May 26, 1936. H. PAPST 2,042,018

METHOD OF PRODUCING MIRROR WHEELS

Filed Dec. 23, 1932

Fig.1

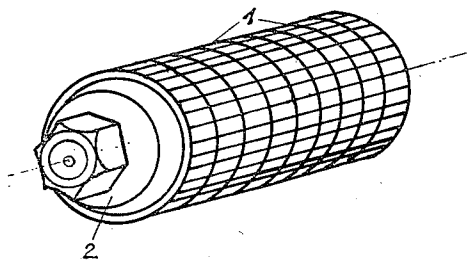
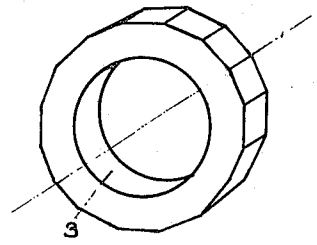


Fig.2



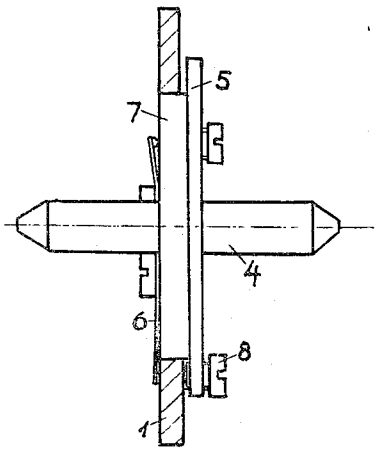


Fig.3

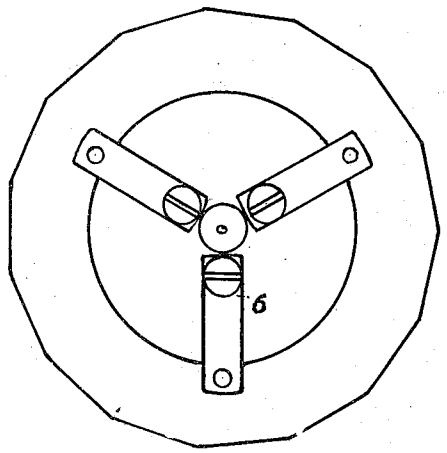


Fig.4

Inventor,
Hermann Papst.
By Sommers & Young Attys.

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METHOD OF PRODUCING MIRROR WHEELS

Hermann Papst, St. Georgen, Schwarzwald, Germany

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In Germany December 23, 1931

2 Claims. (Cl. 29—148)

The invention relates to a method of producing mirror wheels particularly such as are used for dissolving or gathering pictures in the television art.

In prior mirror wheels individual glass mirrors adjustably secured to a wheel body have mainly been used. It has also been proposed to cast mirror wheels in special mirror-metal alloys in accurate moulds and to polish the peripheral surfaces of the cast wheel obtained.

The methods require great care as the accuracy of the angular position of the mirror surfaces must be retained to a fraction of a minute of arc, which requires an average accuracy in the mirror surfaces of within about 0.001 millimeter for a mirror size of only a few square centimetres. The smaller the size of the individual mirror surfaces the more difficult does their adjustment become. On the other hand, even small surfaces cannot be satisfactorily ground flat. All the usual methods of polishing impart a small curvature to the surfaces, especially at the edges. This curvature is due to the fact that the fine grinding medium employed must be used with a liquid. Owing to the adhesive forces, therefore, a wedge-shaped film is drawn between the surfaces, as a result of which the desired accuracy is not attained.

Similar difficulties would arise in the polishing of the previously accurately worked mirror surfaces, because the accuracy previously attained would be lost, whether a rapid polishing process or a slow polishing process were used. It is known that a polishing process should be carried out with a medium which gets finer and finer in successive stages. It appears, however, that the changing of polishing medium while maintaining uniform action on the large number of mirror surfaces is impossible to carry out if the accuracy required for mirror wheels is to be retained. A slow polishing process would increase the accuracy of the previously worked surfaces, but on the other hand such a process would require so much time that it is not practical for reasons of lack of economy.

The present invention relates to an economical method of making mirror wheels of any desired size, and with any desired number of surfaces, preferably in one operation, which combines a planing treatment with an optical polishing process. For this purpose it is proposed to work the mirror surfaces on suitable dividing machines with diamond cutting tools. Hereby only one setting up of the mirror wheel to be worked is required as the dividing machine enables positioning of the mirror wheel so that the mirror surfaces are accurately located with regard to the mutual angular position. In addition to a satisfactory removal of shavings being obtained, the diamond tools are capable of removing very small shavings and therefore leave a polished surface when advanced over the work.

In this way all the requirements as regards accuracy and optical polish are fulfilled in an economical manner. This action is based on the extreme hardness and retention of cutting quality possessed by diamond tools and because no grinding medium is required. The treatment with diamond tools will therefore give mirror wheels of the greatest accuracy in one operation. With a polishing stone, which is preferably a diamond with arched surface, the very small traces of the working left by the advancing of the cutting diamond can be removed.

A further simplification of the manufacture of mirror wheels according to the above method consists in providing a number of mirror wheels placed on a mandrel with mirror surfaces at the same time. In comparison to the rapid working with the cutting tools, the dividing process which must be carried out with the greatest care takes up most time. The work put in on a single mirror wheel can therefore be diminished if several wheels can be adjusted for a cutting operation at one time.

After the above treatment of a number of mirror wheels together, each must be arranged with optical accuracy on an axle. For small mirror wheel discs it is not only necessary to adjust the discs optically but they must also be permanently mounted without being stressed. For this purpose, after centering on the axle, the lateral clamping is effected at three points which transmit the pressure for holding the mirror wheel discs without bending moment to three counter points. A modification may consist in pressing the mirror wheel by means of three fine adjustment screws against a resilient star on the axle, the bearing points of the star being opposite the screws. By adjusting only two screws, it is in this way possible to adjust the mirror wheel to the required accuracy.

The manufacture of mirror wheels according to the above method by means of diamond cutting tools is especially advantageous for metals which are not too hard, and silver or alloys similar to silver are most suitable for this method, as these are the best as regards optical properties. It is, however, just as satisfactory to work a cheaper metal with the cutting tools after

which a thin layer of metal which is optically more suitable. e. g., silver or chromium, can be uniformly applied. It is also possible to apply first, on the mirror wheel body, thick layers of highly reflecting metal and to work the mirror surfaces out of the layers.

After working, the mirror wheel is provided with a coating for protecting against the action of the atmosphere.

In the accompanying drawing Fig. 1 shows in perspective a series of prism or mirror wheel rings which are placed on a substantial mandrel for simultaneous working.

Fig. 2 shows a prism ring in perspective.

Figs. 3 and 4 are side and front views, respectively, of a clamping arrangement for the mirror wheel.

It is clear that the boring 3 of the mirror wheels 1 is comparatively large so that for mass production a large number of mirror wheels may be satisfactorily mounted together on a thick mandrel 2, as shown in Fig. 1. After being mounted as shown, the surfaces of the mirror wheels 1 are formed by cutting with a diamond cutting tool, as described above.

Figs. 3 and 4 show how the mirror wheel disc, after it is completed, is mounted on the running axle without being subjected to stress. On the axle 4 a large hub wheel 5 with a flange and an accurately turned fitting surface 7 is provided. Near the axle 4, pressure springs 6 are secured which, at their outer ends, press the mirror wheel disc 1, which fits accurately on the surface 7, against the adjustment screws 8. The ends of the pressure springs 6 are preferably arranged opposite the screws 8 in order to avoid any stress on the mirror wheel disc. By adjusting only two screws, it is possible to bring the mirror wheel into the desired plane since, as is well-known, a plane is determined by three points. This securing without stress, especially for narrow mirror wheel discs, is indispensable.

The importance of the invention lies more particularly in the fact that the manufacture of useful mirror wheel picture analyzers is thereby placed on a technically satisfactory, and also economical, basis.

What I claim is:

1. The method of manufacturing mirror wheels comprising setting up a wheel body on a dividing machine and cutting the mirror surfaces thereon by slowly advancing diamond tools so as to leave polished surfaces, all of the mirror surfaces being cut with one setting up.

2. Method according to claim 1 and in which small traces of the diamond cutting tool are removed from the work by polishing with a stone.

HERMANN PAPST.