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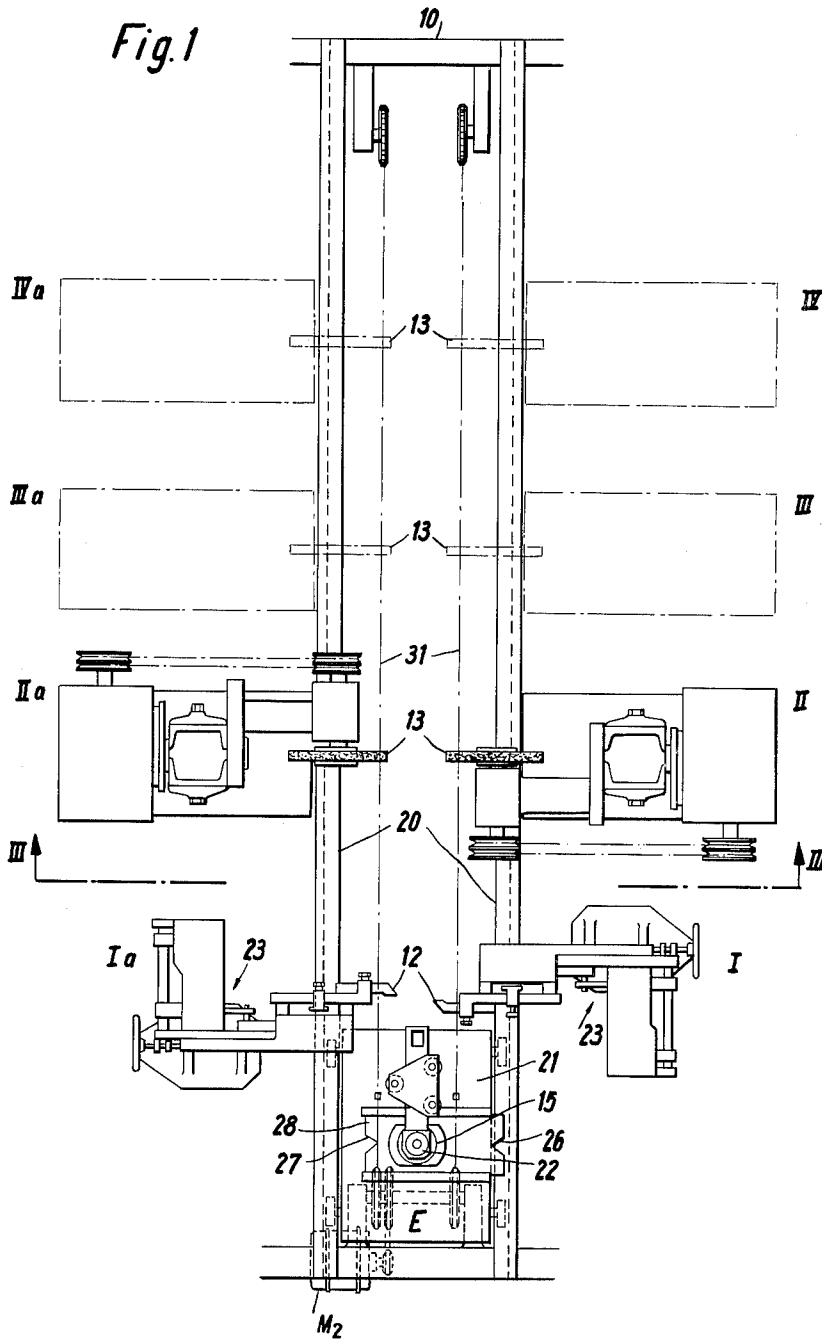
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3,224,022

MACHINE FOR BURRING AND CLEANING WORKPIECES

Filed May 22, 1963

4 Sheets-Sheet 1



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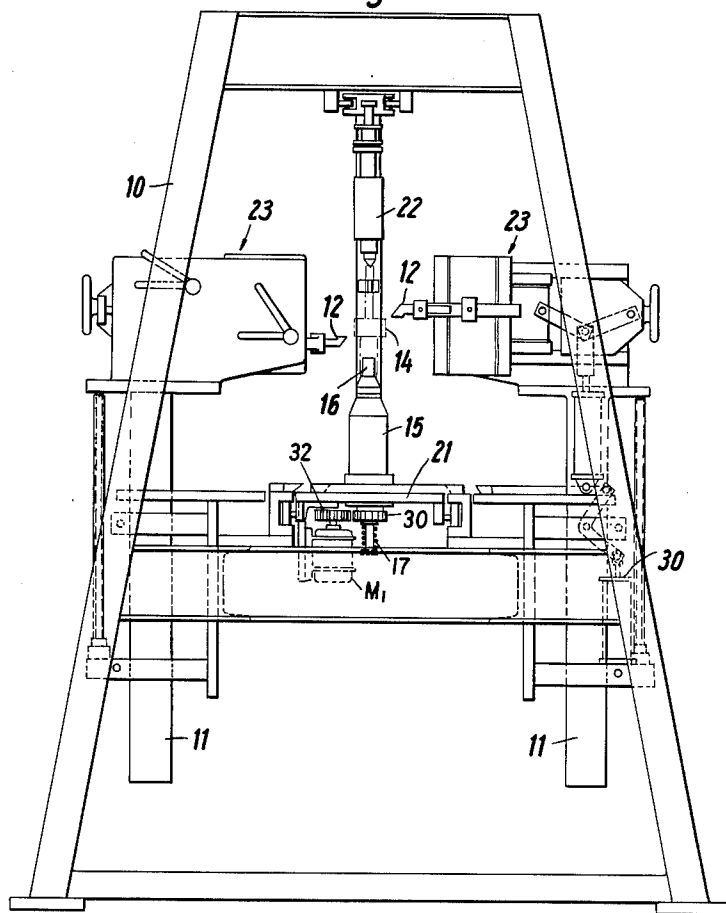
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Fig. 2



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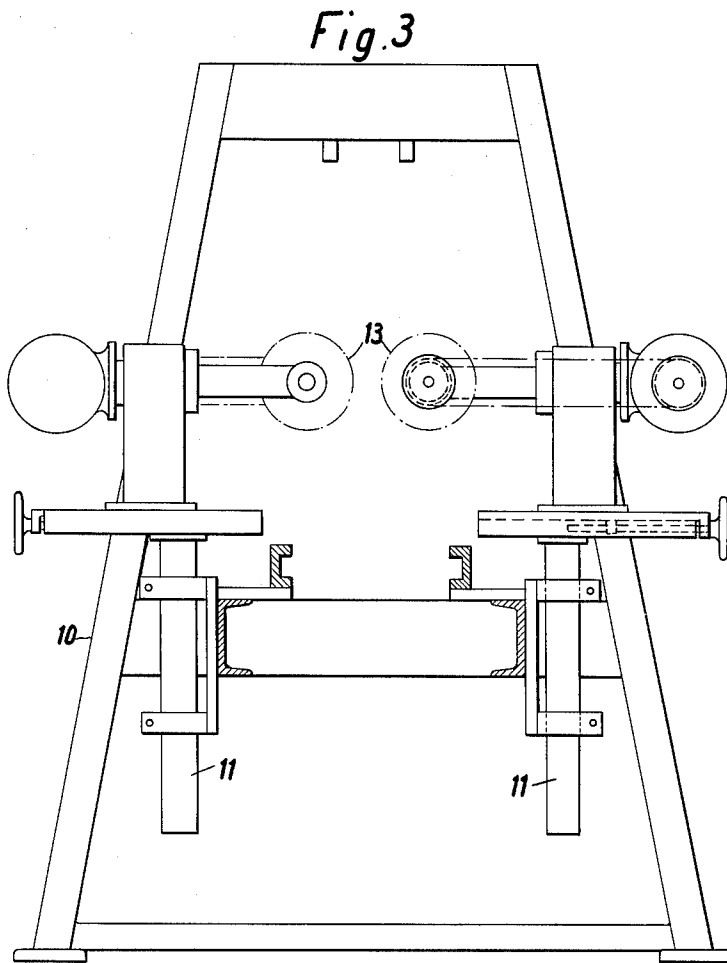
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MACHINE FOR BURRING AND CLEANING WORKPIECES

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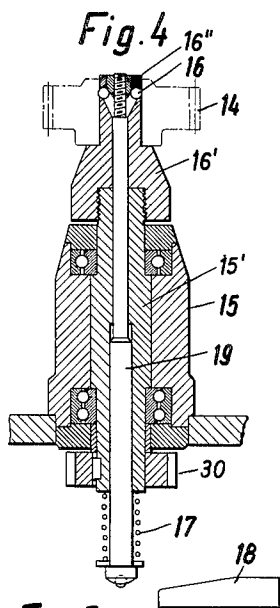


Fig. 4

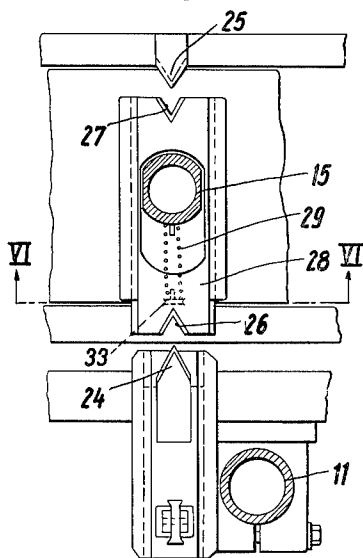


Fig. 5

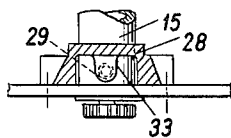


Fig. 6

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**MACHINE FOR BURRING AND CLEANING
WORKPIECES**

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Claims priority, application Germany, May 25, 1962,

K 46,838

7 Claims. (Cl. 15—4)

The present invention relates to a machine for burring and cleaning workpieces, especially gear wheels, pinion spindles, disks, or the like, by means of a plurality of tools, for example, brush rollers, milling cutters, or butting tools. While the workpieces are passed successively to the tools which carry out several successive operations on each workpiece which is mounted on a rotatable clamping fixture, each workpiece is positively rotated, except for a short length of time while it is being mounted in the setup position of the machine. The clamping fixture comprises a device which grips the workpiece under the action of a spring when it is located within the area in which it is worked upon by the tools, while within the area of the setup position the clamping device is released against the action of the spring by a slide rod which then engages with a stationary cam surface.

The known machines of the above-mentioned type have a turntable on the periphery of which the workpieces are rotatably mounted by means of their clamping fixtures. The turntable is intermittently rotated and the individual workpieces are thus passed successively to the different tools. The workpieces are individually rotated by means of a chain drive, except when they are located at the setup point of the apparatus.

These known machines have proved very successful. However, they are intended primarily for a mass production of large factories and are very complicated and of a large size, and therefore also very expensive.

It is an object of the present invention to provide a machine of the type as described above which is of an improved design and of a smaller size and a more simple and inexpensive construction than one of the previous machines, and which is therefore also suitable for use in a smaller factory and is within the means which even a smaller firm can easily afford.

The principal features of the invention for attaining the above-mentioned object consist in mounting the tool along a straight runway in a row behind each other, in providing a carriage with a work-clamping fixture thereon which is movable back and forth along the runway for passing one workpiece at a time to one tool after the other and then back to its original setup position, and in providing the carriage in addition to the work clamping fixture with an arbor support for supporting the upper end of a longer workpiece, for example, a pinion spindle.

Due to these features, the machine according to the invention is of a much more simple and inexpensive construction and of a much smaller size than one of the previous machines of this type. In spite of these facts, the new machine has a very high degree of efficiency.

According to a preferred embodiment of the invention, the tools are mounted at both sides of the runway opposite to each other so that each workpiece may be worked upon simultaneously at diametrically opposite points. This has the advantage that the machine may be made of a very short length and compact construction.

Another feature of the invention consists in providing at least one cutting tool at the first work station of the machine for coarse-burring the workpieces and for compensating minor variations in size, and a plurality of brush rollers at the further work stations for fine-burring and cleaning the workpieces. This arrangement of the tools has the advantage that, since the coarse burr is already removed by the cutting tools and therefore does not have to be removed by the brush rollers, they only need a very short time for carrying out their work and will also last for a much longer time.

The aforementioned as well as numerous other features and advantages of the present invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which:

FIGURE 1 shows a diagrammatic plan view of the apparatus according to the invention;

FIGURE 2 shows a front view thereof;

FIGURE 3 shows a cross section which is taken along lines III—III of FIGURE 1;

FIGURE 4 shows an enlarged axial section of the work-clamping fixture;

FIGURE 5 shows a plan view, partly in cross section, of the carriage when located at the first work position; and

FIGURE 6 is a partial cross section taken along lines VI—VI of FIGURE 5.

The apparatus according to the invention comprises a frame 10 on which a plurality of tools are adjustably mounted on supporting posts 11. The tools to be employed preferably consist of cutters 12 and brush rollers 13, although other kinds of tools may also be used, for example, filing or milling disks. Tools 12 and 13 successively operate on workpieces, for example, gear wheels, pinion spindles, disks, or the like, which are rotatably mounted and fed one at a time to these tools. In the drawings, it is assumed that the workpieces are pinion spindles. One of these workpieces 14 is rotatably mounted on a work-locating member 15 and it is positively rotated during its entire movement through the apparatus by a motor M, as indicated in FIG. 2, except at the setup point E as explained below. While passing through the apparatus, each workpiece is worked upon several times successively by the tools 12 and 13. The work-locating member 15 has an inner member 15' turnably mounted in the outer member 15 by means of roller bearings and the inner member 15' carries at its lower end a gear 30 meshing with a gear 32 fixed to the shaft of the motor M, and on its upper end a chuck or other suitable fixture 16 for holding a workpiece 14. Chuck 16 is of known construction and comprises a member 16' fixed to the upper end of member 15' and having upper portions resiliently displaceable in radially outward direction by downward pressure of the balls, carried by the upper member 16'', on the inclined inner face on the upper portions of member 16'. The upper member 16'' is carried on the upper end of a slide rod 19 slidably guided in a bore of member 15'. Within the area of each individual work position I, Ia, II, IIa, III, IIIa, and IV, IVa, chuck 16 is maintained in the clamping position by the action of a compression spring 17 exerting a downward pressure on slide rod 19. Within the area of the setup position E, however, chuck 16 may be released against the action of spring 17 when the slide

rod 19 engages with and slides up along a cam member 18, as illustrated particularly in FIGURE 4. Tools 12 and 13 are mounted behind each other in two rows above a runway 20 consisting of a pair of rails, and one workpiece 14 after the other is fed in a cadence to the successive tools 12, 13 by means of a carriage 21 which supports the work-receiving member 15 and runs along runway 20 from the station E to the other end of the runway from which the finished workpiece is then returned to the station E where it is exchanged for the next unfinished workpiece.

In the event that longer workpieces 14, for example, pinion spindles, are to be machined, carriage 21 may be connected to an arbor support 22 which is slidable along an upper runway on frame 10 parallel to the rails of runway 20 and is adapted to support the upper end of the workpiece.

Tools 12 and 13 are mounted on both sides of runway 20 opposite to each other at the different work positions I, Ia to IV, IVa. The first work position I, Ia is provided with at least one cutting tool 12 for rough-burring and for compensating small variations in size of the workpiece, while the subsequent work positions II, IIa, III, IIIa, IV and IVa are provided with brush rollers 13 for fine-burring and cleaning the workpiece.

Each side of the first work position I, Ia is provided with a tool carrier in the form of a cross slide 23 for adjusting the cutting tool 12 relative to the workpiece 14 in a manner well known in the art and not forming part of the present invention. The first work position I, Ia is further provided with means for locking the carriage 21 in a fixed position relative to the cross slides 23. These locking means consist of tapered locking members 24 and 25 at both sides of runway 20 which are adapted to engage into corresponding tapered recesses 26 and 27 in the carriage 21 for locking the carriage in a fixed position so that the cutting tools 12 can properly operate on the workpiece.

These locking means are preferably designed so that one tapered locking member 25 is fixed, while the other tapered locking member 24 is slidable in a direction transverse to the runway 20 by means of a two-way hydraulic drive 30 of a conventional type. The tapered recesses 26 and 27 in carriage 21 are provided in a slide member 28 on the carriage which is movable by the slidable tapered locking member 24 against the action of a spring 29 in the direction toward the fixed tapered locking member 25 and until the latter engages into the tapered recess 27 in carriage 21. The spring 29 engages with one end the outer member 15 fixed to the carriage 21 and with the other end a lug 33 (FIG. 6) extending downwardly from the slide member 28 to maintain the latter when not engaged by the locking member 24 in the position as shown in FIG. 5. This preferred construction of the locking means has the advantage that driving means have to be provided for only one of the tapered locking members.

Carriage 21 is moved back and forth along runway 20 by means of chains 31 which, in turn, are driven intermittently in a certain cadence by a motor M₂.

The operation of the apparatus may be controlled electrically in a conventional manner by means of contacts and time-lag relays. The control means do not, however, form a part of the invention and have therefore not been illustrated in the drawings as they would interfere with a clear disclosure of the invention. For driving the brush rollers 13, each of them is driven in a conventional manner by a separate motor. For driving the workpiece, also a separate motor is provided.

Although my invention has been illustrated and described with reference to the preferred embodiment thereof, I wish to have it understood that it is in no way limited to the details of such embodiment, but is capable of nu-

merous modifications within the scope of the appended claims:

Having thus fully disclosed my invention, what I claim is:

1. A machine for burring and cleaning workpieces, such as gear wheels, pinion spindles, disks or the like, comprising a substantially straight runway, a plurality of tools mounted above said runway and respectively arranged in a plurality of work positions spaced from each other in longitudinal direction of said runway, a carriage movable along said runway, a work-locating member rotatably mounted on said carriage, means for rotating said work-locating member at all points along said runway except when located at a setup position near one end of said runway, work-clamping means on said work-locating member and including a work clamping member, at least one spring for maintaining said work-clamping member in work-clamping position and a slide rod slidable within said work-locating member engaged by said spring and connected to said work-clamping member, a stationary cam member disposed within the area of said setup position, said slide rod adapted to engage within said area with said cam member to release said work-clamping means against the action of said spring, and means for moving said carriage back and forth along said runway and for passing a workpiece on said work clamping means successively to said tools.

2. A machine as defined in claim 1, in which said tools are disposed in two rows respectively arranged on opposite sides of said runway and the tools in one row are respectively aligned in a direction transverse to the longitudinal direction of the runway with the tools in the other row.

3. A machine as defined in claim 1, in which the tool of the work position following the setup position comprises at least one cutting tool for coarse-burring the workpiece and compensating small variations of the size thereof, while the tools of the subsequent work positions comprise brush rollers for fine-burring and cleaning the workpiece.

4. A machine as defined in claim 3, further comprising means for temporarily locking said carriage at said first mentioned position relative to said tool support.

5. A machine as defined in claim 4, in which said locking means comprise tapered locking means at both sides of said runway adapted to engage into corresponding tapered recesses in said carriage.

6. A machine as defined in claim 5, in which the tapered locking means at one side of said runway are stationary and secured to said runway and the tapered locking means at the other side of said runway are slidable transversely to said runway, a slide member mounted on said carriage and slidable transversely thereto, said tapered recesses provided in the opposite ends of said slide member, and at least one spring acting upon said slide member and tending to move the same in the direction toward said slidable locking means and out of engagement with said stationary locking means.

7. In a machine tool, in combination, a runway; a carriage movable along said runway; a workpiece locating member fixedly mounted on said carriage; tool means adjacent said runway and having an operating member adapted to act on a workpiece carried by said workpiece locating member when the latter is in a work position in which said workpiece locating member is aligned in direction transverse to the movement of said carriage with said operating member; and means for temporarily locking said carriage on said runway in a position in which said workpiece locating member is in said work position, said means for locking said carriage in said position comprising a slide member mounted on said carriage movable in a direction transverse to the direction of movement of said carriage, said slide member being formed at each of its opposite ends with a tapered recess, a stationary tapered locking member fixed to said runway at one side

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of the carriage and adapted to engage in one of said recesses when said workpiece locating member is in said work position, a second tapered locking member located at the other side of said carriage movable transverse to said runway toward and away said stationary locking member and adapted, when moved, toward said stationary locking member to engage into the other recess and to move said slide member in a direction in which said stationary locking member engages with said one recess, and spring means cooperating with said slide member and tending to yieldably hold the latter in a position in which

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said stationary locking member is out of engagement with said one recess.

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