The invention relates to adapters for grinding form tools and is particularly characterized in that it supplies a rotatable arbor for a flat or surface grinding machine so that the latter may serve as a machine tool with a rotating work spindle.

The invention is designed to provide convenient and readily adjustable operation, to be economically provided and easily applied, and to insure an accurate product.

The annexed drawings and the following description set forth in detail certain means illustrating the improved adapter for grinding form tools, such means constituting, however, only one of the various forms in which the principle of the invention may be embodied.

In said annexed drawings:

Figure 1 is a front elevation of a surface grinding machine with the improved adapter mounted on the work table thereof;

Figure 2 is a side elevation of the surface grinding machine with the improved adapter incorporated therewith, the view being partially in vertical section;

Figure 3 is a plan view of a portion of the top of the surface grinding machine, particularly showing the gearing for effecting vertical adjustment of the grinding wheel;

Figure 4 is a plan view, on an enlarged scale, of the adapter detached from the grinding machine;

Figure 5 is a front elevation of the adapter shown in Figure 4;

Figure 6 is a right-side elevation of the adapter;

Figure 7 is a partial vertical section, partly broken away, and particularly showing the drive for the adapter spindle;

Figure 8 is a vertical transverse section, upon an enlarged scale, partly broken away and partly in elevation, particularly illustrating the relation of the adapter to the grinding wheel and to the table and saddle of the surface grinding machine;

Figure 9 is a vertical axial section of the adapter through the spindle thereof to which the work is secured and by which it is rotated; and

Figures 10 and 11 are side and face views, respectively, of a completed forming tool which has been ground through use of the improved adapter.

Referring to the annexed drawings in which the same parts are indicated by the same respective numbers in the several views, a surface grinder of standard type is indicated by the ordnary "1," which has a work table 2, a crosswise adjustable saddle 3 upon which the table 2 is mounted, a hand wheel 4 for a cross-feed screw 44, and a hand wheel 5 for a longitudinal adjustment drive shaft 32. A bed 6 formed with transverse grooves or ways 48 adapted to be engaged by tongues 35 depending from the saddle 3 provides supports and guides for the cross-feed of the saddle 3 and the work table 2 relatively to the bed 6, and a tongue 53 depending from the table 2 and engaging a way 54 formed in the top surface of the saddle 3 provides a support and guide for the longitudinal movement or reciprocation of the table 2 on the saddle 3.

The adapter which serves to convert the surface grinder into a work rotating machine tool is indicated by the ordnary "11" and is mounted on the work table 2 of the grinder 1 through the medium of T bolts 22 so disposed that the enlarged heads thereof are lowermost and engage a plurality of parallel T-slots 2' formed in the upper part of the work table 2. The upper ends of these bolts 22 are threaded and engaged by nuts which contact the upper surface of the base 21 of the adapter 11, thus clamping the adapter to the face of the table 2. Secured to the upper surface of the adapter base 21 is an angular bracket 43 to the rear surface of whose vertical leg is secured a standard motor 29. This motor is equipped with a gear reducing set 30 from which extends a drive shaft 28 provided exteriorly of the casing of the motor 29 with teeth to form a pinion 28', on the side of the motor casing toward the base 21, which pinion 28' engages a gear 31 mounted in a drum-like housing 31 and enclosed within a cap or guard 50 forming an extension at one end of the housing 31. The gear 27 is secured to a hollow spindle 24 rotatably mounted in a pair of spaced combined radial and thrust bearings 26 within the drum 31 within which and for rotation with which spindle 24 the work shaft 25 is removably mounted, said shaft 25 having an end portion 25' extending outwardly of the drum 31 to which is fixedly secured, by clamping or otherwise, the work or forming tool 13 which is designed to be ground. The adapter drum 31 is seated in and fixed to a saddle 23 which is in turn secured to the adapter base 21.

By standard means forming parts of standard flat grinding machine tools a grinding wheel 12 is mounted on a spindle 41 so as to be vertically adjustable toward and from the work 13 to effect the grinding operation, such adjusting means including a hand wheel 14 to which is secured a shaft 16 having a bevel pinion 16 which engages a bevel gear 17 which has screw-threaded engagement with a vertical screw 18 which is rotatably fixed at its lower end to a head 19 slidably mounted upon surfaces 48 of the grinding tool frame, the head 19 serving as a support for the grinding wheel spindle which is driven, in the
embodiment disclosed, by the grinding wheel motor 47, although a belt or any other conventional means may be used for driving the grinding wheel 12.

For effecting the grinding operation, the grinding wheel 12 is vertically adjusted as is desired and the work 13 fed transversely into the wheel 12 and rotated. A sample of the finished work, detached from the adapter and ground ready for mounting in a screw machine or other machine tool, is indicated in Figures 10 and 11. The grinding wheels 12 are changed or redressed for grinding different surfaces of the work, as is well understood by those skilled in the art. A guard 51 is provided for the grinding wheel 12 and a housing 42 for the bearing of the spindle thereof.

The crosswise adjustment of the saddle 3 and hence of the work table 2 is effected through the hand wheel 4 to which is secured a cross screw 44 journaled at its ends in the bed 6 and having screw-threaded engagement intermediate its ends with a boss 36 depending from the saddle 3. The adjustment of the saddle 3 and table 2 relative to the bed of the grinding machine is permitted by the tongues 35 depending from the saddle 3 and sliding in the ways 49 formed in the bed 6.

The longitudinal adjustment of the adapter, that is, the longitudinal reciprocation of the table 2, which is not used in the application of the invention herein shown and described except for the purpose of locating the center of the work under the grinding wheel, is effected by the hand wheel 5 which is secured to a drive shaft 32 to an intermediate portion of which is secured a drive pinion 33 which engages an intermediate gear 34 which in turn engages a rack 52* integrally formed with flanges 52 secured to the under surface of the work table 2. The intermediate gear 34 is rotatably mounted upon a pin 46 secured in a pair of opposed ears 45 depending from the opposed side portions of the tool saddle 3. Power means for alternatively rotating the shaft 32 in opposite directions and means for selectively connecting either the power means or the hand wheel 5 to the shaft 32 are normally provided and are well known. These parts are indicated in dot-and-dash lines in the accompanying drawings in order to disclose the relation thereof to the parts of the invention herein particularly shown and described. During the longitudinal adjustment of the work table 2, the tongue 33 slides in the way 34 formed in the saddle 3.

It will be readily understood that if clearance is desired on the form tool, to prevent binding of the form tool and the work being machined by the form tool, a cam or any equivalent device tensioned by suitable means such as a spring can be provided within the adapter drum 31 to provide the desired clearance.

The end portion 28' of the shaft 28, shown particularly in Figure 9, and upon which the form tool 13 is to be ground is secured, is sized according to the diameter of the bore of the form tool to be secured thereto. Therefore, for the mounting of the form tools of different sized bores, a plurality of the shafts 28 are provided, each of which has a similar diameter for mounting in the hollow spindle 24, but the portions 28' of which are respectively sized according to the size of the bore of the particular form tool which is to be secured thereto. As above stated, the manner of fixedly securing form tool 13 to the end portion 28' of the shaft 28 is by clamping the same thereon or otherwise suitably securing it.

What we claim is:

1. An adapter, for the conversion of a surface grinder into a machine tool for grinding circular form tools, consisting of a base member provided with means for detachable securing thereof to the adjustable work table of a surface grinder, an angular bracket mounted upon and secured to the base member and having a vertical leg extended upwardly therefrom, a motor secured to the outer face of the vertical leg of the bracket, a shaft driven by the motor and provided with a pinion secured thereto, a saddle member and upstanding from the base member, a drum mounted in the saddle and having an end cap portion, radial and thrust bearings in the drum, a hollow spindle journaled in the bearings, a gear secured to the spindle within the cap portion of the drum and engaging the pinion, a shaft secured to and extended through the spindle and having an end portion extended outwardly of the drum at the end of the latter opposite the cap, the shaft end portion being adapted for engagement in the bore of a circular form tool, and means for securing a form tool to said shaft portion.

2. An adapter, for the conversion of a surface grinder into a machine tool for grinding circular form tools, consisting of a compact assembly having a base provided with means for detachable securing thereof to the adjustable work table of a surface grinder, a drum directly mounted on and upstanding from the base, bearings in the drum, a shaft journaled in the bearings, means for rotating the shaft including a gear secured to the shaft within one end of the drum, and a motor and a gear reducing set directly mounted on and upstanding from the base and having a drive shaft formed with a pinion portion engaging the gear, the first-mentioned shaft having an end portion extended outwardly of the opposite end of the drum and adapted for engagement with a circular form tool, and means for securing a form tool to said extending shaft portion.

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