Patent Application

Wheel Construction

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Background

There are many documents and artefacts to show that wheels used for transportation existed in the ancient times, perhaps as far back as 7000 years ago. The constructions were either a solid disc or a hub with radiating spokes. The tension-spoked wheel, such as used on bicycles, is roughly two centuries old. It is surprising therefore to discover a very simple and practical alternative to the traditional hub-spoke arrangement.

The context here is the wheel as used in transport, and in the following is most easily understood as a horse-age device for light vehicles.

The hub of a spoked wheel has to be heavily built, made from best materials by a highly skilled craftsman and made to close tolerances. This takes time and money. Traditional wheels with compression spokes have very limited shock-absorbing capability which limits speed and requires extremely strong construction.

Invention

The invention is quickly understood from figure 1. Braces span roughly a diameter in one single length, and together they clasp a hub. Many arrangements are possible. Some method is used to maintain a snug interface between the hub and the braces.

Figure 1 shows a transport wheel. Axle 1 may or may not be fixed to hub 2. The hub is a spool with saddles carved into the periphery which are used to locate the braces 4. The braces are attached to the rim 3. Anyone familiar with structures will observe a complex interplay of forces is set up when weight is applied to the axle. It should also be clear that the stiffness of the structure depends on the stiffness of the braces. (In a hub-spoke arrangement a lot of the stiffness comes from the joints. Joints wear and need expert construction and skilled maintenance.)

Figure 2 shows an example straight-brace arrangement. Items labelled 5 illustrate notional methods of fixing braces together, thus obviating the need to fix braces to the hub. If the braces were 'broomsticks' then at the position labelled 6 there would be a semi-circular trough milled out of the edge of the hub for the brace to sit snugly in. (It may be in practice that a bit of give in this interface is beneficial to the overall strains in the system.)

Figure 3 shows braces 4 identically curved to those in figure 1, but now the stresses at the apogee of each brace are applied from the opposite side, reducing outer-edge tensile forces and inner-edge compressive forces. This illustrates how, even with these simple geometries, there are many ways of using the properties of materials to tune the dynamic performance, cost, weight, durability and maintainability of such a wheel. As an example of the latter, suppose we insert a replacement for a broken brace 4. Applying a temporary weight at 9 will make the wheel oval. The new brace can be pegged at 7, and with the hub providing pressure, can be snapped into socket 8 then the weight at 9 released. (The equivalent for a spoked wheel would require time-consuming rim disassembly by a highly skilled wheelwright.) This also serves to illustrate that light and relatively flimsy wheels can be economical if they are simple and cheap to maintain.

Specifically:

1. A number of rim to rim braces are fitted, but not necessarily fixed, tangentially to the hub. The hub and brace will be sculpted so the interface isn't a point-contact.

2. Each brace is a continuous piece of material from one side of the wheel to the other. Braces may be straight or curved. There is no requirement to span an exact diameter.

3. Multiple braces in a symmetrical layout restrict the hub to the central axis. Typically braces will be fixed together close to the hub.

4. The dynamic performance of the wheel depends on the material properties of the braces and chosen geometry. This permits optimising the wheel for resilience and absorbing shocks in the braces, or making the best of the available material.

Figure 1

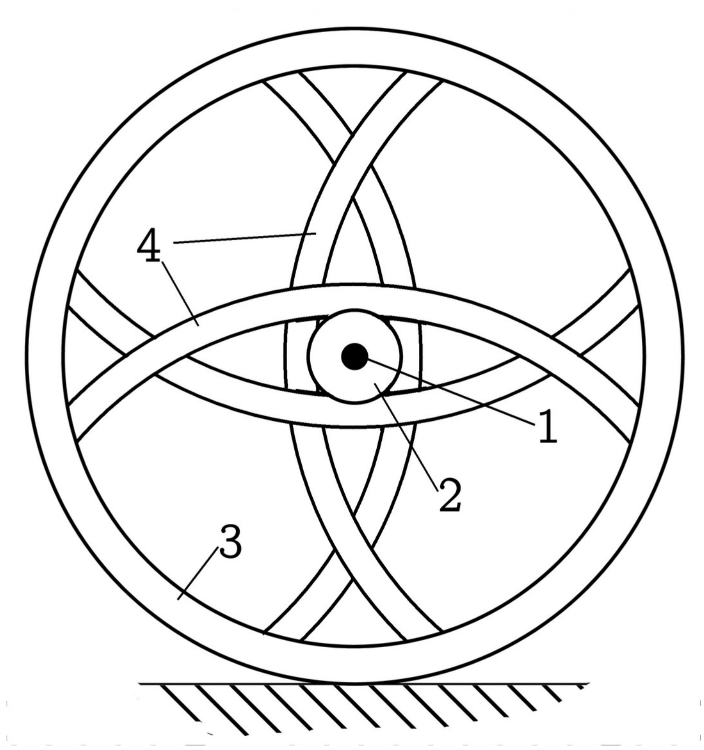


Figure 2

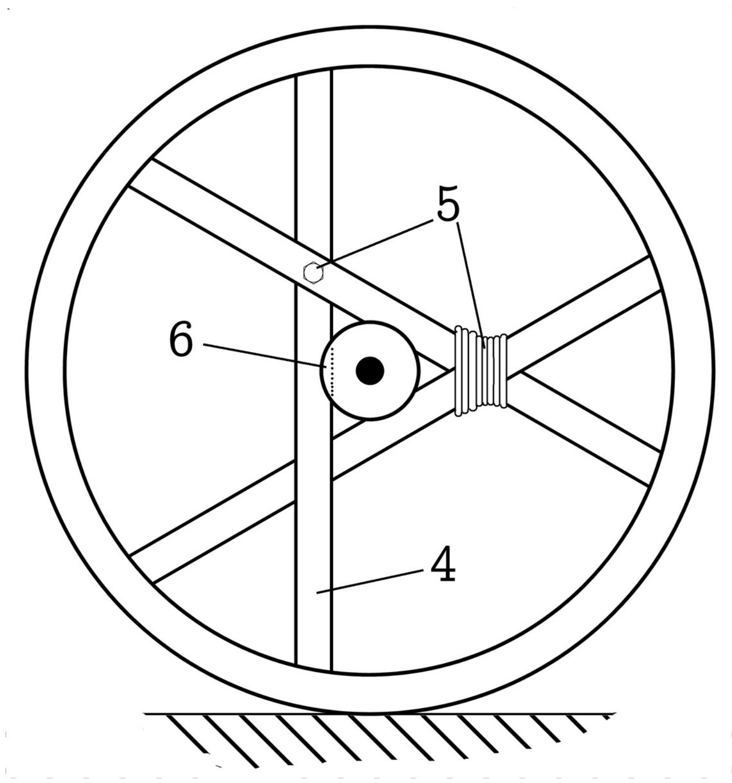
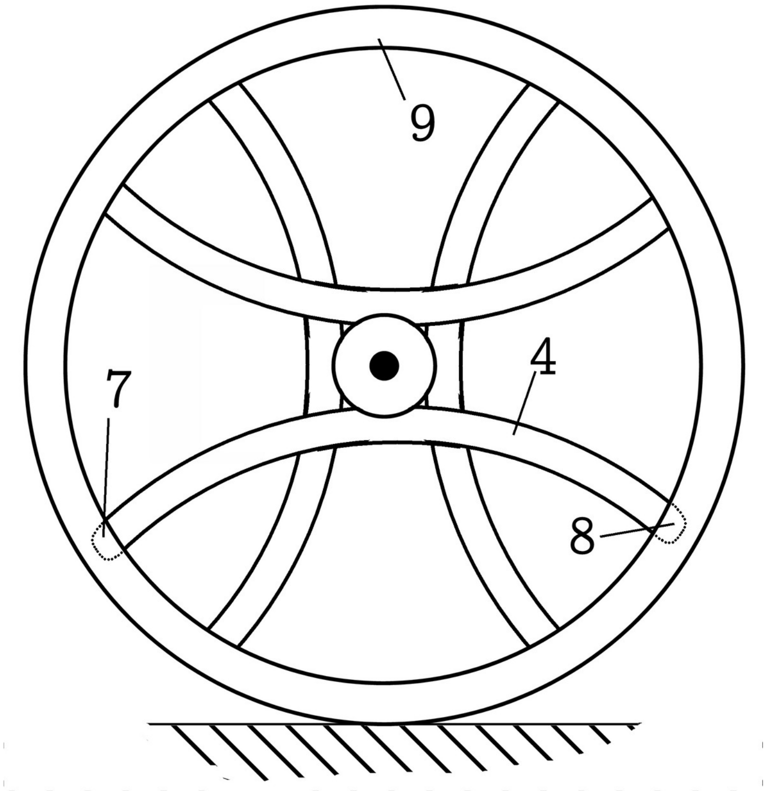


Figure 3



Abstract

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Instead of radial spokes, a wheel is formed of continuous braces 4 'across the diameter'. A number of braces clasp the periphery of a hub 2 without being jointed into it. This reduces the weight, quality of raw material, time, and skill required to manufacture. The material properties of the brace, and rim can be selected to make a wheel with resilience such as might be useful for high speed over uneven ground.

It is a very simple concept, though clearly original and not obvious if no examples exist in the lengthy historical and archaeological record.

Figures 1 to 3 show some out of many possible constructions.

Claim

1.
A wheel where a number of rim to rim braces fit tangentially to a hub.