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 Batten for weaving loom.

 A batten for weaving looms, of the type consisting of a full batten shaft (1) mounted in a bearing, upon which batten components such as batten legs (2), reed beam (3) and reed (4) are mounted, characterized by the fact that the batten is mounted in a bearing such that its oscillatory axis (O - O) runs parallel to the geometrical axis (A - A) of the batten shaft (1) and the gravitational axis (Z - Z) of the whole formed by the batten shaft (1) and the components (2, 3 and 4) mounted thereon, in which the oscillatory axis (O - O) lies outside and the gravitational axis (Z - Z) lies inside the periphery of the actual batten shaft (1) itself.

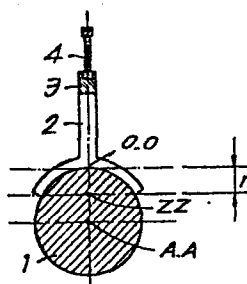


Fig. 2

Batten for weaving loom

The invention involves a batten for weaving looms and also a weaving loom which uses such a batten.

More especially, the invention involves a batten which is not only fitted with the batten legs, the batten beam and the reed, but also has a batten shaft constructed according to the invention as a counter weight.

In particular, the invention involves a batten in which the gravitational axis of the batten, including any counter weight, does not coincide with the oscillatory axis, but lies instead at a certain distance under, and/or is located on the opposite side of the reed from, the oscillatory axis.

In a preferred application, the batten according to the invention is constructed such that together with the aforementioned characteristics, it also exhibits a minimum mass moment of inertia in relation to its centre of gravity or gravitational axis.

Known weaving looms are mainly equipped with a batten consisting of a cylindrical batten shaft mounted in a bearing upon which batten legs, reed beam and reed are mounted. As a result of this, the gravitational axis does not coincide with the oscillatory axis, and the gravitational axis always lies on the side of the reed with respect to the oscillatory axis, which usually

amounts to the gravitational axis lying above the oscillatory axis.

Thus it has often been proposed that the batten should be equipped with counter weights in such a way as to be in accordance with the general principle of equilibrium, which is known from the science of dynamics, according to which the counter weights are fitted to an oscillating body such that the centre of gravity of the overall structure lies at the oscillatory axis thereof.

A well-known application provides a solution in which the original batten shaft is displaced over a fairly large distance with respect to the oscillatory axis by the use of crank webs. Such a construction offers the advantage that the total weight of the batten remains practically unchanged, whereby the displaced batten shaft operates as a counter weight and the batten legs are usually produced hollow so that the total weight of a batten balanced in this way is not greater than that of the unbalanced batten. Such an application is known, for example, from USA patent No. 4.076.048.

Despite having the favourable characteristic of not or hardly increasing the total weight of the batten, such a known construction has the disadvantage that the inertia or the mass moment of inertia around the oscillatory axis increases greatly. Indeed, it is known that when the oscillatory axis of an object oscillating around its gravitational axis is displaced, its inertia increases both in direct proportion to its mass and proportionally to the square of its displacement. Displacing the batten shaft in such a known way causes a consequent substantial and undesirable increase in the mass moment of inertia of the batten, even if the mass is not increased. The aforementioned known solution thus has the disadvantage that the drive torque of the batten is considerably increased.

In a known application, the batten shaft is thus manufactured in a special shape and consists chiefly of a fully cylindrical shaft mounted on an eccentric bearing, in which the gravitational axis of the overall batten lies within the geometrical periphery of the batten shaft. The objective here was not to maintain the same weight, but to achieve the minimum mass moment of inertia around the oscillatory axis. In a particular application, the gravitational axis and the oscillatory axis were made to coincide with the geometrical periphery of the batten shaft.

In both the latter case and that of the aforementioned known application, in which an overall equilibrium occurs, there is practically no horizontal loading of the loom involved, although it has been observed that the vertical forces exerted on the floor under the weaving loom are very large and sometimes inadmissible. Especially in weaving mills where the looms are sited on upper floors, such as in old factory buildings, this can be highly dangerous for the building.

Further research has shown that a better distribution of forces is given by the use of an application in which the centre of gravity of the batten lies underneath the oscillatory axis. A construction of this type will be discussed in greater detail below with reference to a number of variations. More particularly, the distribution of forces in the supporting points of the weaving loom will be shown.

The improvement according to the invention lies in the construction of a batten in which the distance between the oscillatory axis and the gravitational axis is chosen such that the vertical forces in the supporting points of the weaving loom which arise as a consequence of the oscillation of the batten are reduced to zero and only horizontal forces remain.

In a variation of the invention there is a batten fitted in which the distance between the oscillatory axis and the gravitational axis is chosen such that there is a compromise between the values of firstly the horizontal and secondly the vertical components of the forces in the supporting points. This offers the advantage that firstly the horizontal components of the forces are smaller than those in an unbalanced batten and secondly that the vertical forces are smaller than those in the completely balanced case. It is obvious that the forces under consideration here are at all times the forces which are attributable to the movement of the batten.

With a view to better demonstrating the characteristics according to the invention, a number of representative but not exhaustive examples of some preferred applications are discussed below with reference to the accompanying sketches, in which :

figure 1 shows a front view of a batten according to a practical application of the invention ;

figure 2 shows a section through line II - II in figure 1 ;

figure 3 shows the distribution of the most important forces in a weaving loom in which the centre of gravity of the batten shaft lies under the oscillatory axis ;

figure 4 shows a front view of a variation of the invention ;

figure 5 shows a section through line V - V in figure 4.

In figures 1 and 2 can be seen the batten, which chiefly consists of a fully cylindrical batten shaft 1 and a number of batten legs 2 attached onto it which carry a batten beam 3, onto which the reed 4 is attached.

Lines A - A, O - O and Z - Z show the geometrical axis of

the batten shaft 1 and the oscillatory and gravitational axes of the batten respectively, all three axes running parallel to each other. In accordance with the invention, the gravitational axis $Z - Z$ lies underneath the oscillatory axis $O - O$. The beneficial effect created by this is explained below using figure 3. The following will also show the importance of the distance r between the oscillatory axis $O - O$ and the gravitational axis $Z - Z$.

Figure 3 shows a schematic representation of a weaving loom 5 which is fixed onto supporting points 6 and 7. For the sake of simplicity, as indicated in the figure and also the following dissertation, the starting point will be taken as the most representative and simplified model, in which the batten is represented by a point mass m situated at the aforementioned distance r from the oscillatory axis $O - O$ and an inertia around the centre of gravity. For the same reason, the point mass m is shown in its lowest position, so that the instantaneous acceleration due to the rotational acceleration, equal to $r \cdot \alpha$, acts horizontally.

It is clear that when the point mass m is at its lowest position, the oscillatory axis $O - O$, the gravitational axis $Z - Z$ and the geometrical axis $A - A$ are located in a vertical plane in which the moment due to the rotational acceleration, $I \cdot \alpha$, is reacted against by the moment of the force due to the horizontal component of the translational acceleration $m \cdot r \cdot \alpha$ in such a way that they both cancel each other out.

The most important dynamic forces which arise with such a batten moving backwards and forwards and which have to be absorbed in the supporting points 6 and 7 are :

- the horizontal component of the force due to the translational acceleration $m \cdot r \cdot \alpha$;

- the moment which arises due to the rotational acceleration $I.\alpha$, in which I represents the mass moment of inertia of the batten with respect to the gravitational axis $Z - Z$.

These values are obtained from the general theory of mechanics, from which it is known that the forces on a moving body may be considered as being equivalent to the combination of firstly a force which acts through the centre of gravity of the body and secondly a moment with respect to the centre of gravity.

Given the aforementioned moment together with the aforementioned force, the forces directed toward the supporting points may be simply calculated by a known process. The values are thus merely given without further ado in figure 3, and consist chiefly of a horizontal force component :

$$F_h = m.r.\alpha$$

and a directly opposing vertical force component F_v at each supporting point 6 and 7,

$$F_v = I.\alpha/L - m.r.\alpha.Z/L$$

Here the values L and Z represent the distance between the two supporting points 6 and 7 and the height of the mass m above them respectively.

From the foregoing, it may be seen that the forces F_v are composed of two opposite force components, the first of which arises due to the aforementioned moment $I.\alpha$ and the second of which arises due to the moment of the force through m with respect to the supporting points 6 and 7.

The invention thus provides for an application which is completely different from the traditionally balanced batten, in which an attempt is made to minimize the vertical force components F_v and preferably to reduce them to zero, which is achieved by manufacturing the

batten as referred to above, with the gravitational axis $Z - Z$ lying between the oscillatory axis $O - O$ and the geometrical axis.

In a first application, the distance r between the oscillatory axis $O - O$ and the gravitational axis $Z - Z$ is selected such that the absolute values of both components of each of the forces F_v , namely $I.\alpha/L$ and $m.r.\alpha Z/L$, are equal.

As both components are vectorially opposed, consequently each force F_v in each of the supporting points 6 and 7 is equal to zero, since $r = I/m.Z$.

In a second application, the distance r is selected such that, depending upon the desired result, a compromise is created between the values of the vertical force components F_v and the horizontal force components F_h .

It is obvious that, according to the desired result, a craftsman can determine the distance r by a calculation using the foregoing line of reasoning or by conducting comparative tests with a number of battens.

In another application, in order to limit the horizontal force component F_h , in addition to the aforementioned properties the aim is to manufacture the batten concerned in such a way as to minimize the mass moment of inertia I of the gravitational axis $Z - Z$.

The advantage of this is as follows. When designing a batten for a particular weaving loom, the starting point used is a number of previously known parameters, some of which are constant and others of which can be considered as constant. In the same way, if the starting point used is the aforementioned model from figure 3, then the values of the distance L and the angular acceleration can be assumed to be constant parameters. The value of Z

shows little variation in the various designs, and can be considered to be approximately constant.

In the preferred application according to the model of figure 3, the absolute values of the components $I.\alpha/L$ and $m.r.\alpha.Z/L$ are necessarily equal. From this it can be deduced that the product $m.r.\alpha$, i.e. the magnitude of the horizontal force component F_h , is determined by the quotient of I/Z , or that in the event of the value of Z being considered to be constant, the force F_h is proportional to the moment of inertia I .

From the foregoing, it may be seen straight away that in this application of the batten, the aim will be to achieve a minimum mass moment of inertia I in order to hold the horizontal force component F_h to a minimum.

In the application shown in figures 4 and 5, the batten shaft is so constructed as to minimize the mass moment of inertia I of the overall batten with respect to the gravitational axis $Z - Z$. To this end, the exterior surface of the fully cylindrical batten shaft 1 is adjacent to the gravitational axis $Z - Z$. The aforementioned characteristic, whereby the gravitational axis $Z - Z$ lies between the oscillatory axis $O - O$ of the batten and the geometrical axis $A - A$ of the batten shaft 1, is of course maintained.

This last application is constructed with a mass of 112 kg, with the gravitational axis $Z - Z$ lying at a distance (2) of 0.0079 metres from the oscillatory axis $O - O$. The values of L and Z are 1 metre and 0.844 metres respectively. The order of magnitude of the angular acceleration α is 1800 rad/s^2 with a loom speed of 475 revolutions per minute. The moment of inertia of the practical application is 0.75 kg m^2 . The forces $I.\alpha/L$ and $m.r.\alpha.Z/L$ cancel each other out here, and each have a value of practically 1350 Newtons at the speed under

consideration.

The invention is in no way restricted to the applications described and shown in the accompanying sketches as examples, and such a batten may be manufactured in all types of shapes and sizes without extending beyond the scope of the invention.

Claims.

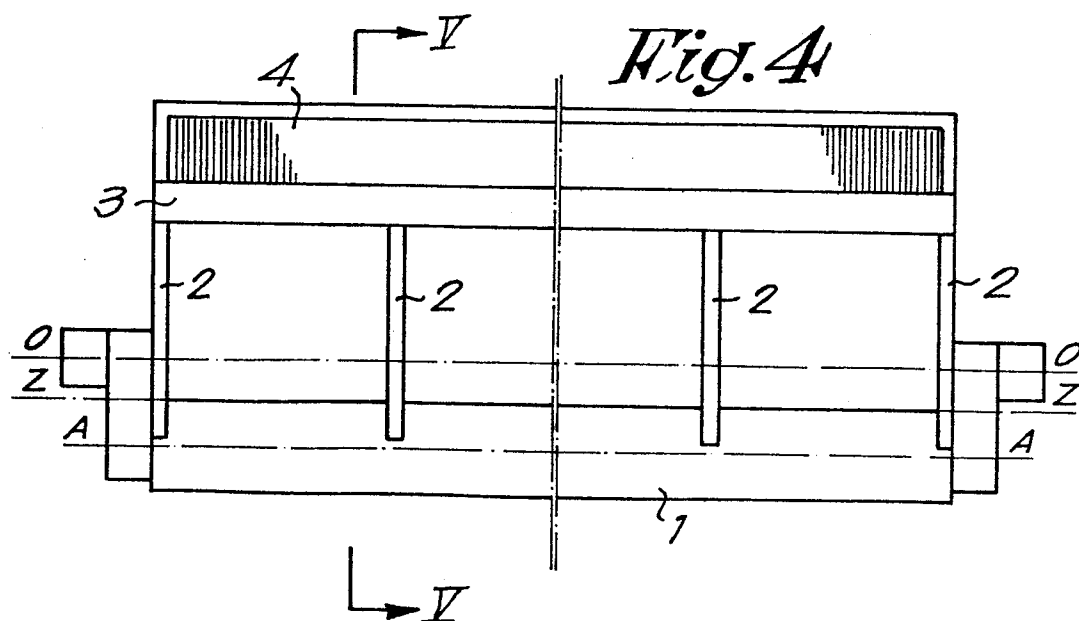
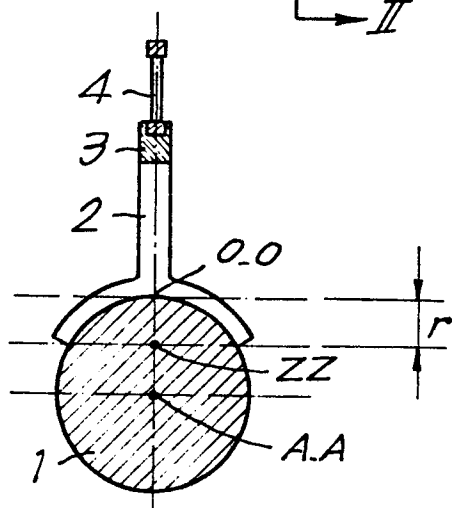
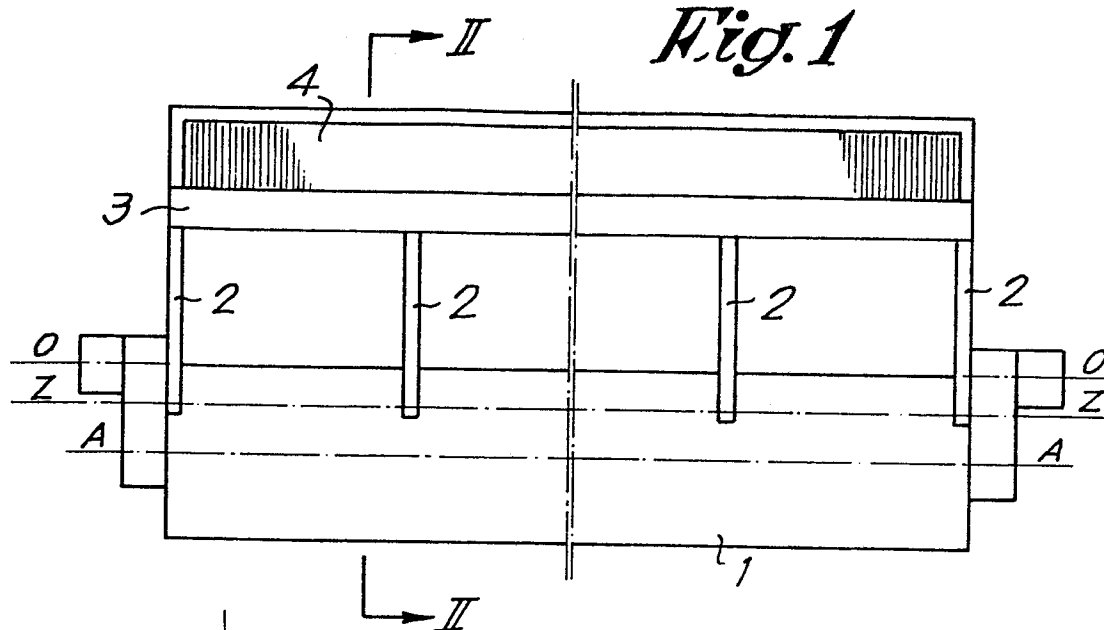
1. A batten for weaving looms, of the type consisting of a full batten shaft (1) mounted in a bearing, upon which batten components such as batten legs, reed beam and reed are mounted, characterized by the fact that the batten is mounted in a bearing such that its oscillatory axis (O - O) runs parallel to the geometrical axis (A - A) of the batten shaft (1) and the gravitational axis (Z - Z) of the whole formed by the batten shaft (1) and the components (2, 3 and 4) mounted thereon, in which the oscillatory axis (O - O) lies outside and the gravitational axis (Z - Z) lies inside the periphery of the actual batten shaft (1) itself.

2. A batten as specified in claim 1, characterized by the fact that the gravitational axis (Z - Z) lies between the oscillatory axis (O - O) and the geometrical axis (A - A).

3. A batten as specified in claims 1 or 2, characterized by the fact that the gravitational axis (Z - Z) lies just on the exterior surface of the batten shaft (1).

4. A batten as specified in any of the previous claims, characterized by the fact that the batten shaft (1) has a circular section.

5. A weaving loom which uses a batten according to any of the previous claims, in which the position of the gravitational axis (Z - Z) in relation to the oscillatory axis (O - O) is selected so that the moment due to the rotational acceleration l is opposed by the moment of the force due to the horizontal component of the translational acceleration $m.r.$ Z such that they both cancel each other out when the oscillatory axis (O - O), the gravitational force (Z - Z) and the geometrical axis (A - A) lie in a vertical plane.



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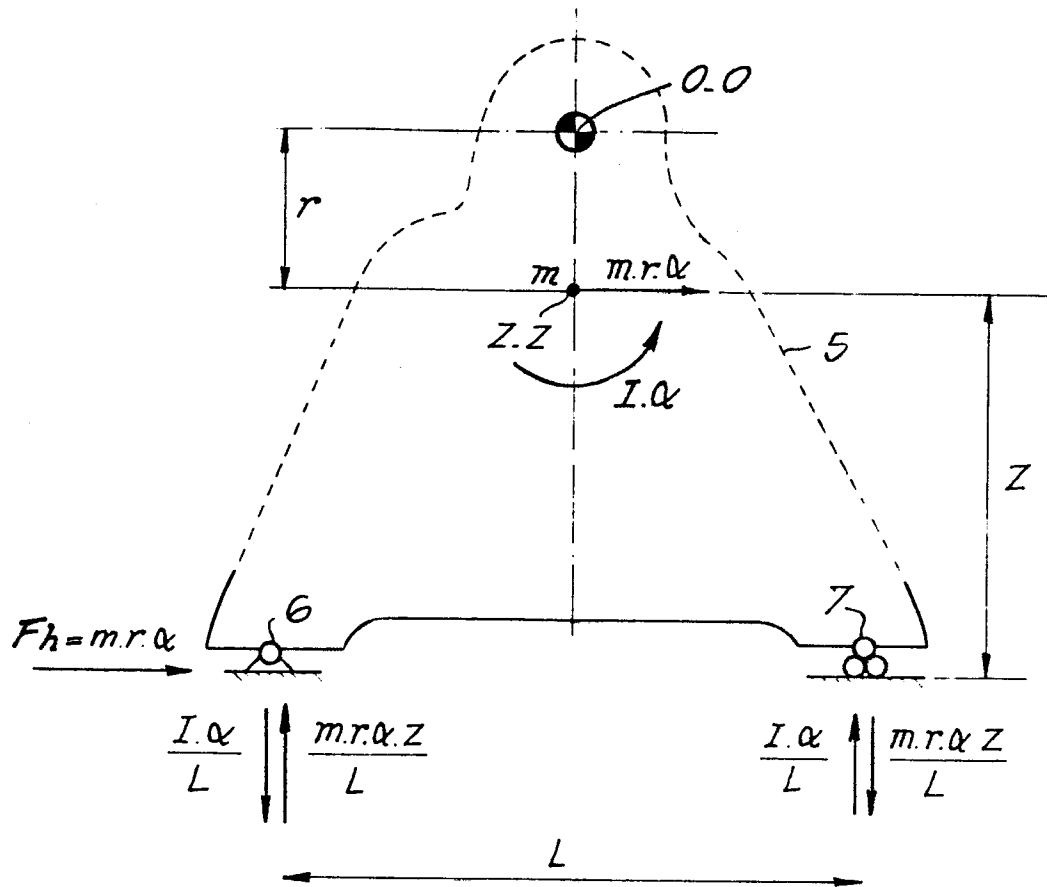


Fig. 3

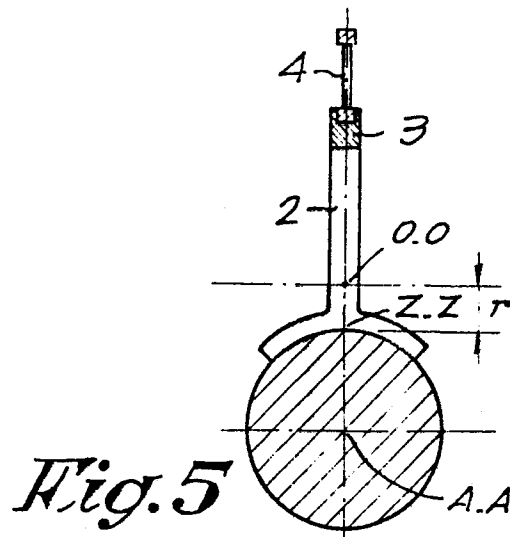


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

0191955
Application number

EP 85 20 1218

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	BE-A- 899 057 (PICANOL) * Whole document *	1-4	D 03 D 49/60
A	--- FR-A-2 326 511 (S.A.C.M.)		
A, D	--- FR-A-2 314 282 (SULZER) & US - A - 4 076 048 -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			D 03 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-05-1986	Examiner BOUTELEGIER C.H.H.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			