United States Patent [19]

Heller

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[54] **HARNESS FRAME SUPPORT ROD POSSESSING INCREASED BENDING STRENGTH**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 854,146, Aug. 29, 1969, abandoned.

[30] **Foreign Application Priority Data**

Sept. 13, 1968 Switzerland 14224/68

[52] **U.S. Cl.** **139/92**
[51] **Int. Cl.** **D03d 9/00**
[58] **Field of Search** 139/82, 91, 92; 211/123

[56] **References Cited**

UNITED STATES PATENTS

2,674,237	4/1954	Blickenstorfer	139/92
3,412,762	11/1968	Goodman et al.	139/92
3,604,469	9/1971	Schneiter et al.	139/91

FOREIGN PATENTS OR APPLICATIONS

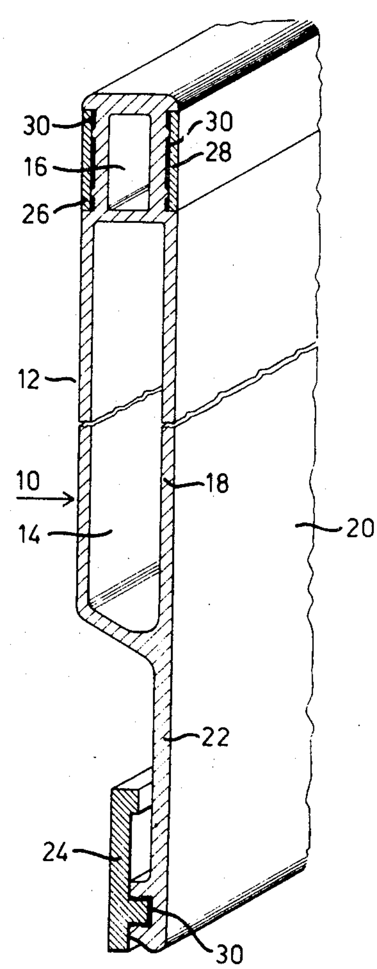
1,181,962	1/1959	France	139/92
412,706	7/1934	Great Britain	139/92

Primary Examiner—Henry S. Jaudon
Attorney—Werner W. Kleeman

[57] **ABSTRACT**

A support rod for a harness frame of a loom and method for the fabrication of such support rod wherein at least one edge reinforcement means is mounted at the region of at least one of the extremities of a light-weight support rod body member, with a thermally hardenable adhesive material interposed at the interface between the edge reinforcement means and the body member. A force is applied to said edge reinforcement means and said body member sufficient to firmly clamp such edge reinforcement means and body member to one another while preventing relative shifting of said edge reinforcement means and body member. The body member and edge reinforcement means are then heated to a temperature sufficient to set the adhesive material while maintaining the clamping force to prevent relative shifting of said edge reinforcement means and body member. The body member and edge reinforcement means are then cooled down to room temperature while still maintaining the clamping force to further prevent shifting of the edge reinforcement means and body member relative to one another, in order to provide a substantially stress-free bond between said edge reinforcement means and body member by virtue of the set adhesive material.

31 Claims, 6 Drawing Figures



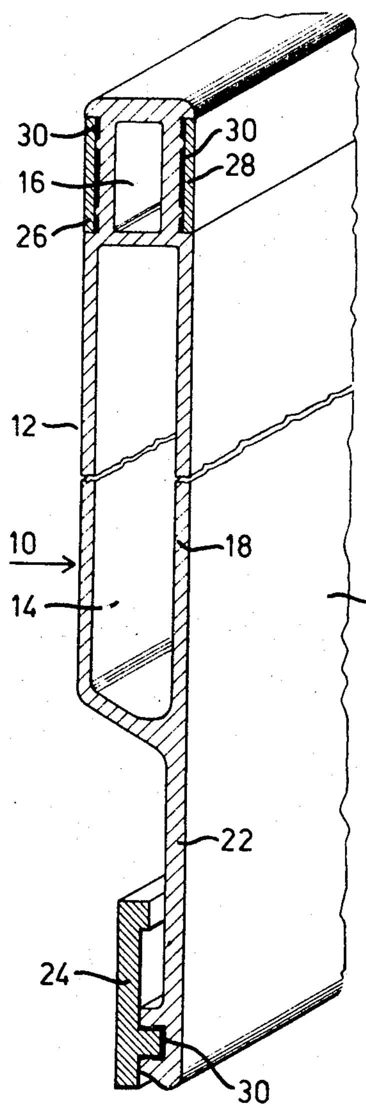


FIG. 1

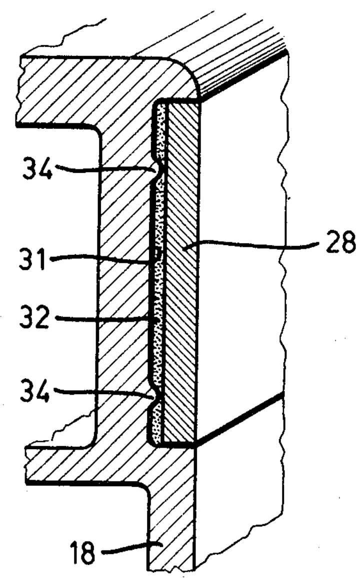


FIG. 2

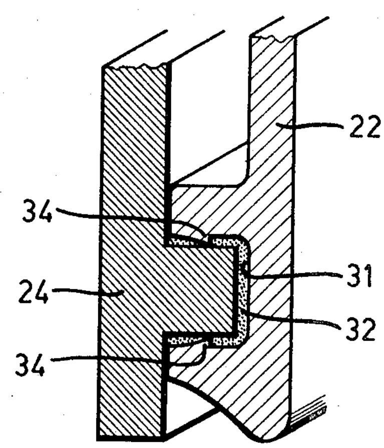


FIG. 3

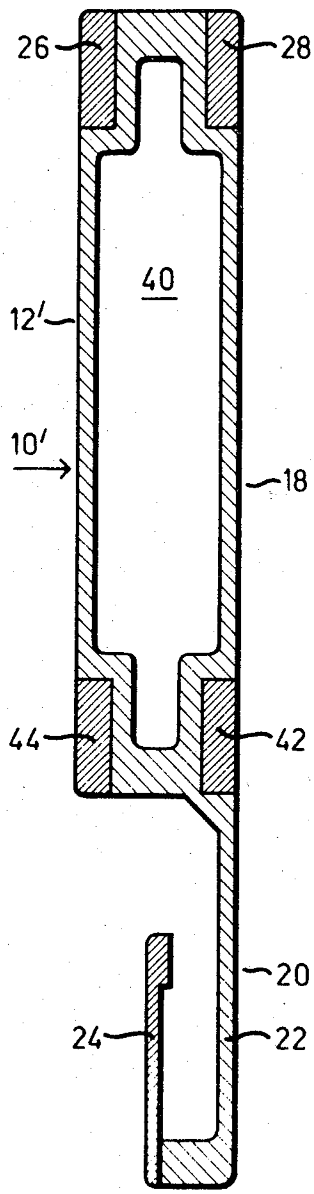


FIG. 4

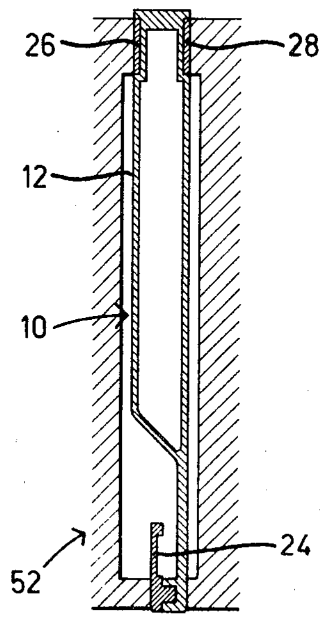


FIG. 5

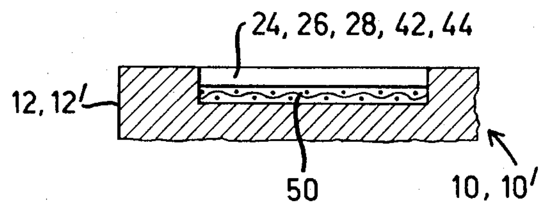


FIG. 6

HARNESS FRAME SUPPORT ROD POSSESSING INCREASED BENDING STRENGTH

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part application of my commonly assigned, co-pending, United States application Ser. No. 854,146, filed Aug. 29, 1969 and entitled "ROD WITH INCREASED BENDING STRENGTH AND USE THEREOF", now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved harness frame support rod or rail for looms possessing increased bending strength or structural rigidity, and also is concerned with a novel method for the fabrication of such inventive harness frame support rod.

It should be recognized that in the case of heddle or harness frames for looms it is especially important to satisfy the requirements of smallest possible weight and greatest possible bending strength or structural rigidity. This is particularly the case if it is desired to drive the harness frames at high operating speeds. As is well known the energy required for driving such harness frames increases in proportion to the weight thereof and as a function of the square of the speed of movement. Increased weight of the harness structure requires a corresponding greater amount of drive power. This energy must be furnished by suitable drive motors or other prime movers. It is therefore desirable to reduce the weight of the harness frames.

On the other hand, bending of the harness frames, and in particular the heddle support rods, owing to insufficient bending strength or structural rigidity causes operational disturbances inasmuch as such, in turn, can bring about buckling and/or rupture of the heddles suspended at the harness frames. By providing minimum weight and maximum bending strength of the mechanical components it is possible to increase the natural frequency of the relevant components, inducement of resonant frequencies only occuring at correspondingly high frequency-dynamic loading.

From what has been stated above, it should be apparent that in the case of harness frames for looms it is extremely desirable to provide a harness frame construction which possesses increased bending strength and minimum weight, thereby permitting the harness frame to be driven at high operating frequencies.

SUMMARY OF THE INVENTION

Hence, it is a primary object of the present invention to provide a novel construction of support rod or rail for the harness frame of looms which effectively and reliably fulfills the existing need in the art.

Still a further significant object of the present invention relates to a novel construction of heddle support rod for the harness frames of looms possessing increased bending strength, yet relatively low weight.

A further significant object of the present invention relates to an improved construction of support rod or rail for the harness frames of looms formed from a lightweight body member equipped with reinforcement means at least at one of the extremities of the support rod, the reinforcement means being formed of a material possessing a considerably greater modulus of elasticity than the modulus of elasticity of the material forming the lightweight support rod body.

Still a further significant object of the present invention concerns an improved method of constructing such support rods or rails, and specifically concerns a novel technique for securely and reliably bonding the reinforcement means to the body of the support rod or rail so that there is achieved a good bond, especially a stress-free bond therebetween, which is maintained even during high dynamic loading of the harness frame.

Now in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the support rod for a loom harness frame as contemplated by this invention comprises a support rod body member formed of a lightweight material possessing relatively low modulus of elasticity. The body member includes external edges or edge regions spaced furthest from the neutral bending axis of such body member, reinforcement means being secured to such external edges. The reinforcement means exhibit a total cross-sectional area which is small in relation to the cross-sectional area of the body member. For instance, the cross-sectional area of such reinforcement means preferably amounts to no more than approximately one-fifth of the cross-sectional area of the solid material of the harness frame body member and no more than approximately one-twentieth of the total cross-sectional area of the body member. Each such reinforcement means is advantageously formed of a material different from the material of the body member and possesses a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member. Typically, the modulus of elasticity of the material forming the reinforcement means is preferably at least approximately three times as large as the modulus of elasticity of the material forming the support rod body member.

As already explained above the invention is also concerned with a novel method of fabricating such new and improved construction of harness frame support rods for looms. As also previously mentioned the reinforcement means are securely bonded in a stress-free fashion to the support rod body member. This is important inasmuch as the materials forming the reinforcement means and the support rod body member differ from one another and therefore, possess different coefficients of expansion and contraction. Hence, if measures were not otherwise undertaken to provide a stress-free adhesive bond between these different materials during thermal bonding such materials would elongate and contract at different rates. Thus, when the assembly is again brought down to room temperature relative shifting or displacement between the reinforcement means and the support rod body member would occur, resulting in loading and particularly the formation of shear stresses at the adhesive bond formed between the reinforcement means and rod body member. Since the harness frames are desirably driven at high operating frequencies or speeds and thus subjected to high dynamic loads these loads would promote rupture of the adhesive bond between such reinforcement means and the body member if special measures were not undertaken and which, in turn, would result in rupture of the strung heddles and breakdown of the loom.

Hence, in consideration of the above it was necessary to devise a new and improved technique for fabricating such type edge reinforced- support rods of harness frames and specifically to provide a completely novel technique of bonding the reinforcement means with the body of the support rod. In its broadest aspects this technique contemplates thermally bonding the reinforcement means with the support rod body member with an interface of a thermally hardenable adhesive material. It has surprisingly been found that if relative displacement of the reinforcement means and body member are prevented during the thermal bonding operation there can be advantageously formed a relatively stress-free bond capable of withstanding high dynamic loads. To this end, the invention contemplates prevention of relative displacement or shifting of the reinforcement means and body member during the heating and subsequent cooling operations by physically restraining or confining such members. More specifically, a pasty or liquid thermally hardenable adhesive bonding agent, typically a commercially available epoxy resin which sets or hardens at elevated temperatures, typically above 100°C, is provided at the interface between the reinforcement means and support rod body member. Sufficient pressure is applied for the purpose of tightly clamping the reinforcement means and body member to one another so no relative shifting occurs. This assembly is then heated, for instance to a temperature in the range of 110° – 130°C, the bonding agent hardening at the elevated temperature, typically for instance at 120°C. Then such assembly is permitted to cool down. Owing to the imposed restraint against relative elongation and contraction of the reinforcement means and body member during the heating and cooling of these components the adhesive bond can set without being subjected to any appreciable shear-stresses. As a result, there is produced a good firm stress-free bond between these components, promoting high operating speeds of the loom without any great danger of disconnection or rupture of this bond of the heddle support rod, which otherwise could cause heddle failure and loom breakdown.

The previously discussed restraint against relative displacement between these components i.e., reinforcement means and rod body member, can be achieved in a number of different ways. One specific technique which may be employed is to provide an excess length of the reinforcement means and support rod body member, then to fixedly interconnect these members to one another, as by riveting, to prevent relative shifting or displacement. The adhesive bond at the interface between these members is then permitted to set at elevated temperatures while a clamping force is applied between the members, and thereafter the assembly is permitted to again cool down to room temperature. Upon completion of the bonding operation the excess length of the reinforcement means and body member which contains the connection rivets is cutaway so that the harness frame construction is then of desired size.

Another preferred technique which can be successfully practiced is to clamp the entire assembly of reinforcement means and body member, with the thermally hardenable adhesive material at the interface therebetween, in a press and to apply sufficient clamping pressure to this assembly of components so as to prevent relevant shifting i.e., elongation and contraction of the reinforcement means and body member during the heating and subsequent cooling operations. The adhesive material is then permitted to set at elevated temperature and the assembly cooled down to room temperature, producing the stress-free bond between these components.

It is a further aspect of this invention, and particularly when practicing the inventive method, to provide means for confining the adhesive material at the interface between the reinforcement means and body member so that when the clamping pressure is exerted the adhesive material is not displaced out of such interface, which otherwise would not afford the firm bond which is desired. Such adhesive material- confining means can be in the form of raised spacer ribs located at the interface between these components, and preferably at each of the recesses of the support rod body member receiving one of the reinforcement means. These spacer ribs take-up the forces exerted during the clamping operation so that the clamping pressure is distributed to a large extent over such spacer ribs, thus ensuring that the adhesive material in the recess or recesses at the interface between these abovementioned components will not be expressed out of such recesses, rather will set thereat to provide the desired bond. Instead of using these spacer ribs it would be also possible to use an open glass fiber fabric or web, for instance of about 0.2 mm. thickness, imbued with the adhesive material and providing the same function as the spacer ribs discussed above.

DETAILED DESCRIPTION OF THE DRAWINGS

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 drawings wherein:

FIG. **1** is a fragmentary perspective cross-sectional view of a preferred construction of harness frame support rod equipped with edge reinforcement means as contemplated by this invention and produced in accordance with the inventive method;

FIG. **2** is a fragmentary enlarged view showing details of the connection of an edge reinforcement means with an upper end or upper extremity of the support rod body member;

FIG. **3** is a fragmentary enlarged view showing details of the connection of a reinforcement means with the lower end or extremity of the support rod body member;

FIG. **4** is a modified construction of support rod for a harness frame and also equipped with reinforcement means as contemplated by the invention;

FIG. **5** is a schematic cross-sectional view of the edge reinforced- support rod assembly depicted in FIGS. **1 – 3** inclusive, during such time as it is clamped in a press during the manufacturing operation; and

FIG. **6** is an enlarged fragmentary view showing details of adhesive material-confining means in the form of an open glass fiber fabric or web interposed at the interface between the support rod body member and reinforcement means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, and referring initially in particular to the exemplary embodiment of harness or heddle frame support rod **10** depicted in FIGS. **1 – 3** inclusive, it will be seen that such embodies a lightweight support rod body member **12.** This body member **12** is advantageously in the form of a hollow profile member possessing one or more internal compartments **14** and **16**. A transverse rib **15** separates these compartments **14** and **16** as shown. In the embodiment under consideration the body member **12** incorporates an upper body portion **18** and a lower body portion **20**, the upper portion **18** possessing a substantially quadratic or rectangular cross-sectional configuration as shown. The lower portion **20** is in the form of a downwardly depending wall or web **22** merging with the lower wall **19** of the box-like upper portion **18** and at which there is bonded in a recess **30** a reinforcement means **24**, also referred to as edge reinforcement, providing a heddle-carrier or stringing rail. At the upper region or extremities of body member **12** there are provided additional edge reinforcement means **26** and **28** likewise bonded in suitable recesses **30** formed at the upper region of body member **12**. The reinforcement means **24**, **26** and **28** are for instance in the form of plate-like reinforcement elements.

As best seen by referring to FIG. **2** a suitable commercially available adhesive material **32** is provided at the interface between each edge reinforcement means **26, 28** and the bottom wall **31** of each of the associated recesses **30** formed at the upper region of body member **12.** Such adhesive material **32** is also provided at the interface between the lower edge reinforcement means or element **24** defining the heddle stringing rail and the wall **31** of the recess **30** at the lower end of the downwardly depending web **22** of the body member **12** receiving such edge reinforcement means **24,** as best seen by referring to FIG. **3.** Further, in the exemplary embodiment under consideration adhesive material-confining means in the form of spacer ribs **34** are provided at the region of the adhesive material- receiving recesses **30** for the purposes to be explained more fully hereinafter, and specifically, such spacer ribs **34** are here shown provided at the wall **31** of the body member **12** from which the recesses **30** are formed. These spacer ribs or cams **34** advantageously extend over the full length of the associated recesses **30** receiving the edge reinforcement means **24, 26** and **28** bonded therein by the high-grade thermally hardenable adhesive **32.** High-grade thermally hardenable adhesive materials which set at elevated temperatures, typically above 100°C, suitable for the purposes of the invention are well known in the art and commercially available, a typical example thereof being a pasty epoxy resin of the type which hardens or sets for instance at about 120°C.

Now in consideration of maintaining the weight of the support rod for the harness frame as small as possible the body member **12** is not only advantageously formed to possess a hollow construction, but from a suitable lightweight material, for instance such as aluminum or aluminum alloys, glass fiber-reinforced plastic, such as glass fiber-reinforced polyester resins or magnesium alloys, Aluminum alloys are particularly preferred materials for the body member **12** since such can be readily extruded or otherwise worked into desired shape. A suitable commercially available aluminum alloy is one having a modulus of elasticity of about 700,000 kg/cm^2, a tensile strength or breaking load of 30 kg/cm^2, and a specific weight of approximately 2.8 kg/dm^3. In the case of glass fiber-reinforced plastic the modulus of elasticity typically amounts to approximately 300,000 kg/cm^2, the tensional strength to 50 kg/cm^2, and the specific weight to 1.8 kg/dm^3. As far as the edge reinforcement means **24, 26** and **28** are concerned such can be formed of high-grade steel or spring steel, the physical properties of which advantageously can be improved by cold rolling, or else from carbon fiber laminates. In the case of steel, typical values for the modulus of elasticity are 2,100,000 kg/cm^2, for the specific weight 8.0 kg/dm^3, and for the tensile strength or breaking load 120 kg/cm^2 or greater, depending upon the manner of processing the steel in order to improve its properties. The commercially available carbon fiber laminates are preferably of the type comprising unidirectional carbon fibers embedded in a suitable bonding agent and plastic resin, typically an epoxy resin. The modulus of elasticity thereof amounts to 2,500,000 kg/cm^2, the tensile strength or breaking load to 200 kg/cm^2 and the specific weight to 1.6 kg/dm^3.

Hence, from what has been explained above it will be seen that the harness frame- support rod comprises a body member **12** formed of a relatively light weight material possessing a relatively low modulus of elasticity in relation to the edge reinforcement means **24, 26** and **28** which possess a relatively high modulus of elasticity. The modulus of elasticity of body member is preferably less than 1,000,000 kg/cm^2 and that of the reinforcement means preferably greater than 1,500,000 kg/cm^2. In fact, it will be observed the modulus of elasticity of the edge reinforcement means preferably amounts to at least three times that of the material forming the body member. Further, the edge reinforcement means **24, 26** and **28** are advantageously located solely at extremities of the body member **12** i.e., the localities furthest from the neutral bending axis of the heddle frame- support rod to provide maximum bending strength. The lower reinforcement element **24** is advantageously located at the region of the central lengthwise vertically extending axis of the body member **12.** The foregoing construction provides a support rod for a harness frame of a loom which possesses not only low weight but increased bending strength, thereby requiring less power for driving the harness frame at high frequencies or operating speeds.

The use of the edge reinforcement means located in the manner described above affords the requisite bending strength required of the support rod for the harness frame. The thickness and length of the edge reinforcement means are, in actual practice, accommodated to the required bending strength in both main directions of the support rod. Excess material should be avoided in order to retain the total weight of the structure as low as possible and also for reasons of manufacturing economy. Typically, the cross-sectional area of an edge reinforcement means usually amounts to no more than approximately one-fifth of the cross-sectional area of the solid material forming the body member **12** and no more than approximately one-twentieth of the total cross-sectional area of the hollow profile body member. By the same token the external dimensions and wall thickness of the light-weight hollow profile body member **12** also should be retained as low as possible in order to save on weight, without however falling below the requisite compressive- and shear-strength which is required. In some instances filling of the internal hollow space or spaces **14** and **16** with a suitable reinforcing material of a small as possible specific weight, i.e., for instance amounting to no more than 0.5 kg/dm^3 results in improvement to the support rod.

A modified construction of support rod **10'** for a loom harness frame has been depicted in FIG. **4,** wherein like reference characters have been generally used to again designate the same or analogous components. In this instance the hollow profile body member **12'** of the modified support rod **10'** is only provided with a single internal compartment **40.** The main difference over the construction here shown from that of FIGS. **1 – 3** is that additional edge reinforcement means **42** and **44** are provided intermediate the lower edge reinforcement means **24** and the upper edge reinforcement means **26** and **28,** and these additional edge reinforcement means **42** and **44** are specifically shown located at the lower region of the upper portion **18** of the body member **12** at the bottom end of the internal compartment **40.** The materials for the body member and plate-like reinforcements and physical dimensions are advantageously selected as discussed above.

It was previously explained that an important aspect of this invention concerns a method of forming the support rod for the harness frames, and specifically bonding the reinforcement elements or means to the body member of the support rod. A preferred technique for carrying out the inventive method will now be considered in conjunction with FIGS. **5** and **6** inclusive. In practicing the method the material to be bonded, namely the plate-like reinforcement elements, are advantageously initially sand blasted or scoured, and degreased. A pasty adhesive bonding agent for instance a commercially available epoxy resin of the type which hardens or sets at approximately 120°C is then applied, either to one face of each reinforcement plate or into the various recesses **30** where the individual reinforcement plates are to be inserted. The recesses **30** are advantageously of the type depicted in FIGS. **1 – 3** possessing the spacer ribs **34** preferably extending the length of the associated recesses or body member and serve to confine the adhesive bonding agent therein during application of the clamping force or pressure. if no such spacer ribs are provided for the recesses then, there is advantageously employed an open glass fiber fabric or web **50,** for instance of about 0.2 mm. thickness, and of the type depicted in FIG. **6,** which is then inserted into each associated recess. The glass fiber fabric or web **50** absorbs the adhesive material and has the same function as the spacer ribs **34** previously discussed above. Then the complete assembly is mounted together, in other words, the plate-like reinforcement elements are inserted into the various recesses so that at the interface between such reinforcement plates and the confronting wall of each recess there appears either the adhesive layer or the glass fiber reinforced web or fabric **50** imbued with the adhesive material.

As best seen by referring to FIG. **5** this assembly is then introduced into a suitable press **52** which has been cooled down to room temperature. Press **52** is then closed and the necessary clamping force or pressure is applied, which pressure can be experimentally determined. In any event this force or pressure must be sufficient to tightly clamp the reinforcement elements with the body member of the support rod so as to prevent any relative displacement or shifting between these components during the expansion and contraction occuring by virtue of the heating and cooling operations. For instance, when using a 1 mm. thick reinforcement element and the spacer ribs a clamping pressure in the range of approximately 50 – 100 kp/cm^2, based upon each square centimeter of surface area of the reinforcement plate i.e. adhesive location, has been found to be satisfactory. After the necessary clamping pressure has been applied the assembly is heated to a temperature sufficient for setting or hardening the adhesive bonding agent, and the bonding agent is permitted to harden or set at a temperature between approximately 110° – 130°C. The applied clamping force is sufficient to prevent any relative elongation of the reinforcement elements and body member of the support rod, notwithstanding the fact that they are formed of different materials and possess different coefficients of expansion. Further, this clamping pressure or force is also maintained and effective during cooling of the aforementioned components back down to room temperature, so that during contraction of the reinforcement elements and body member again no relative displacement or shifting between these components occurs. Hence no shear-stresses, at least none of an appreciable nature, are present at the intermediate layer of adhesive bonding agent so that a good permanent bond is attained for securely and fixedly attaching the reinforcement plates or elements with the body member. After the assembly has been cooled down to room temperature the support rod with the now therewith affixed reinforcement elements is removed from the press **52.** The spacer rib means **34** or glass fiber fabric web **50,** respectively, are effective to confine the adhesive material within the associated recesses to prevent such adhesive material from being expressed out of such recesses when the clamping force or pressure is applied. Such also contribute to provide adequate frictional forces between the body member and reinforcement elements to safeguard relative shifting or displacement.

An alternative technique for practising the inventive method of fabricating such support rods for harness frames resorts to the use of fastening means for fixedly interconnecting the reinforcement elements with the body member of the support rod during the heating and cooling operations. In this case the reinforcement elements and body member possess a length exceeding that ultimately desired, and at the excess length portion of such members fastening elements such as rivets for instance are connected between the reinforcement elements and the body member so as to securely non-displaceably attach such to one another. The rivets then contribute to prevent any relative shifting or displacement of the reinforcement elements and body member relative to one another during the heating and cooling operations, carried out while this assembly is in the press **52,** so that again the interface of adhesive bonding material between these elements is free of stresses. In this case where the fastening elements are used the clamping pressure applied by the press **52** can be lower, typical values amounting to for instance 2 – 5 kp/cm^2 per unit area of adhesive material.

Regardless of the technique which is employed in any event due to the provision of measures to prevent different relative elongation and contraction of the reinforcement elements and body member of the support rod the set adhesive bond is free of stresses so that a secure premanent fixation is provided between these components, one which is not likely to rupture when subjected to load during operation of the harness frame at high frequencies. It will be noticed that the reinforcement plates or elements are retained in the complementary configured recesses and advantageously do not protrude past the surface of the associated body member.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Accordingly, what is claimed is:

1. A support rod for the harness frame of a loom possessing increased bending strength, comprising a support rod body member having a neutral bending axis, said body member being formed of a lightweight material possessing a relatively low modulus of elasticity, said body member further including external regions spaced remote from the neutral bending axis of the support rod, edge reinforcement means provided for at least one of said external regions, said edge reinforcement means exhibiting a total cross-sectional area which is small in relation to the cross-sectional area of said body member, said edge reinforcement means being formed of a material different from the material of said body member and possessing a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member, said body member being constructed in the form of a substantially rectangular hollow profile member possessing four external edges each of which is equipped with a recess, said edge reinforcement means being in the form of a respective edge reinforcement plate member adhesively bonded into an associated edge recess such that said edge reinforcement plate members do not protrude past the external surfaces of the rectangular hollow profile rod member.

2. The support rod as defined in claim **1**, wherein the modulus of elasticity of the material forming said edge reinforcement means is at least three times greater than the modulus of elasticity of the material forming said body member.

3. The support rod as defined in claim **1**, wherein said edge reinforcement means is formed of steel.

4. The support rod as defined in claim **1**, wherein said body member is formed of a material containing at least aluminum.

5. The support rod as defined in claim **1**, wherein the cross-sectional area of said edge reinforcement means is no greater than one-twentieth of the total cross-sectional area of said body member.

6. The support rod as defined in claim **1**, further including an edge reinforcement means provided for each of said external regions.

7. The support rod as defined in claim **6**, wherein said edge reinforcement means are located solely at said external regions.

8. The support rod as defined in claim **6**, wherein one of said edge reinforcement means simultaneously forms a heddle stringing rail.

9. The support rod as defined in claim **6**, wherein each of said edge reinforcement means comprises an edge reinforcement plate member adhesively bonded to the associated external region of said body member.

10. The support rod as defined in claim **1**, further including at least one recess for receiving each edge reinforcement means provided at said at least one external region, and a thermally hardenable adhesive material interposed at the region of said recess for bonding said edge reinforcement means with the body member of the support rod.

11. The support rod as defined in claim **10**, further including a glass fiber-reinforced material layer containing the adhesive material located in said recess between said edge reinforcement means and said body member for maintaining the adhesive material confined within said recess.

12. The support rod as defined in claim **10**, further including spacer ribs disposed at the region of said recess.

13. The support rod as defined in claim **11**, wherein said spacer ribs extend over the length of the associated recess.

14. The support rod as defined in claim **10**, wherein said spacer ribs are located at the boundary wall of said recess and serve to confine the adhesive material therein.

15. The support rod as defined in claim **1**, wherein said body member is formed as a hollow profile member containing at least one internal compartment.

16. The support rod as defined in claim **1**, wherein said edge reinforcement plate members are configured to possess a substantially flat rectangular shape.

17. The support rod as defined in claim **1**, wherein said edge reinforcement means is a carbon fiber laminate.

18. A support rod for the harness frame of a loom possessing increased bending strength, comprising a support rod body member having a neutral bending axis, said body member being formed of a lightweight material possessing a relatively low modulus of elasticity, said body member further including external regions spaced remote from the neutral bending axis of the support rod, edge reinforcement means provided for at least one of said external regions, said edge reinforcement means exhibiting a total crosssectional area which is small in relation to the cross-sectional area of said body member, said edge reinforcement means being formed of a material different from the material of said body member and possessing a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member, and wherein said edge reinforcement means is a carbon fiber laminate.

19. A support rod for the harness frame of a loom possessing increased bending strength, comprising a support rod body member having a neutral bending axis, said body member being formed of a lightweight material possessing a relatively low modulus of elasticity, said body member further including external regions spaced remote from the neutral bending axis of the support rod, edge reinforcement means provided for at least one of said external regions, said edge reinforcement means exhibiting a total cross-sectional area which is small in relation to the cross-sectional area of said body member, said edge reinforcement means being formed of a material different from the material of said body member and possessing a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member, and wherein said material of body member is a fiber reinforced plastic.

20. A support rod for the harness frame of a loom possessing increased bending strength, comprising a support rod body member having a neutral bending axis, said body member being formed of a lightweight material possessing a relatively low modulus of elasticity, said body member further including external regions spaced remote from the neutral bending axis of the support rod, edge reinforcement means provided for at least one of said external regions, said edge reinforcement means exhibiting a total cross-sectional area which is small in relation to the cross-sectional area of said body member, said edge reinforcement means being formed of a material different from the material of said body member and possessing a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member, at least one recess for receiving each edge reinforcement means provided at said at least one external region, a thermally hardenable adhesive material interposed at the region of said recess for bonding said edge reinforcement means with the body member of the support rod, and a glass fiber-reinforced material layer containing the adhesive material located in said recess between said edge reinforcement means and said body member for maintaining the adhesive material confined within said recess.

21. A support rod for the harness frame of a loom possessing increased bending strength, comprising a support rod body member having a neutral bending axis, said body member being formed of a lightweight material possessing a relatively low modulus of elasticity, said body member further including external regions spaced remote from the neutral bending axis of the support rod, edge reinforcement means provided for at least one of said external regions, said edge reinforcement means exhibiting a total cross-sectional area which is small in relation to the cross-sectional area of said body member, said edge reinforcement means being formed of a material different from the material of said body member and possessing a relatively high modulus of elasticity in relation to the modulus of elasticity of the material forming the body member, and wherein said body member possesses a substantially rectangular configuration and comprising a hollow profile member, said hollow profile member being provided with an integral support web, one of said edge reinforcement means providing a heddle stringing rail connected with said support web, said heddle stringing rail being disposed substantially in the vertically extending symmetrical plane of said hollow profile member, said external edges of said hollow profile member facing away from said heddle stringing rail being provided with recesses receiving additional edge reinforcement means.

22. The support rod as defined in claim **21**, wherein the modulus of elasticity of the material forming said edge reinforcement means is at least three times greater than the modulus of elasticity of the material forming said body member.

23. The support rod as defined in claim **21**, wherein said edge reinforcement means is formed of steel.

24. The support rod as defined in claim **21**, wherein said edge reinforcement means is a carbon fiber laminate.

25. The support rod as defined in claim **21**, wherein said body member is formed of a material containing at least aluminum.

26. The support rod as defined in claim **21**, further including at least one recess for receiving each edge reinforcement means provided at said at least one external region, and a thermally hardenable adhesive material interposed at the region of said recess for bonding said edge reinforcement means with the body member of the support rod.

27. The support rod as defined in claim **26**, further including spacer ribs disposed at the region of said recess.

28. The support rod as defined in claim **27**, wherein said spacer ribs extend over the length of the associated recess.

29. The support rod as defined in claim **27**, wherein said spacer ribs are located at the boundary wall of said recess and serve to confine the adhesive material therein.

30. The support rod as defined in claim **26**, further including a glass fiber-reinforced material layer containing the adhesive material located in said recess between said edge reinforcement means and said body member for maintaining the adhesive material confined within said recess.

31. The support rod as defined in claim **21**, wherein said body member is formed as a hollow profile member containing at least one internal compartment.

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