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[54] **LOOM HARNESS**
1 Claim, 2 Drawing Figs.

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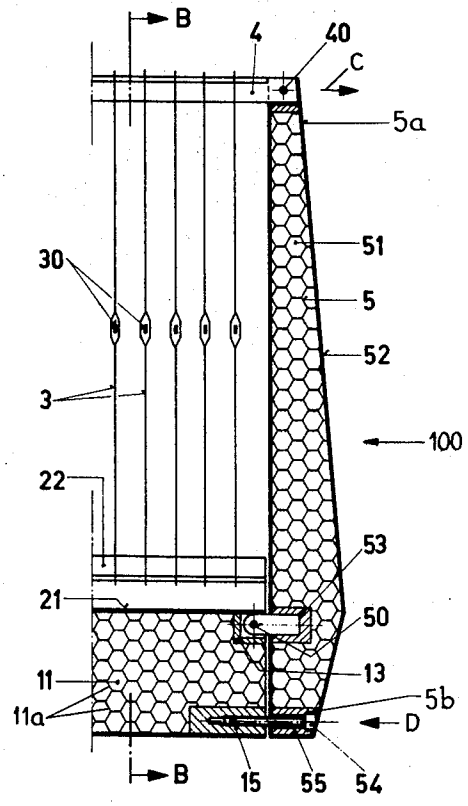
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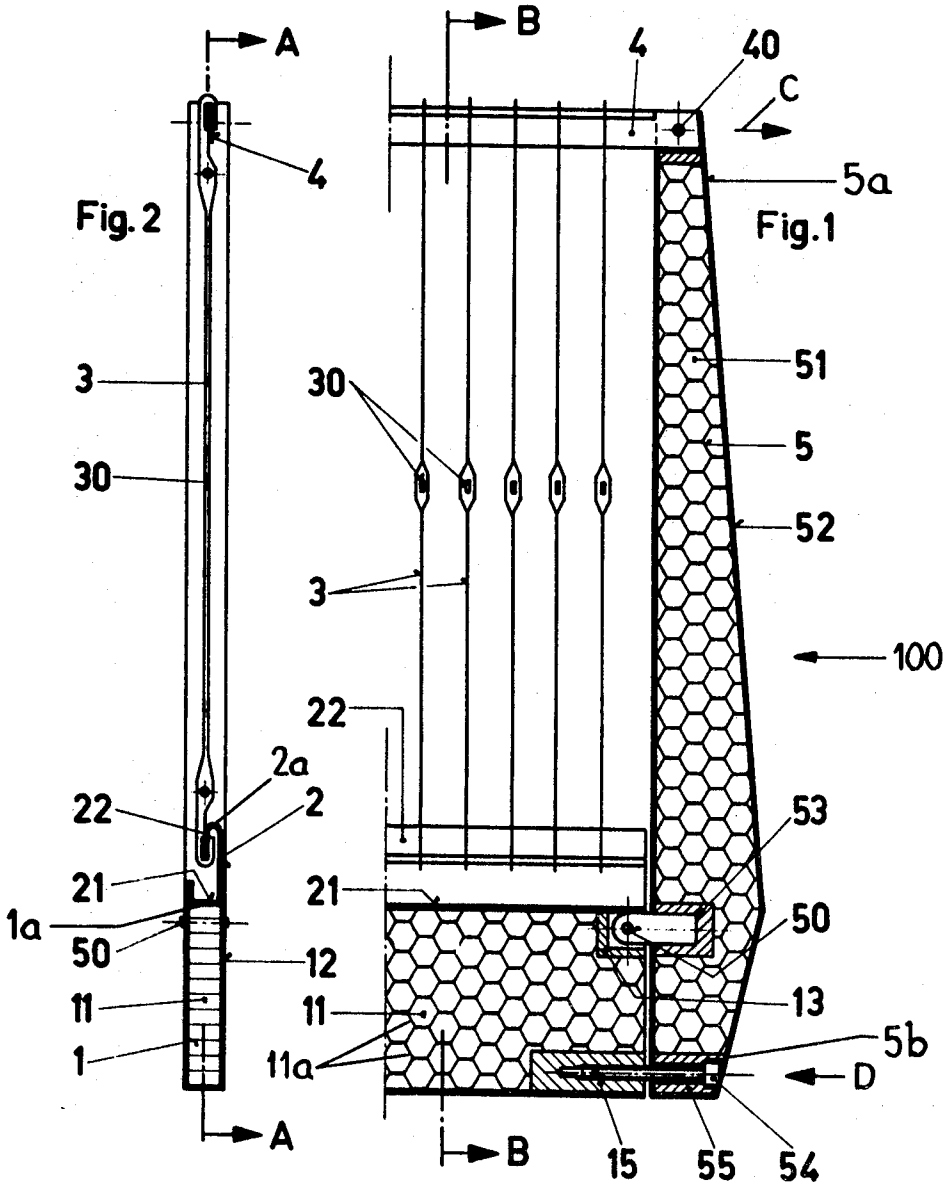
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ABSTRACT: There is disclosed a new and improved loom harness construction comprising a harness frame incorporating a harness beam and a pair of side struts. According to one aspect of the invention the harness beam and, if desired, also the side struts are constructed as respective substantially lightweight composite body members with cellular core and therewith substantially flushly connected shell means. Furthermore there is provided a pair of substantially parallel and spaced heddle support rails carried by the harness frame. The aforesaid pair of side struts extend substantially perpendicular to the ends of the harness beam. One of the heddle support rails is detachably mounted between the free ends of the side struts, and the invention further contemplates the provision of means for applying a lengthwise directed tensional force to the one detachably mounted heddle support rail. The other heddle support rail is inserted at the harness frame near to the bottom or lower region of the side struts.





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LOOM HARNESS

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved harness serving as the carrier or support structure for two substantially parallel and spaced heddle support rails.

Harnesses of this type serve in looms for the raising of an appropriate group of warp threads for the purpose of forming the shed in order to insert the filling or weft. In modern day looms these harnesses are raised and lowered in their plane at high speeds, in other words, at high operating frequencies. Generally, known harness frame constructions practically always consist of two parallel harness beams which are completed by two side struts to form a closed substantially rectangular harness frame. In such prior art constructions both heddle support rails are detachably mounted between the side struts at the region of the harness beams. With the large weaving width and the high operating frequencies which are desired during the operation of modern day looms considerable difficulties exist in keeping the weight of the harness frame low enough so that it does not exceed an impermissible or undesirable value and in maintaining the harness frame and the heddle support rails inserted therein sufficiently rigid or flexurally stiff so that the heddle support rails do not begin to undergo resonance oscillations with impermissible high amplitudes. When this happens the heddles easily can be jolted or ruptured.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide an improved harness construction for looms which effectively overcomes the aforementioned drawbacks of the prior art constructions.

A further significant object of the present invention relates to an improved construction of harness which can be operated the high working frequencies demanded of modern day looms without the danger of damage to the heddles.

Another more significant object of the present weaving fabrics to an improved harness which can be employed for weaving fabrics of large width and operating at increased frequencies without the danger of damage to the heddles due to impermissible resonance oscillations of the heddle support rails, thereby ensuring for less likelihood of interruption in the weaving operation and downtime of the loom.

Still a further very noteworthy object of this invention is to provide a relatively lightweight harness possessing a desired increased flexural or bending stiffness.

Yet a further significant object of this invention relates to an improved harness construction for looms which permits the heddles to be mounted and dismantled in a quick and safe manner, enables the heddles to be used during the shed-forming motions of the harness in a way which ensures for longevity in operation thereof, thereby resulting in less likelihood of damage to the warp threads and downtime of the loom.

Now, in order to implement these and still further objects of the invention which will become more readily apparent as the description proceeds, the harness of the invention serves as the carrier or support for two parallel and spaced heddle support rails. According to the one aspect of the invention it is contemplated that between the free ends of two side struts which extend perpendicular to the ends of a harness beam one of the heddle support rails is detachably inserted while subjected to a lengthwise or longitudinal tension, whereas the other heddle support raid is inserted near the region of the base or root of the side struts. Due to the tension force exerted upon the aforesaid one outer heddle support rail it natural frequency is considerably increased much in the manner of a saw blade or cable. As will be explained more fully hereinafter, it is very advantageous to construct the one harness beam and, if desired, also the side struts as a composite or compound body possessing a cellular core and therewith adhesively bonded shell means, according to conventional construction techniques employed in the aircraft and spacecraft industries. As a result, it is possible to provide especially great structural rigidity, small weight, and appropriately high natural oscillating frequencies. If the inner heddle support rail is connected with such harness beam at as great a number of attachment locations as possible distributed over its entire length, preferably integrated therewith, then also its oscillatory movements will be prevented.

The side struts can be detachably coupled with the harness and constructed as pivotal levers. These side struts are arranged to be pivotably supported at the harness beam via pivot shafts disposed near to the inner heddle support raid, wherein such pivot shafts are directed transverse to the plane of the harness frame. Moreover, such side struts can be connected via tightening screw connection means or the like at their other end with the harness frame in order to produce the desired tensioning force for the outer heddle support rail by tightening the tensioning or tightening screw connection means.

As previously briefly mentioned, a further aspect of the invention contemplates that at least one lengthwise beam of the harness frame carrying the heddle support rails is constructed as a lightweight composite or compound body member with cellular core and shell means connected in flat condition therewith. As a result, the desired high bending or flexural stiffness with small weight can be attained much better than with conventional constructions. It is advantageous if the cellular core is constructed as a honeycombed cellular body, for instance formed from aluminum sheet metal, the sides of which containing the openings are each adhesively bonded with a shell which likewise advantageously is formed of sheet metal. In so doing, the reinforcing and connection components are advantageously anchored and adhesively bonded at the honeycombed core.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein:

FIG. 1 is a fragmentary sectional view of a preferred embodiment of inventive loom harness, taken along the lines A—A of FIG. 2 and serving to explain the construction of such inventive harness; and

FIG. 2 is a sectional view of the harness shown in FIG. 1, taken substantially along the line B—B thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawing, in FIGS. 1 and 2 there is shown a harness structure **100** incorporating a harness beam **1** constructed as a substantially flat beam member according to the previously mentioned well known composite or compound construction principal. More specifically, this harness beam **1** encompasses a core **11** possessing a hollow cellular structure defined by the members **11***a*, preferably formed of honeycomb aluminum sheet metal, and a sheet metal shell **12** flushly adhesively bonded with this core **11**. The sheet metal shell **12** is preferably formed from a high-grade steel allow. Since this harness beam **1** is intended to serve as the actual stability determining primary support element of the illustrated harness **100**, at which there also are applied the forces for raising and lowering such harness during weaving, it is especially advantageous to utilize an adhesive bonding construction technique as is well known in the aircraft and spacecraft industries with a high grade core structure **11** and a metal shell **12** having especially good strength characteristics in order to obtain an extremely high structural rigidity or stiffness with as low as possible spatial weight. Consequently, it is therefore possible to increase the natural frequency of a structure which tends to oscillate, in order to reduce the danger that there will occur undesired high oscillations or extremely high force am-

plitudes or peaks during driving of the harness to perform its periodic motions.

Continuing, it will be recognized that the base or pedestal portion **21** of a steel profile rail member **2** is adhesively bonded, that is, integrally connected with, i.e. made a component part of the harness beam **1**, at the one narrow side **1***a* or this flat harness beam **1**. The protruding head portion **2***a* of this steel profile rail **2** forms a heddle support rail **22** for retaining one end of each of the heddles **3**. The other end of each of these heddles **3** which are of similar construction but oppositely directed, as shown in FIG. **2**, are retained by a second heddle support rail member **4**. The illustrated heddles **3** are punched in conventional manner out of suitable sheet metal. Their heddle eyes for guiding the warp threads are designated by reference numeral **30**. The previously mentioned second heddle support rail member **4** is secured between the free ends **5***a* of two side struts **5** with aid of plug bolt members **40** or equivalent fastening expedients. To simplify the harness illustration in the drawing only one of these side struts **5** has been depicted, but it can be assumed that the other nonillustrated side strut is of similar construction. These side struts **5** are constructed and arranged in such a manner that they exert upon the outer or upper heddle support rail **4** tractional or tensional forces directed towards the outside in its lengthwise direction, as indicated by the arrow C. Consequently, just as is the case when mounting a saw blade or suspending a violin string, here also, it is possible to obtain a considerable increase in the natural frequency of the transverse vibrations or oscillations, provided that during operation resonance frequencies are not themselves induced at the side struts **5** which eliminate the effect of the prestress of the heddle support rail **4** during the critical operation conditions. In order to prevent such, and as shown in the drawing, the side struts **5**, similar to the harness beam **1**, are also formed according to the lightweight compound or composite construction technique with a honeycomb core **51** and a sheet metal shell **52** adhesively bonded therewith.

A respective reinforcing element, here in the form of support body member **53** is adhesively bonded to the honeycomb core **51** and forms a protruding flange means which is operably connected, with a respective reinforcing support body member **13** adhesively bonded at the honeycomb core **11** of the harness beam **1**, by means of an associated pivot bolt or hinge shaft **50** in such a fashion that the side strut **5** is pivotable about this hinge shaft **50** which is disposed transverse to the plane of the harness. It is important that the hinge shaft **50**, serving for the pivotable connection of the associated side strut **5** with the cooperating end of the harness beam **1**, be arranged near the narrow side of the harness beam **1** which is connected or integrated with the heddle support rail **2**.

The lower respective end **5***b* of the side struts **5** are each operatively connected by a respective tensioning bolt or screw connection **54**, or similar fastening device, with the harness beam **1** in such a manner that they can be pulled, in the direction of the arrow D, towards the end surface of the harness beam **1**, and, therefore, at their outer free ends **5***a*, connected with the upper heddle support rail **4** by the transverse plug bolts **40**, apply an outwardly effective tensional force C. In order to absorb the traction or tensional forces which are generated by tightening the bolts or screws **54**, there are advantageously provided the reinforcing support body members **55** and **15** which are inserted in the associated side strut **5** and harness beam **1**, respectively.

In order to exchange the heddles or heddle wires **3** at the harness or harness frame **100** it is possible to remove each of the side struts **5** by loosening the tensioning screws **54** and by removing the plug bolts **50** and **40** from the harness **100** so that the now free end faces of the harness support rails **22** and **4** can be connected to a suitable heddle exchange mechanism.

If desired, it would also be possible to consider the side struts **5** as connected as one piece with the harness beam **1** and sufficiently resilient so that the heddle support rail **4** which is to be mounted between their free ends can be inserted with the aid of tensioning screws or clamps in order to inwardly bend or flex the side struts **5**, thereby producing the necessary tensioning force for the heddle support rail. In this case, the one end of both heddle support rails **4** and **22** must be released from the side strut and the harness beam, respectively, and bent somewhat out of the plane of the harness **100** so that the heddles **3** can be pushed onto the heddle support rails and removed therefrom.

It should be apparent from the foregoing detailed description that the objects set forth at the outset to the specification have been successfully achieved.

What is claimed is:

1. A loom harness construction comprising a harness frame incorporating a single harness beam and a pair of side struts, a pair of substantially parallel and spaced heddle support rails carried by said harness frame, said pair of side struts extending substantially perpendicular to the ends of said harness beam, each of said side struts having a free end, means for detachably mounting one of said heddle support rails between said free ends of said side struts, means for applying a lengthwise directed tensional force to said one detachably mounted heddle support rail, the other heddle support rail being inserted at the harness frame near to the bottom region of said side struts, at least one of said side struts being constructed as a pivotable lever, means for pivotably supporting said one side strut at said harness beam, said pivotably supporting means including pivot shaft means disposed substantially transverse to the plane of the harness frame and arranged near an end of said harness beam confronting said pivotably supported side strut, and wherein said means for applying said lengthwise directed tensional force to said one heddle support rail incorporates tensioning bolt connection means for operably connecting an end of said pivotable side strut at a region remote from its free end with said harness beam, so that upon tightening said tensioning bolt connection means it is possible to produce an appropriate tensioning force upon said one heddle support rail.