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(54) **Batten of a weaving machine**

(57) The invention relates to a batten of a weaving machine comprising a thin-walled hollow body which contains a thin-walled tube (4) and a pair of arms (10) between whose free ends (100) there is a gap (11) for locating the lower stringer (20) of a reed (2) with which the arms (10) are connected by means of bolts (3) into a fixed separable unit, the arms (10) being by their end opposed to their free end (100) fixed to the outer surface of the thin-walled tube (4).

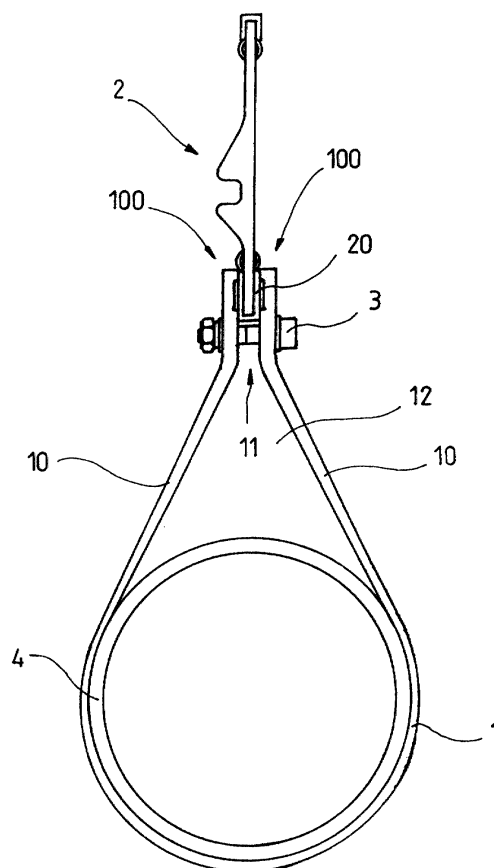


FIG. 1

Description

Technical field

[0001] The invention relates to the batten of a weaving machine comprising a thin-walled hollow body which contains a thin-walled tube and a pair of arms between whose free ends there is a gap for locating the lower stringer of a reed with which the arms are connected by means of bolts into a fixed separable unit.

Background art

[0002] The batten of a weaving machine usually consists of two connected bodies, and more exactly, of a reed and a swinging means on which the reed is mounted and which ensures the reciprocating motion of the reed. In weaving machines, especially in highly productive weaving machines, provision must be taken for fixed and rigid connection of the reed with the swinging means, for easy exchangeability of the reed, and for sufficient torsional and flexural rigidity of the batten.

[0003] In some cases, the above requirements for fixed and rigid connection of the reed with the swinging means are fulfilled to some extent by situating relatively stiff swords on relatively stiff swinging means. The swords carry a heavy and complicated beam seated therein and fitted with a groove into which there is inserted by its lower stringer the reed fixed by a plurality of screws on the length of the beam by which the reed is at the same time leveled. The beam can serve for instance also for the seating of auxiliary jets, of a confusor, or of the guide path of the weft carrier in the shed. The uniformity of the fixing force exerted on the reed by the system of screws situated along the length of said beam is obtained by means of an additional vee strip inserted into said groove in the beam between one side of the groove and the lower stringer of the reed.

[0004] Another used arrangement contains a relatively stiff swinging means fitted with a plurality of relatively stiff swords in which the reed is fixed by its lower stringer. If the distance between the individual swords is chosen in such a manner that the deflection of the lower stringer is negligible, the value of the flexural and torsional deformation of the batten depends exclusively on the rigidity of the swinging means which must resist the action of the load in view of the inertia moment of the whole batten. However, the value of the moment of inertia depends chiefly on the distribution of the mass of the batten in relation to the axis of rotation of the batten.

[0005] For this reason, the drawback of these two solutions consists exactly in the distribution of the mass of the batten in its section since it is in particular the heavy lower stringer in which the reed is seated that has a marked negative influence on the value of the moment of inertia of the whole batten while the contribution of the stringer to the increase in the torsional and flexural rigidity of the batten is minimal. Due to this, the machine

run involves the increase in the value of the forces of inertia resulting in increased load of the beat-up mechanism. Said forces of inertia are transmitted also to various other parts of the weaving machines which are thus also exposed to increased load.

[0006] The drawbacks of these arrangements have been reduced by the solution described in Czech patent No. 278 388 relating to a weaving machine batten consisting of a thin-walled hollow body containing a thin-walled tube out of which two arms reach between whose ends there is a longitudinal groove for the lower stringer of the reed, the two arms constituting together with the lower stringer of the reed by means of screws a fixed separable unity. In this arrangement, a large part of the section of the batten takes part in the increase in the batten rigidity but only very little contributes to the increase in the moment of inertia of the batten. In addition to this, the insertion of the stringer of the reed into the groove and the tightening of screws leads to the closing of the cross section of the thin-walled hollow body and to the increase in its torsional and flexural rigidity. The thin-walled hollow body can be made either of a metal alloy with a high relation strength/specific weight, for instance of dural, or it can be made of a composite material.

[0007] The drawbacks of this arrangement appear in high-speed weaving machines in which the thin-walled hollow body is made of dural since the previously favourable relation strength/specific weight is suppressed in high-speed operation of the weaving machine thus limiting the applicable top operating speed of the weaving machine. The attempts at increasing the strength of the thin-walled hollow body made of dural without increasing its weight have encountered technological problems because the harder dural is the more difficult is its processing and the more difficult it is, consequently, to reach the required precision and quality of the production. Although it is possible to produce a thin-walled hollow body of a composite material which has a more favourable relation between strength and specific weight the thin-walled hollow body according to the CZ 278 388 made of a composite has proved to be apt for production only with difficulties and at accordingly high costs with correspondingly unfavourable price of such a thin-walled hollow body.

[0008] The invention aims to eliminate or at least to reduce the drawbacks of the background art and to achieve a moment of inertia of the batten as low as possible.

Principle of the invention

[0009] The aim of the invention has been reached by the batten of the weaving machine whose principle consists in that the arms are by their end opposed to their free end fixed to the outer surface of a thin-walled tube.

[0010] In this simple way a light but highly load-resisting batten is created, with reduced moment of inertia

while maintaining full resistance against the load acting on the batten during the weaving, and with reduced load acting on the whole weaving machine. The batten arranged in this way shows favourable price and high service life. This solution also permits to produce the individual parts of the thin-walled hollow body with a different goal consisting in that the thin-walled tube is made so as to reach the optimum torsional and flexural rigidity of the whole batten whereas the arms are made so as to obtain the optimum gripping of the lower stringer of the reed by means of bolts and to obtain a low moment of inertia of the batten.

[0011] It is advantageous if the two arms are made as the ends of one open thin-walled body one part of whose length embraces a part of the circumference of the thin-walled tube distant from the gap between the free ends of the arms and the thin-walled body is fixed on the outer surface of the thin-walled tube.

[0012] This arrangement is simple in production, reliable in operation, and reasonably priced.

[0013] For the maximum use of suitable shape strength it is advantageous if the thin-walled tube is made as a cylindrical tube. Such thin-walled cylindrical tube means for the batten only a minimal increase in weight and moment of inertia and considerable increase in its torsional rigidity.

[0014] In one preferred embodiment, the thin-walled tube is made of a composite material.

[0015] In another preferred embodiment, the thin-walled tube is made of steel.

[0016] Each of these two embodiments is simple, reliable in operation and favourable in price, in particular for obtaining a low moment of inertia of the batten at sufficient strength.

[0017] For obtaining as low as possible moment of inertia of the batten at sufficient strength, it is advantageous if the arms are made of a composite material.

[0018] To minimize the weight of the batten it is advantageous if the arms and the thin-walled tube are connected by gluing because glued joints are sufficiently load-resistant and durable and thus meet all the requirements imposed on them.

[0019] For the manufacture of the batten according to the invention it is advantageous if the composite material consists of a fibre reinforcing material in a polymeric matrix. Such composite materials are sufficiently tested and of well established technology of preparation and production so that their application is facilitated.

[0020] It is advantageous if the fibre reinforcing material consists of mutually oriented layers of separate parallel carbon fibres in a matrix of epoxide resin. This specific type of fibre composite material is particularly suitable by its favourable mechanical properties and low specific weight.

Description of the drawings

[0021] The invention is schematically shown in the

drawing in which Fig. 1 is a cross section of a batten with arms made as ends of an open thin-walled body having inserted therein a thin-walled tube, and Fig. 2 a cross section of a batten with a pair of independent arms glued onto a thin-walled tube.

Examples of embodiment of the invention

[0022] In the example of embodiment shown in Fig. 1, the batten of a weaving machine comprises an open thin-walled body 1 having at its ends a pair of arms 10 which get nearer to each other in the direction from the axis of rotation of the batten to their free ends 100, the free end 100 of each of the arms 10 being made as the fixing part of a lower stringer 20 of a reed 2. A gap 11 for the lower stringer 20 of the reed 2 is provided between the fixing parts of the two arms 10. The free ends 100 of the arms 10 clamp the lower stringer 20 of the reed 2 by prestressing the arms 10 by means of a plurality of bolts 3 distributed on the arms 10 uniformly along the whole length of fixation of the reed 2.

[0023] Inserted into the cavity 12 of the open thin-walled body 1 is a thin-walled tube 4 made in this example of embodiment as a cylindrical tube sitting by a part of its outward wall on the inner wall of the single-part open thin-walled body 1. In this area, the open thin-walled body 1 is glued together with the thin-walled tube 4. In this arrangement of the batten, the open thin-walled body 1 serves to ensure optimum clamping of the lower stringer 20 of the reed 2 and to transmit the transverse bending stress while the thin-walled tube 4 serves to obtain optimum flexural and torsional rigidity and to transmit the torsional and longitudinal bending stress acting on the whole batten system. In this example of embodiment, the pins for the rotary seating of the batten in the frame of the weaving machine are suitably seated at the ends of the thin-walled tube 4.

[0024] In the example of embodiment shown in Fig. 2, the arms 10 are separate, and each of the arms 10 is independently glued onto the thin-walled tube 4 from one side of the thin-walled tube 4. Like in the example of embodiment of Fig. 1, the thin-walled tube 4 is made as a cylindrical tube.

[0025] The thin-walled tube 4 is made either of a composite material or of a suitable metal such as steel, and the thin-walled body 1 or the separate arms 10 are made of a composite material or of a light metal. A combination of a composite and a metal is possible.

[0026] The composite material of which the respective batten part can be produced can be for instance a composite material with a fibre reinforcing component seated in a polymeric matrix. For reasons of strength, it is particularly advantageous if the composite material consists of a system of suitably oriented layers of individual parallel carbon fibres seated in a matrix of epoxide resin. In such a case, the value of the specific weight of the composite material is approximately 1,5 g.cm⁻². The fibre reinforcing component can consist of another

fibre type such as kevlar fibres, and the individual layers need not consist of parallel individual fibres but for instance of a suitably oriented woven fabric made of a suitable type of fibres, or the whole reinforcing component can consist of suitably oriented layers of a woven fabric made of a suitable type of fibres. The matrix of the used composite materials need not be polymeric but can be made of another suitable material or even of a metal. It is also possible to make the two thin-walled profiles of the same composite material or of mutually different composite materials.

[0027] Since the mechanical properties of composite materials, and especially of fibre composite materials can be influenced by a specific advantageous orientation of the reinforcing component of the composite material in the individual layers of the reinforcing component (by using the anisotropy of the composite material properties) it is possible to optimize the mechanical properties of each part of the thin-walled profile in relation to the specific expected load. Thus, the properties of each specific thin-walled profile can be relatively simply and easily optimized in relation to the expected load of the batten of the weaving machine in question.

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Claims

1. A batten of a weaving machine comprising a thin-walled hollow body which contains a thin-walled tube and a pair of arms between whose free ends there is a gap for locating the lower stringer of a reed with which the arms are connected by means of bolts into a fixed separable unit, **characterized by** that the arms (10) are by their end opposed to their free end (100) fixed to the outer surface of the thin-walled tube (4).
2. A batten of a weaving machine as claimed in Claim 1, **characterized by** that the two arms (10) are made as the ends of one open thin-walled body (1) one part of whose length embraces a part of the circumference of the thin-walled tube (4) distant from the gap (11) between the free ends (100) of the arms (10) and (the thin-walled body) is fixed on the outer surface of the thin-walled tube (4).
3. A batten of a weaving machine as claimed in Claim 1 or 2, **characterized by** that the thin-walled tube (4) is made as a cylindrical tube.
4. A batten of a weaving machine as claimed in any of Claims 1 to 3, **characterized by** that the thin-walled tube (4) is made of a composite material.
5. A batten of a weaving machine as claimed in any of Claims 1 to 3, **characterized by** that the thin-walled tube (4) is made of steel.

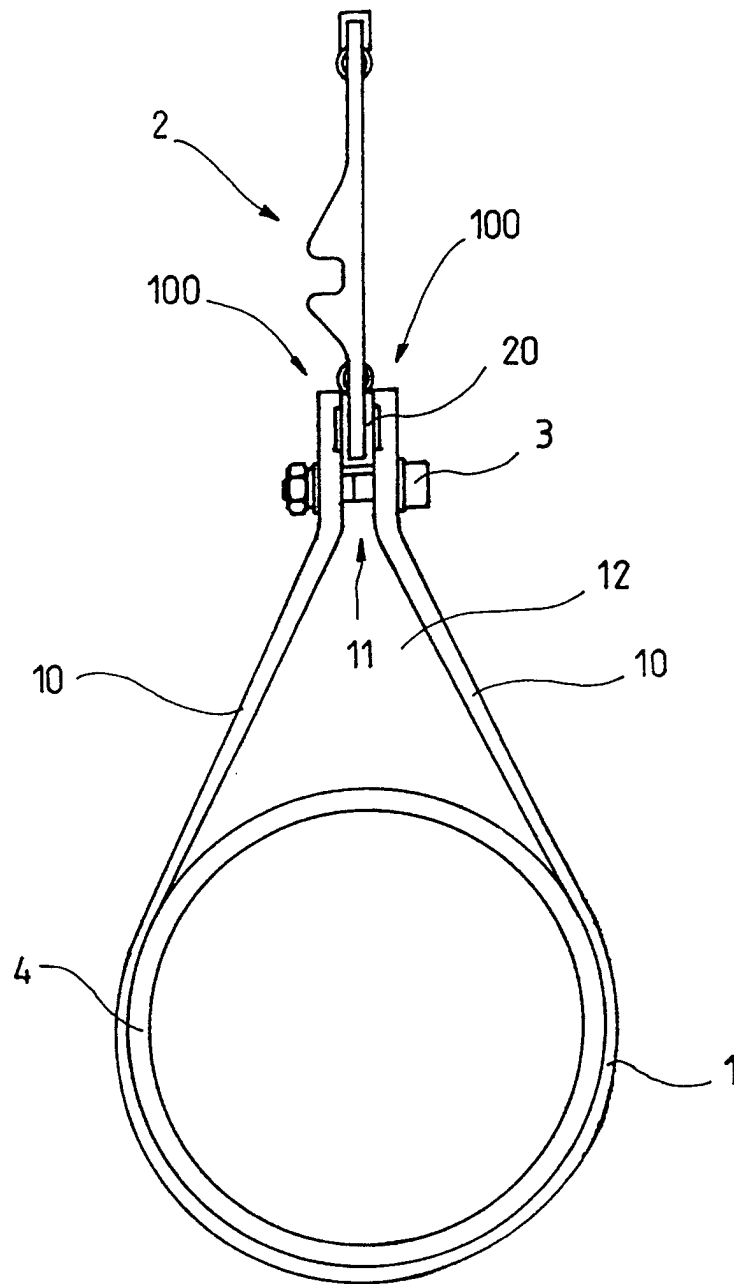


FIG. 1

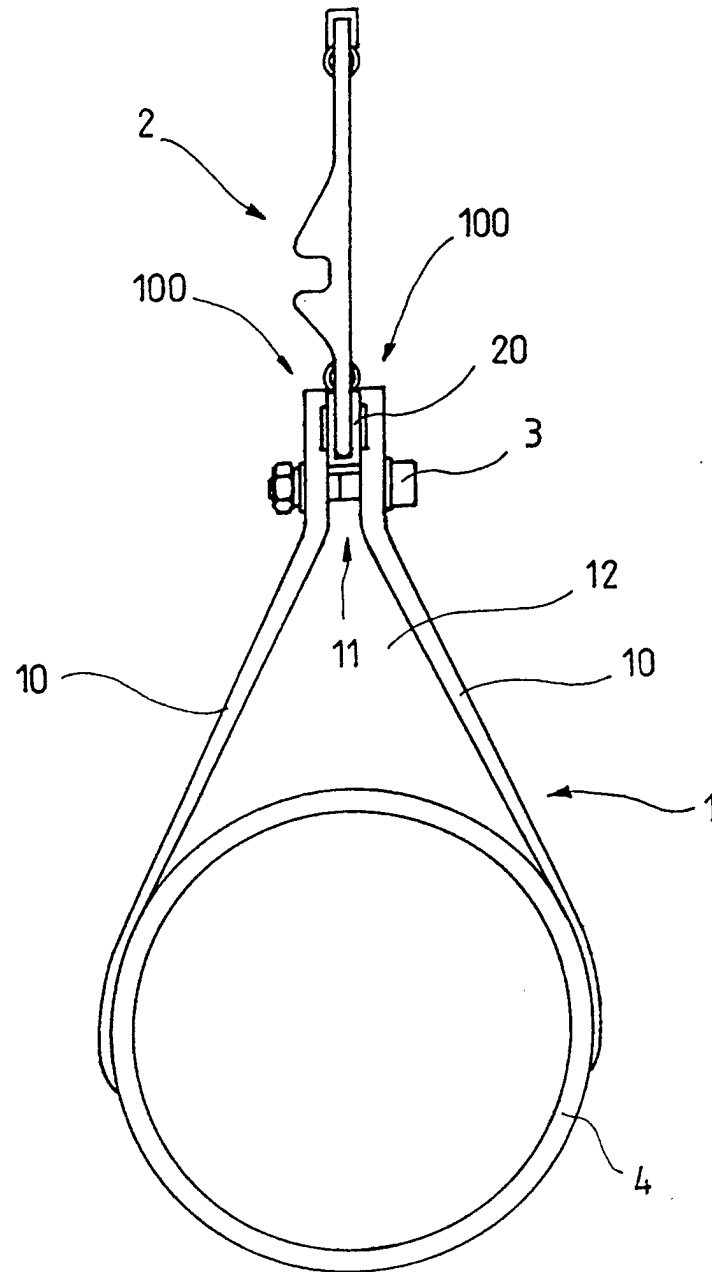


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 11 4447

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) D03D
Place of search THE HAGUE		Date of completion of the search 1 October 2001	Examiner Boutelegier, C
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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