Nov. 1, 1955 K. SCHULTZE 2,722,212

MACHINE FOR TRUING OR DRESSING GRINDING WHEELS BY REPRODUCTION FROM A PATTERN

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Fig. 1

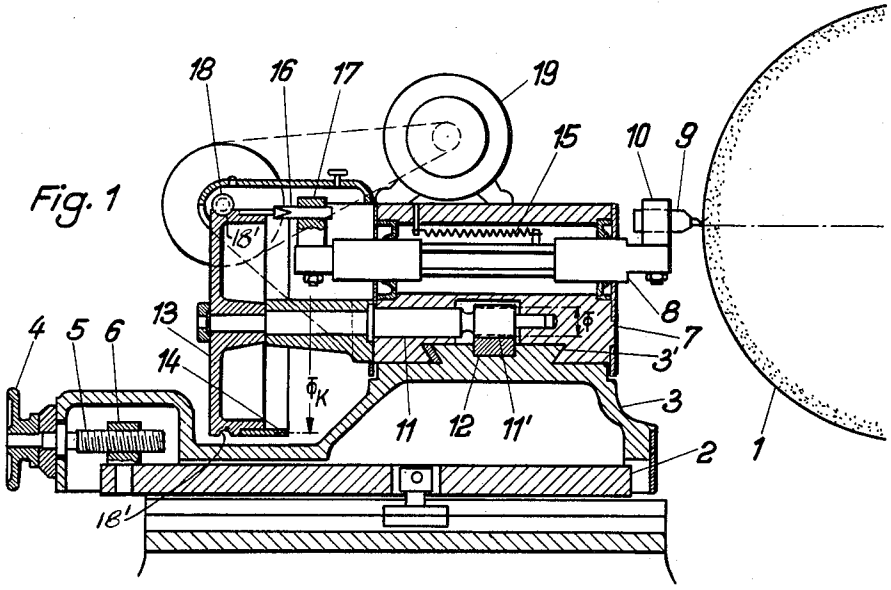


Fig. 3



Fig. 2

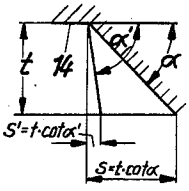
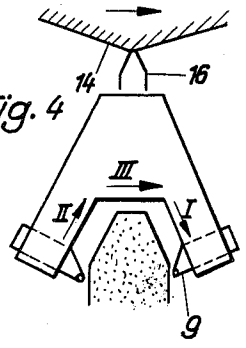
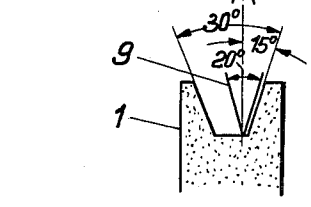


Fig. 4





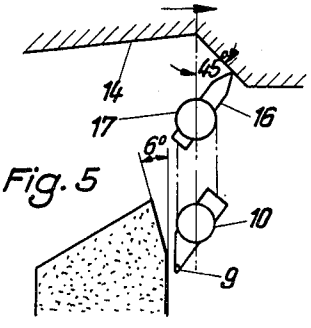
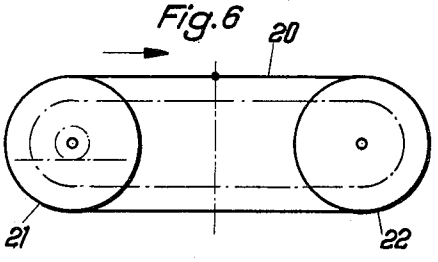


Fig. 5

Fig. 6



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MACHINE FOR TRUING OR DRESSING GRINDING WHEELS BY REPRODUCTION FROM A PATTERN

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5 Claims. (Cl. 125—11)

For shaping grinding discs of grinding machines, especially thread grinding machines, often pattern controlled truing or dressing apparatus must be used. In such machines the diamond carrier is guided in a known manner in the longitudinal (axial) direction of the grinding disc along a thin plane pattern whereby the diamond produces the desired profile of the grinding disc. Such truing devices, however, are not adapted for profiles having a larger angle of inclination than 45°.

It has also been suggested to move the plane pattern in opposite direction to the movement of the diamond carrier whereby the profile of the pattern is extended or stretched in the longitudinal direction and the angle under which the diamond carrier moves upward has a smaller inclination. As, however, the total length of the pattern is limited for want of space the pattern has scarcely been extended for more than according to a proportion of 2:1. The angle of the profile inclination α' depends on the said angle α at which the diamond carrier moves and of said proportion of extension i_1 according to the formula

$$\frac{\cot \alpha'}{i_1}=\cot \alpha$$

Therefore only an angle of profile inclination of about 63° is obtainable with an angle of 45° at which the diamond carrier is moved.

According to the invention a profile inclination angle α' of 5° and less may be obtained with a pattern extended or stretched in a practically obtainable proportion of

$$i_1=\frac{12}{1}$$

and with an agle $\alpha=45°$ at which the diamond carrier moves.

For this purpose, according to the invention, the pattern is curved or curves during its movement suchwise that the pattern which is thus elongated and thereby allows a steeper profile inclination angle remains practically always within the space provided for the truing device.

Many embodiments of the invention are possible. Thus, an embodiment may be chosen in which the pattern is cylindrically curved. In this case suitably a cylindrical drum is used for carrying the pattern, which drum, according to a further feature of the invention, may be attached to the same shaft with the driving element of the longitudinal copying slide.

Another embodiment of the invention consists therein that the pattern is made like a flexible band for the purpose of being able to pass, during its movement, straight and curved paths. The simplest example of this suggestion is an endless band running around two drums arranged in a certain distance from each other. Also in such case one of the drums may be attached to the same shaft with the driving element of the longitudinal slide.

Further on, theoretically the flexible pattern band may

be guided around more than two guiding elements. Instead of, or in addition to cylinders also other bodies having another shape may be used as guiding elements.

For the sake of completness it must be mentioned that it is not required to use always an endless band. In numerous cases it will be sufficient to form the pattern as an elongated body having two ends. It is only essential that the pattern passes during the working through curved paths.

The accompanying drawing shows two embodiments of the invention by way of example.

Fig. 1 is a vertical section through a truing or dressing apparatus according to the invention, the section being taken in a plane rectangular to the axis of the grinding disc.

Fig. 2 illustrates the dependency of the profile inclination angle α' on the angle α under which the diamond carrier moves and on the proportion of extension of the pattern.

Figs. 3–5 show examples of profiles adapted to be trued or dressed, said profiles having an extremely steep angle of inclination.

Fig. 6 shows schematically a flexible pattern running around two guiding cylinders, in the manner of an endless band.

In Fig. 1 the grinding disc to be trued or dressed is designated with the reference numeral **1**. The base plate or lower slide **2** is fastened at the place provided for the truing devices. This lower slide guides the upper slide **3** which may be adjusted in the direction toward the grinding disc by means of a hand wheel **4**, a spindle **5** and a nut **6**. The upper slide **3** is provided with a dovetailed guide **3'** extending in the longitudinal direction of the grinding disc **1** and guiding the longitudinal copying slide **7**. This longitudinal copying slide guides the diamond carrier **8** forming the transverse copying slide and carrying the diamond **9** by means of the diamond holder **10**. In the longitudinal copying slide **7** a shaft **11** of a pinion **11'** is supported, said pinion engaging a rack **12** fixed to the upper slide **3**. The shaft **11** further carries a drum **13** on which the exchangeable pattern **14** is fastened. The pattern **14** made of a band is placed around said drum **13** whereby it obtains a cylindrical shape. The front side of this pattern has a controlling surface provided with grooves or recesses corresponding to the longitudinal extended profile. The spring **15** presses the copying finger or pattern follower **16** against the pattern **14**, the movement being transmitted by the diamond carrier **8** and the holder **17**. The drum is provided with a rim **18'** toothed like a worm wheel and meshing with a worm **18**. By turning this worm **18** the drum **13** and simultaneously the pattern **14** and the shaft **11** of the pinion **11'** is rotated. Thereby the longitudinal copying slide is moved in the longitudinal (axial) direction of the grinding disc while the pattern moves along the copying finger or pattern follower **16** and controls the diamond carrier **8** in the transverse (radial) direction of the grinding disc. In this way the desired profile of the grinding disc **1** is produced. As already mentioned the largest obtainable inclination angle of the profile with a given maximum angle of the curve along which the copying finger slides only depends the proportion of the longitudinal extension of the pattern. The relations are illustrated in Fig. 2.

In this figure **14** designates the pattern, α is the angle of the curve along which the copying finger slides and α' the inclination angle of the profile of the grinding disc. If for a partial profile depth t the length of the path, performed by longitudinal copying slide **7** is equal to S^1 and the length of the path of the pattern **14** is equal to

S then the required proportion of the longitudinal extension of the pattern

$$i_1=\frac{S}{S^1}=\frac{\cot \alpha}{\cot \alpha'}$$

The proportion of the said longitudinal extension i_1 corresponds to the proportion of the mean diameter of the pattern Φ K (Fig. 1) to the diameter Φ of the pitch circle of the pinion **11'**.

The worm shaft **18** may be driven by hand or automatically, e. g. by a motor **19**.

Fig. 6 illustrates another embodiment of the invention. Here an endless flexible pattern **20** is used running around two cylindrical guiding bodies **21** and **22**. One of the cylindrical bodies, e. g. the cylinder **21**, may be attached to the same shaft with the driving element of the longitudinal slide, in a similar way as described with respect to the first embodiment. In this case the second guiding cylinder **22** is driven suitably by this shaft.

What I claim is:

1. A machine for truing or dressing wheels by reproduction from a pattern, comprising: a support, a slide movably mounted on said support for movement in a direction parallel to the longitudinal axis of the wheel to be trued, a shaft rotatably mounted on said slide, the axis of said shaft extending perpendicular to the direction of movement of said slide, cooperating engaging means connected with said shaft and said support for causing a movement of said slide relative to said support upon a rotation of said shaft, a drum secured to said shaft, a band-like pattern mounted on said drum in a cylindrical shape, said band-like pattern having a controlling surface of predetermined shape at one of its edges, driving means connected with said drum, a tool holder reciprocably mounted on said slide for movements towards and away from the wheel to be trued, said tool holder being arranged for carrying a truing tool, a pattern follower connected with said reciprocable tool holder and arranged for cooperation with said controlling surface on said pattern, and means for holding said pattern follower in engagement with said controlling surface.

2. A machine for truing or dressing wheels by reproduction from a pattern, comprising: a support, a slide movably mounted on said support for movement in a direction parallel to the longitudinal axis of the wheel to be trued, a band-like pattern having a controlling surface of predetermined shape extending in the direction of the longitudinal axis of the band-like pattern, at least one cylindrical body rotatably mounted on said slide for rotation about an axis perpendicular to the direction of movement of said slide, said band-like pattern being trained around said cylindrical body, driving means associated with said slide and said cylindrical body for moving same in predetermined relationship to each other, a tool holder reciprocably mounted on said slide for movements towards and away from the wheel to be trued, said tool holder being arranged for carrying a truing tool, a pattern follower connected with said reciprocable tool holder and arranged for cooperation with said controlling surface on said pattern, and means for holding said pattern follower in engagement with said controlling surface, said pattern being in the shape of an endless band and being trained around a pair of cylindrical bodies.

3. A machine for truing or dressing wheels by reproduction from a pattern, comprising: a support, a slide movably mounted on said support for movement in a direction parallel to the longitudinal axis of the wheel to be trued, a band-like pattern having a controlling surface of predetermined shape extending in the direction of the longitudinal axis of the band-like pattern, at least one cylindrical body rotatably mounted on said slide for rotation about an axis perpendicular to the direction of movement of said slide, said band-like pattern being trained around said cylindrical body, driving means associated with said slide and said cylindrical body for moving same in predetermined relationship to each other, a tool holder reciprocably mounted on said slide for movements towards and away from the wheel to be trued, said tool holder being arranged for carrying a truing tool, a pattern follower connected with said reciprocable tool holder and arranged for cooperation with said controlling surface on said pattern, and means for holding said pattern follower in engagement with said controlling surface, and a power drive connected with said driving means for actuating same.

4. A machine for truing or dressing wheels by reproduction from a pattern, comprising: a support, a slide movably mounted on said support for movement in a direction parallel to the longitudinal axis of the wheel to be trued, a band-like pattern having a controlling surface of predetermined shape extending in the direction of the longitudinal axis of the band-like pattern, at least one cylindrical body rotatably mounted on said slide for rotation about an axis perpendicular to the direction of movement of said slide, said band-like pattern being trained around said cylindrical body, driving means associated with said slide and said cylindrical body for moving same in predetermined relationship to each other, a tool holder reciprocably mounted on said slide for movements towards and away from the wheel to be trued, said tool holder being arranged for carrying a truning tool, a pattern follower connected with said reciprocable tool holder and arranged for cooperation with said controlling surface on said pattern, and means for holding said pattern follower in engagement with said controlling surface, said tool being movably and adjustably mounted on said tool holder.

5. A machine for truing or dressing wheels by reproduction from a pattern, comprising: a support, a slide movably mounted on said support for movement in a direction parallel to the longitudinal axis of the wheel to be trued, a band-like pattern having a controlling surface of predetermined shape extending in the direction of the longitudinal axis of the band-like pattern, at least one cylindrical body rotatably mounted on said slide for rotation about an axis perpendicular to the direction of movement of said slide, said band-like pattern being trained around said cylindrical body, driving means associated with said slide and said cylindrical body for moving same in predetermined relationship to each other, a tool holder reciprocably mounted on said slide for movements towards and away from the wheel to be trued, said tool holder being arranged for carrying a truing tool, a pattern follower connected with said reciprocable tool holder and arranged for cooperation with said controlling surface on said pattern, and means for holding said pattern follower in engagement with said controlling surface, said pattern follower being movably and adjustably connected with said tool holder.

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