United States Patent

[11] **3,583,279**

[72] Inventors **Ernst G. Klein**
Siegen, Westfalia, Germany;
Karl H. Roehrs, Bellevue, Wash.

[21] Appl. No. **814,698**
[22] Filed **Apr. 9, 1969**
[45] Patented **June 8, 1971**
[73] Assignee **H. A. Waldrich G.m.b.H.**
Siegen/Westphalio, Germany
[32] Priority **Apr. 13, 1968**
[33] **Germany**
[31] **P 17 52 180.1**

[54] **COMBINED BORING AND MILLING MACHINE**
4 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **90/11,** 90/15, 77/3
[51] **Int. Cl.** **B23c 1/02**
[50] **Field of Search** 90/11, 15, 16; 77/1, 3, 4

[56] **References Cited**

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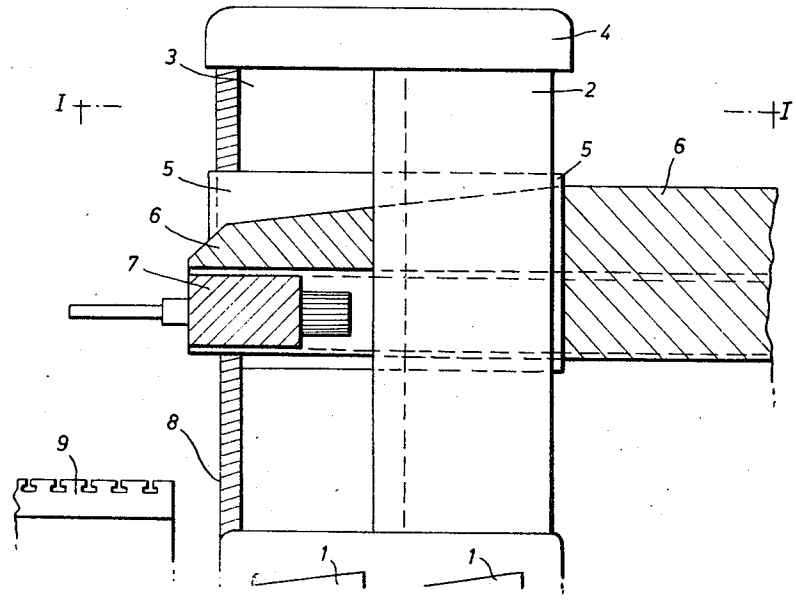
Primary Examiner—Gil Weidenfeld
Attorney—Richards and Geier

ABSTRACT: A combined boring and milling machine has a vertical stand which can be rolled upon a bed, a slide which is movable vertically upon the stand and a transverse arm movable sidewise upon the stand. The machine is particularly characterized in that the stand is constructed as a double stand having inwardly located guides for the slide carrying the movable arm.



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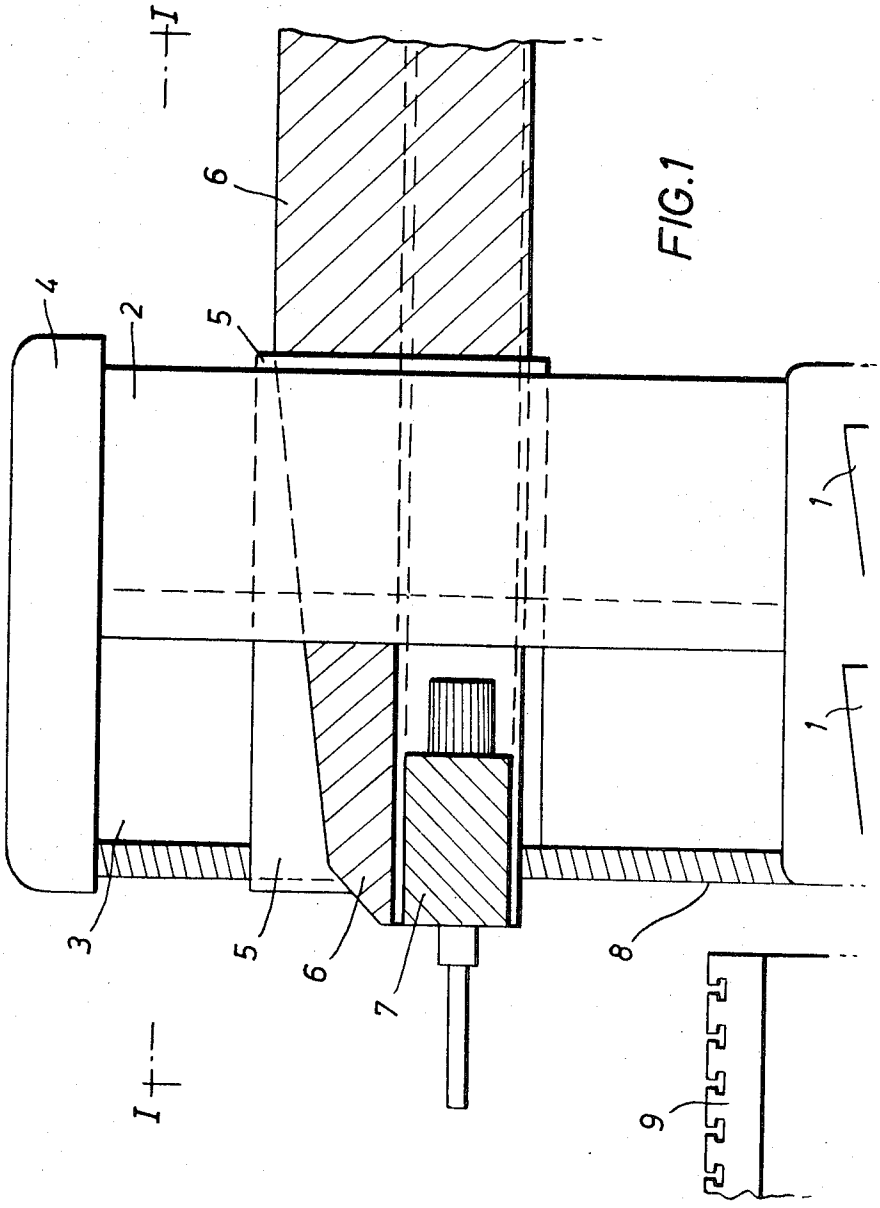

FIG.1

INVENTORS
E. G. Klein and K.-H. Roehrs
BY
Richards & Geier
ATTORNEYS

PATENTED JUN 8 1971

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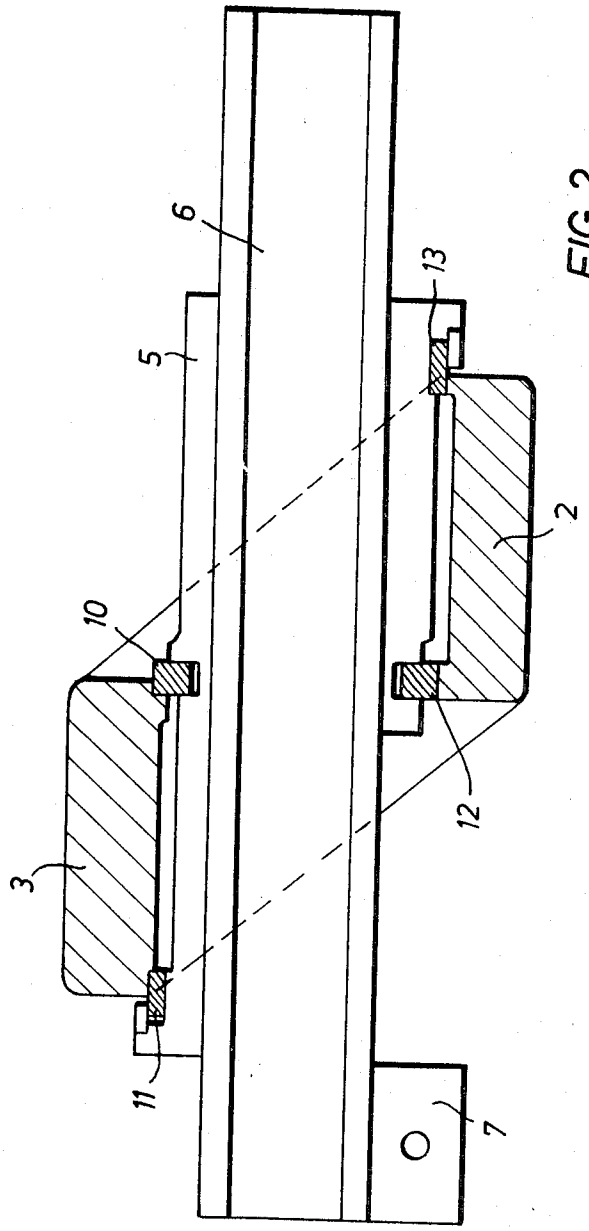

FIG. 2

INVENTORS
E. G. Klein and K.-H. Roehrs
BY
Richards & Geier
ATTORNEYS

COMBINED BORING AND MILLING MACHINE

This invention relates to a combined boring and milling machine and refers more particularly to a combined boring and milling machine having a vertical stand which can be rolled upon a bed, a slide movable vertically upon the stand and a transverse arm movable sidewise upon the slide.

Machines of this type have a torque resulting from forces directed upon the workpiece and related to the stand, which can be quite high, particularly when the head stock is flanged upon the operating end of the transverse arm. The moment of resistance of the stand must correspond to this torque. At the same time it is necessary to provide a precise guiding for the transverse arm.

In existing machines the moment of resistance of the stand is based upon the cross section of a single stand and the extent of movement of the transverse arm is limited to the corresponding width of the stand. This construction is not sufficiently rigid.

An object of the present invention is to improve the rigidity of machines of the above-described type.

Another object is to substantially increase the moment of resistance of stands of these machines for the purpose of improving their rigidity.

Yet another object is to increase the length of the guide for the transverse arms of machines of this type.

Other objects of the present invention will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to construct the stand of these machines as a double stand with the guides for the slide which carries the transverse arm, being located inwardly. An increase in the length of the guide for the transverse arm is attained by shifting the two stands of the double stand relatively to each other in the direction of the feed movement of the transverse arm.

When the stand is constructed as a double stand, the rigidity of this double stand of the present invention as compared to prior art single stands, is increased even if the moment of resistance is the same, to the extent that distortions are eliminated. Furthermore, there is the advantage that the transverse arm is guided upon its both sides, namely, in a more rigid and a more secure manner than heretofore. If the stands of the double stand are shifted relatively to each other in the feed direction of the transverse arm, then according to the present invention the advantage of a double-sided guiding is combined with an increased guiding length for the transverse arm while the total moment of resistance is increased at the same time.

According to one embodiment of the present invention having shifted stands, the slide of the transverse arm is guided by two main guides located at edges of the two stands which extend next to each other as far as the feed direction of the transverse arm is concerned and by two auxiliary guides located at edges of the two stands which are shifted relatively to each other in the feed direction of the transverse arm. Preferably, the two main guides are located opposite each other relatively to the operational movement of the double stand.

If, according to one embodiment of the invention pertaining to a machine with shifted stands, the head stock is flanged upon the side of the stand which is located rearwardly as far as the direction of feed movement of the transverse arm is concerned, then the transverse arm with the head stock can be moved rearwardly to such an extent that it will be possible to work equally well on workpieces which are fixed directly upon the edge of a base plate which is located directly adjacent the front edge of the stand. On the other hand, it is also possible to move the transverse arm further outwardly due to the increased guide length provided by the present invention, while retaining and improving the precision of guiding.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing, by way of example only, a preferred embodiment of the inventive idea.

In the drawings:

FIG. 1 is a diagrammatic side view, partly in section, of a combined boring and milling machine of the present invention, and of a baseplate extending to the front edge of the machine, and

FIG. 2 is a section along the line II–II of FIG. 1.

FIG. 1 illustrates diagrammatically a combined boring and milling machine which is movably mounted upon a bed 1 and which has a double stand consisting of two stands 2 and 3 shifted relatively to each other and a plate 4. The plate 4 is firmly fixed to the top of the stands by any suitable means (not shown). Thus the stands 2 and 3 and the plate 4 constitute a single unit. The stands 2 and 3 are shifted relatively to each other in that they do not extend in alignment with each other but this shifted position does not and cannot change. The unit consisting of stands 2 and 3 and the plate 4 is movable upon suitable tracks (not shown) provided upon the bed 1. A slide 5 is movable vertically upon the stand. The slide 5 carries a transverse arm 6 which is movable sidewise thereon suitable means (not shown). The head stock 7 is connected by flanges to the operational end of the arm 6 at the side of the stand 2 which is located rearwardly as far as the direction of movement of the arm 6 is concerned. The baseplate 9 upon which workpieces to be treated are mounted, extends directly to the front edge of the combined boring and milling machine.

FIG. 2 is a section showing the two stands 2 and 3 of the double stand which are shifted relatively to each other, the inwardly located guides 10, 11, 12 and 13 for the slide 5, the slide itself and the arm 6 which is movable sidewise upon the slide suitable guides and by any suitable actuating means (not shown). FIG. 2 also shows the head stock 7 connected by flanges (not shown) to the operational end of the arm 6 at the side of the stand 2. The two main guides 10 and 12 for the slide 5 are located upon opposed but adjacent edges of the stands 2 and 3 across the path of movement of the slide, while the auxiliary guides 11 and 13 are located upon edges of the stands 2 and 3 which are spaced from each other in the direction of the feed movement of the transverse arm 6. Any suitable means (not shown) may be used to hold the unit consisting of stands 2 and 3 and plate 4 in place upon its tracks. The slide 5 and the arm 6 are prevented from moving after they are positioned by any suitable means well known in the art (not shown).

This construction has the further advantage that the space between the mandrel stock 7 and the main guide 12 can be advantageously used for operating the machine.

We claim:

1. In a combined boring and milling machine comprising a double stand being movable on a bed, said stand double including two spaced vertical columns rigidly connected by a plate member, vertical guide means formed on inwardly located surfaces of each of said columns, a slide located between said columns movably mounted on said guides, an arm supporting a head stock, said arm being transverse to the double stand and carried by the slide and movable horizontally upon said slide.

2. In a machine in accordance with claim 1, wherein the positions of the two columns are shifted relatively to each other in the direction of movement of said arm.

3. In a machine in accordance with claim 2, wherein said stock head connected to an end of said arm and is located adjacent that column which is shifted rearwardly relatively to the other column in the direction of movement of said arm.

4. In a machine in accordance with claim 1, wherein said guides comprise two main guides carried by edge portions of said columns located opposite each other, and two auxiliary guides carried by edge portions of said columns shifted relatively to each other in the direction of movement of said arm.