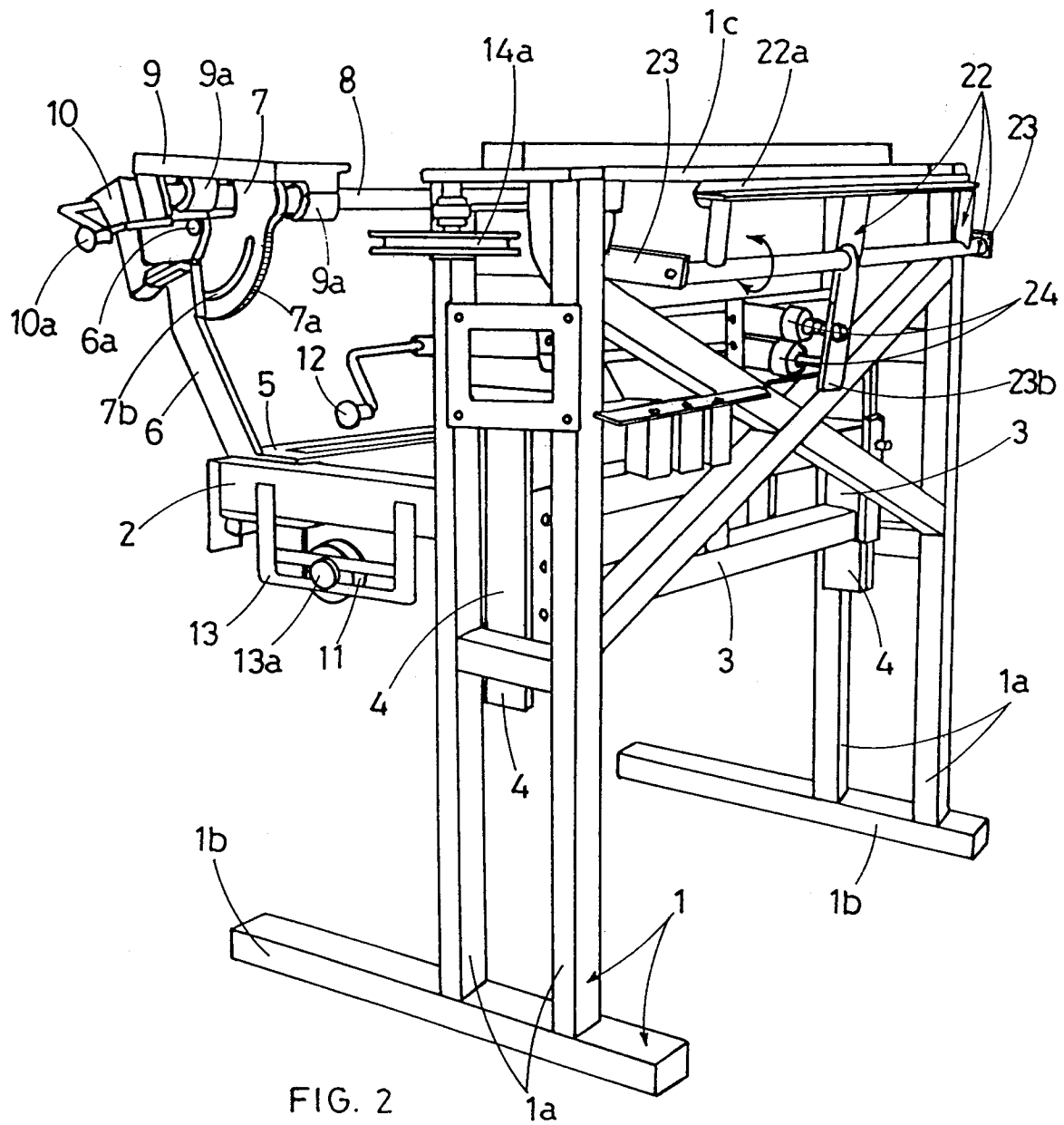
2. A machine according to the above claim characterised in that the two plates (7) have semi-circumference curved perimeter slots (7b) housing a freely sliding retractable pin with enlarged head which is an integral part of a conventional pneumatic clamp (11) fixed on each arm (6) and designed to stably block the head-holder frame.

3. A machine according to claim 1, characterised in that the first slide (3) is operated by means of a crank (12) fitted at the end of a drive shaft (12a) having a horizontal axis, and extending at the front of the support frame (1) bridging the legs (1a) which drives the slide (3) along tracks (4) thanks to driving gears.

4. A machine according to claim 1 characterised in that externally to the shelves (2) there are two brackets (13) having a rectilinear and horizontal slot (13a) housing a freely sliding retractable pin having enlarged head which is an integral part of a pneumatic clamp (11), designed to stably lock the slide (5) on shelves (2).

5. A machine according to claim 1, characterised in that on the back of the upper cross-element (1c) there is a horizontal rod (22a) which is part of a small frame (22) lying on a vertical plane and pivoted idly between an opposing pair of shelves (23), projecting on the back of the framework (1) and fixed on the legs (1a) of the latter; the oscillation of said frame (22) about its pivoting pins being obtained by means of pneumatic cylinders (24) having a horizontal axis mounted on framework (1) and connected to an appendix (23b) of the above frame (22).







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EUROPEAN SEARCH REPORT

Application Number
EP 96 83 0419

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	MACHINES AND TOOLING (STANKI I INSTRUMENTY), vol. 45, no. 4, 1974, MELTON MOWBRAY GB, pages 66-67, XP002033990 AVGUSTOV: "valve lapping machine" * the whole document *	1	B24B15/08
A	FR 2 294 802 A (RICO MEDINA EUGENIO) 16 July 1976 * page 2, line 34 - page 4, line 27; figures *	1	
A	US 1 557 272 A (SCHAEFER) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B24B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 June 1997	Examiner Garella, M
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