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GEAR WHEELS FOR THE DRIVE OF PLANING MACHINES OR THE LIKE

Filed Dec. 4, 1942

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2 Sheets-Sheet 1

Fig. 1

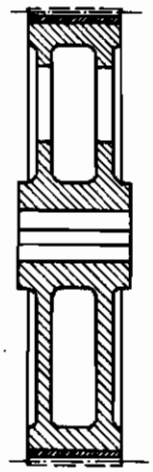

Fig. 2

Fig. 3

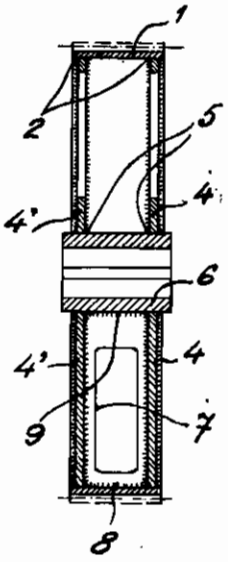

Fig. 4

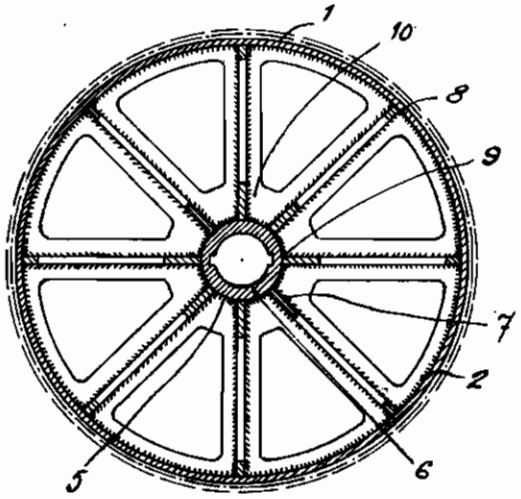

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Fig. 5

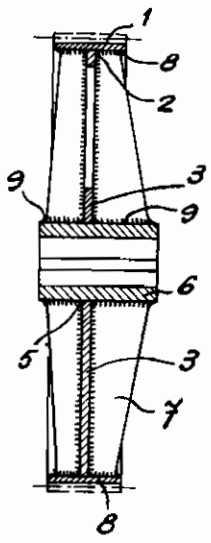
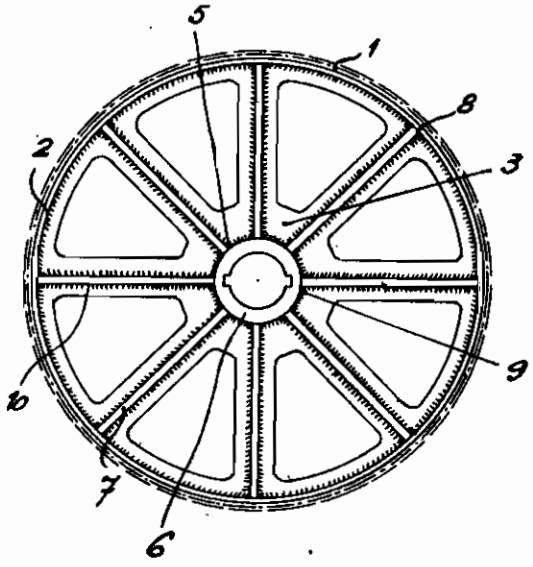


Fig. 6



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ALIEN PROPERTY CUSTODIAN

GEAR WHEELS FOR THE DRIVE OF PLANING MACHINES OR THE LIKE

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When it becomes necessary to make gear wheels of very large size, if they are to work at relatively high speeds, under considerable loads and if their direction of rotation is reversed at full speed, very serious drawbacks are experienced due to the considerable inertia forces that are developed, the energy to be absorbed or to be transmitted being directly proportional to the acceleration and to the mass.

This is for instance the case of wheels made of a molded material (cast iron or steel) which have a very great inertia (due to their size and to their mass) and furthermore which are as a rule more or less unbalanced.

Such wheels have been used up to the present time by the machine makers, in particular for the control and the drive of the tables of planing machines. But, especially in this last mentioned case, with the requirements of modern manufacturing and the use of high-speed cutting-steel which have led to a considerable increase of the cutting and return speeds, very great difficulties are experienced due to the fact that the drawbacks above pointed out involve the following conditions:

(*a*) They reduce the precision of the motion reversing;

(*b*) They increase the time necessary for this reversing and

(*c*) They produce in the circuits of the motor which drives the machine a very important current rise which makes it necessary to increase very much its size, thus further accentuating the inertia of rotor of the motor and also increasing the price of the motor and of the cables thereof, while involving a supplementary consumption of current which constitutes a prominent drawback.

These various drawbacks lead to eliminating more or less important fractions of the work at both ends of the stroke so that it is no longer possible to use the whole of the displacement of the table and relatively long periods of time are lost, which consequently reduces the efficiency of the machine.

Furthermore, the unbalancing of the gear wheels tends to produce vibrations which deteriorate the surface of the piece that is being machined. Finally, the resistance coefficients of molded materials lead to very important modules of the teeth which, combined with defective balancing, makes it impossible to ensure a smooth and continuous drive.

In order to obviate these drawbacks, a solution has already been proposed which consists in welding over a wheel of molded material (cast iron for instance) a ring of high resistance steel. Figures 1 and 2 of the drawings show gear wheels of this kind, Fig. 1 corresponding to the case of a wheel having two webs and Fig. 2 to the case of a wheel having a single web.

However, this solution is far from being perfect. Indeed it permits of obtaining a smoother drive by reduction of the module of the teeth (due to the high resistance of the material which constitutes the ring forced on the molded wheel); but, on the other hand, it does not permit of substantially reducing the diameters since for a given torque, the tangential stresses are inversely proportional to the diameters. Furthermore, the composite wheel thus made is still heavier than the wheel made wholly of cast iron or of molded material. Under these conditions, the above mentioned drawbacks remain in their greater part.

The object of the present invention is to provide a gear wheel the inertia of which is reduced to a minimum and which can be easily balanced.

With this object in view, according to an essential feature of my invention, the gear wheel or gear element includes a rim made of very thin and high resistance steel, welded to sheets of ordinary steel which constitute webs, themselves welded to the hub also made of ordinary steel, stiffening rays being further eventually incorporated in the structure.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described with reference to the accompanying drawings given merely by way of example and in which:

Figs. 1 and 2, as above stated, are diagrammatical views showing known wheels given by way of comparison;

Fig. 3 is a transverse sectional view of a gear wheel made according to the invention, this section being made in a plane passing through the axis of revolution of the wheel;

Fig. 4 is a section corresponding to Fig. 3 but in a plane at right angles to the axis of revolution of the wheel;

Fig. 5 is a sectional view analogous to Fig. 3 but showing another embodiment of the invention;

Fig. 6 is an elevational view corresponding to Fig. 5.

As shown by these drawings, a wheel according to the present invention includes a rim 1, of high-tensile steel, of rectangular section,

which is welded at 2 on a web 3 (embodiment of Figures 5 and 6) or on two webs 4 and 4' (embodiment of Figures 3 and 4), said web, or webs, being made of ordinary steel sheet. On said web, or webs, there is welded at 5 a hub 6 of ordinary steel. Furthermore, in order to eliminate resonance phenomenons, the wheel may be fitted with stiffening rays or frames 7. In the embodiment of Figures 3 and 4, these parts 7 are apertured while in the embodiment of Figures 4, 5 and 6, they are made solid. These rays of frames are also welded at 8 to rim 1 and at 8 on hub 6. They are welded at 10, 9 and 8 to the inner walls of the webs, to the outer surface of the hub, and to the inner surface of the rim respectively.

The combined wheels made as above described may undergo a thermal treatment after welding of the different parts thereof, in order to obtain homogeneity and the desired characteristics of the matter.

The preceding explanations have pointed out the advantages of gear wheels made according to the invention over the gear wheels made prior to this invention, including those having a steel ring forced upon the molded wheel body (Figures 1 and 2) and, of course, the wheels which are entirely made of molded material. These advantages consist chiefly in a reduction of the mass of the wheel and therefore of its inertia. They lie also in the greater facility of balancing the gear wheels thus made.

First, a defect in balancing is less to be feared in a piece which is not obtained by molding, while in the case of molded pieces it is practically impossible to prevent a defective distribution of the matter, due to air pockets, bad molding and other defects.

There is no risk of such a drawback in the case of the wheel according to the invention since the use of molded parts is wholly eliminated. A lack of uniformity in the distribution of the matter could therefore result only from the weldings but, on the one hand, the influence of such unequalities of distribution of the matter is very small and, on the other hand, it can be corrected very easily. As a matter of fact, in view of the relatively low weight of the wheel, very little is necessary for restoring a good balancing while on the contrary, with very heavy wheels such as those of Figures 1 and 2, it is necessary to add relatively great amounts of matter and this in an experimental manner, without having any certainty of reaching the full desired result.

Therefore, to sum up, the wheel according to the invention is of an inertia reduced to the minimum. It is very easy to manufacture. And it can be perfectly balanced.

Of course, the method of manufacturing above described can be applied not only to the wheels shown by the drawing but to any other kind of wheel or even of toothed sector. It might also be used with the same advantages for the manufacture of wheels without teeth, pulleys, etc. and especially when applied to machines having a reciprocating motion.

CHARLES WILLIAM BERTHIEZ.