A shock absorbing sports racket (1) has a head frame (2) and a shaft portion (4) extending outwardly of the head frame (2). The shaft portion (4) includes a hand grip (6). A pair of inserts (10) of elastomeric vibration absorbing material are mounted on the shaft portion (4) within a complementary slot (7) at an inner end (5) of the shaft portion (4) and within associated channels (8) extending along the shaft portion (4) from the slot bracket (7) to a free end (9) of the shaft portion (4).
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Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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"A sports racket"

Field of the Invention

The present invention relates to a sports racket such as a tennis racket, in particular incorporating means for damping vibrations set up in the frame of the racket during use.

Background of the Invention

During use, when hitting a tennis ball with a tennis racket, vibrations occur in the racket frame. These vibrations are undesirable as they can cause discomfort to the player. A number of racket frame constructions have been proposed which attempt to absorb and/or reduce this vibration.

It is an object of the present invention to provide a games racket having good vibration reduction characteristics.

Summary of the Invention

According to the invention there is provided a sports racket, comprising a head frame and a shaft portion extending outwardly of the head frame, the shaft portion including a hand grip at a free end thereof, the shaft portion having a slot, a vibration absorbing material being provided in the slot.

In another aspect of the invention there is provided a sports racket, comprising a head frame and a shaft portion extending outwardly of the head frame, the shaft portion including a hand grip at a free end thereof, the shaft portion having one or more channels extending along at
least part of the shaft portion, a vibration absorbing material being provided in the or each channel.

In a further aspect of the invention there is provided a sports racket comprising a head frame and a shaft portion extending outwardly of the head frame, the shaft portion including a hand-grip at a free end thereof, the shaft portion having a slot and one or more channels extending outwardly from the slot along the shaft portion, a vibration absorbing material being provided in the slot and in the or each channel.

In a preferred embodiment of the invention, the slot is provided in the shaft portion between the hand-grip and the head frame. Ideally, the slot extends through the shaft portion between opposite sides of the shaft portion.

Preferably, the channels extend along an exterior of the shaft portion.

In another embodiment, the or each channel extends between the slot and a free end of the shaft portion.

In a particularly preferred embodiment, two channels are provided in the shaft portion extending along opposite sides of the shaft portion.

Preferably the vibration absorbing material provided in the slot and in the channel or channels is of the same material. Conveniently, one or more inserts of vibration absorbing material may be provided mounted within the slot and/or the channel or channels. Ideally, each insert for a channel is integrally formed with at least portion of an insert for the slot.
In a further embodiment, each insert comprises one or more elongate strips of material, each for engagement within a channel, each strip having an enlarged head at one end for complementary engagement within the slot. In a preferred embodiment, a pair of inserts are provided each having an elongate strip of material mounted in one of a pair of channels extending along opposite sides of the shaft portion, each insert having a head which engages within the slot. Ideally the inserts are bonded together within the slot.

In another embodiment, the vibration absorbing material is an elastomeric material. Conveniently, the vibration absorbing material may be a polyvinyl chloride elastomer. Examples of other suitable vibration absorbing materials are an elastomeric polyurethane foam, Pebax, Sorbothane and Trethane.

In a preferred embodiment, the vibration absorbing material is translucent. Conveniently the vibration absorbing material may be of any desirable colour.

It will be appreciated that the invention may be applied to sports rackets for playing different types of games, for example tennis, squash, badminton, racketball, paddle tennis, platform tennis, table tennis and the like. It is also envisaged that the invention may be applied to other types of hand-held athletic equipment, implements, tools and the like, for example hammers, used for hitting objects to damp vibrations in the handle of any of such devices.

The invention will be more clearly understood by the following description of an embodiment thereof, given by way of example only with reference to the accompanying drawings.
Brief Description of the Drawings

Fig. 1 is a partially cut-away perspective view of a shaft portion of a racket according to the invention with vibration absorbing inserts in position;

Fig. 2 is a perspective view of the shaft portion with a hand grip cover of the racket and the vibration absorbing inserts removed;

Fig. 3 is an elevational view of a frame of the racket of Fig. 2;

Fig. 4 is an end view of a shaft portion of the racket frame of Fig. 3;

Fig. 5 is a detail partially sectioned view taken along the line V-V of Fig. 1;

Fig. 6 is a cross-sectional view of a shaft portion of the racket frame taken along the line VI-VI of Fig. 5;

Fig. 7 is a perspective view of an insert of vibration absorbing material forming portion of the racket;

Fig. 8 is a sectional view taken along the line VIII-VIII of Fig. 7; and

Fig. 9 is an enlarged sectional view of a shaft portion of the racket taken along the line IX-IX of Fig. 3.

Detailed Description of a Preferred Embodiment

Referring to the drawings there is illustrated a tennis racket according to the invention indicated generally by
the reference numeral 1. The racket 1 comprises a head-frame 2 of generally known construction having strings 3 arranged thereon in known fashion. A shaft portion 4 extends from the head-frame 2. The shaft portion 4 has an inner end 5 and a hand-grip 6 at an outer free end thereof. Inserts 10 of vibration absorbing elastomeric material are mounted on the shaft portion 4.

A slot 7 is provided in the shaft portion 4 at the inner end 5 between the hand-grip 6 and the head frame 2. A pair of channels 8 extend along the shaft portion 4 from the slot 7 to a free end 9 of the shaft portion 4. It will be noted that the channels 8 extend along an exterior of the shaft portion 4 at opposite sides of the shaft portion 4.

A pair of inserts 10 of elastomeric material, in this case polyvinyl chloride, are mounted on the shaft portion 4. Each insert 10 has an elongate strip 13 for engagement within a channel 8. An enlarged head 14 at one end of the strip 13 engages within the slot 7. It will be noted from Fig. 5 that the heads 14 of the insert 10 meet within the slot 7 and the heads 14 fill the slot 7. The heads 14 are generally bonded together within the slot 7, however in some cases they may not be bonded. The inserts are preferably of translucent material and may be of any desirable colour. A grip 20 is wound around the shaft portion 4 to form the hand-grip 6 enclosing the inserts 10 within the channels 8. A butt cap 22 is mounted at the free end 9 of the shaft portion 4. This butt cap 22 may be of any suitable construction, for example either a one piece butt cap or a two piece butt cap.

In use, the racket 1 is used in conventional fashion. The inserts 10 of elastomeric material dampen vibrations in
the frame thus increasing the comfort for a player using the racket 1.

Tests have been carried out in which the vibration damping characteristics of a racket according to the invention have been compared with a similar racket without the vibration absorbing material. These tests show that the racket with the vibration absorbing material gives improved vibration damping.

It will be appreciated that the slot may extend either partially or fully through the shaft portion and may be of any desirable shape and/or size. While the slot may be provided anywhere along the shaft portion, it is preferably provided between the hand grip and the head-frame for vibration damping.

It is envisaged that in some cases either only a slot filled with vibration absorbing material may be provided or alternatively only one or more channels filled with vibration absorbing material may be provided, however, it is preferable that both a slot and one or more channels are provided on the shaft portion. In some cases only one channel may be provided or more than two channels may be provided either arranged on opposite faces of the shaft portion or spaced-apart around the shaft portion. The channels may be of any suitable length and need not necessarily extend to a free end of the shaft portion.

While the invention has been described above in relation to a sports racket, it is envisaged that the invention could be applied to dampen vibrations in the handles of other hand-held athletic equipment, for example hockey sticks, bats or the like, and also to implements and tools such as hammers and the like used for hitting objects.
The invention is not limited to the embodiment hereinbefore described which may be varied in both construction and detail.
CLAIMS:

1. A sports racket, comprising a head frame and a shaft portion extending outwardly of the head frame, the shaft portion including a hand grip at a free end thereof, the shaft portion having a slot, a vibration absorbing material being provided in the slot.

2. A sports racket, comprising a head frame and a shaft portion extending outwardly of the head frame, the shaft portion including a hand grip at a free end thereof, the shaft portion having one or more channels extending along at least part of the shaft portion, a vibration absorbing material being provided in the or each channel.

3. A sports racket, comprising a head-frame, and a shaft portion extending outwardly of the head-frame, the shaft portion including a hand-grip at a free end thereof, the shaft portion having a slot and one or more channels extending outwardly from the slot along the shaft portion, a vibration absorbing material being provided in the slot and in the or each channel.

4. A racket as claimed in any preceding claim wherein the slot is provided in the shaft portion between the hand-grip and the head-frame.

5. A racket as claimed in any preceding claim wherein the slot extends through the shaft portion between opposite sides of the shaft portion.

6. A racket as claimed in any preceding claim wherein the or each channel extends along an exterior of the shaft portion.
7. A racket as claimed in any preceding claim wherein the or each channel extends between the slot and a free end of the shaft portion.

8. A racket as claimed in any preceding claim wherein two channels are provided, extending along opposite sides of the shaft portion.

9. A racket as claimed in any preceding claim wherein the vibration absorbing material provided in the slot and in the channel or channels is of the same material.

10. A racket as claimed in any preceding claim wherein one or more inserts of vibration absorbing material are provided mounted within the slot and/or the channel or channels.

11. A racket as claimed in claim 10 wherein each insert for a channel is integrally formed with portion of an insert for the slot.

12. A racket as claimed in claim 11 wherein each insert comprises one or more elongate strips of material each for engagement within a channel, each strip having an enlarged head at one end for complementary engagement within the slot.

13. A racket as claimed in claim 12 wherein a pair of inserts are provided each having an elongate strip of material mounted within one of a pair of channels extending along opposite sides of the shaft portion and each insert having a head which engages within the slot.
14. A racket as claimed in claim 12 or claim 13 wherein the inserts are bonded together within the slot.

15. A racket as claimed in any preceding claim wherein the vibration absorbing material is an elastomeric material.

16. A racket as claimed in claim 15 wherein the vibration absorbing material is a polyvinyl chloride elastomer.

17. A racket as claimed in claim 15 wherein the vibration absorbing material is selected from the following group of materials; an elastomeric polyurethane foam, Pebax, Sorbothane and Trethane.

18. A racket as claimed in any preceding claim wherein the vibration absorbing material is translucent.

19. A racket substantially as hereinbefore described with reference to the accompanying drawings.

20. A handle for hand-held athletic equipment, implements, tools and the like used for hitting objects, comprising a shaft portion including a hand grip, the shaft portion having a slot, a vibration absorbing material being provided in the slot.

21. A handle for hand-held athletic equipment, implements, tools and the like used for hitting objects comprising a shaft portion including a hand grip, the shaft portion having one or more channels extending along at least part of the
shaft portion, a vibration absorbing material being provided in the or each channel.

22. A handle for hand-held athletic equipment, implements, tools and the like used for hitting objects, comprising a shaft portion including a hand-grip, the shaft portion having a slot and one or more channels extending outwardly from the slot along the shaft portion, a vibration absorbing material being provided in the slot and in the or each channel.

23. A handle as claimed in any of claims 20 to 22 wherein the slot is provided in the shaft portion spaced-apart from the hand-grip.

24. A handle as claimed in any of claims 20 to 23 wherein the slot extends through the shaft portion between opposite sides of the shaft portion.

25. A handle as claimed in any of claims 20 to 24 wherein the or each channel extends along an exterior of the shaft portion.

26. A handle as claimed in any preceding claim wherein the or each channel extends between the slot and a free end of the shaft portion.

27. A handle as claimed in any of claims 20 to 26 preceding claim wherein two channels are provided, extending along opposite sides of the shaft portion.

28. A handle as claimed in any of claims 20 to 27 wherein the vibration absorbing material provided
in the slot and in the channel or channels is of the same material.

29. A handle as claimed in any of claims 20 to 28 wherein one or more inserts of vibration absorbing material are provided mounted within the slot and/or the channel or channels.

30. A handle as claimed in claim 29 wherein each insert for a channel is integrally formed with portion of an insert for the slot.

31. A handle as claimed in claim 30 wherein each insert comprises one or more elongate strips of material each for engagement within a channel, each strip having an enlarged head at one end for complementary engagement within the slot.

32. A handle as claimed in claim 31 wherein a pair of inserts are provided each having an elongate strip of material mounted within one of a pair of channels extending along opposite sides of the shaft portion and each insert having a head which engages within the slot.

33. A handle as claimed in claim 31 or claim 32 wherein the inserts or bonded together within the slot.

34. A handle as claimed in any of claims 20 to 33 wherein the vibration absorbing material is an elastomeric material.

35. A handle as claimed in claim 34 wherein the vibration absorbing material is a polyvinyl chloride elastomer.
36. A handle as claimed in claim 31 wherein the vibration absorbing material is selected from the following group of materials; an elastomeric polyurethane foam, Pebax, Sorbothane and Trethane.

37. A handle as claimed in any of claims 20 to 36 wherein the vibration absorbing material is translucent.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
   IPC(5) : A63B 49/00
   US CL: 273/73R
   According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

   Minimum documentation searched (classification system followed by classification symbols)

   Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
   NONE

   Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
   NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>US, A, 4,948,131, (NAKANISHI), 14 August 1990. See Fig. 3.</td>
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<td>US, A, 5,039,096, (CHEN), 13 August 1991. See Fig. 1.</td>
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<td>A, P</td>
<td>US, A, 5,240,247, (DIDIER), 31 August 1993. See Fig. 2.</td>
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<td>US, A, 5,088,734, (GLAVA), 18 February 1992. See Fig. 4.</td>
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<td>A</td>
<td>US, A, 5,188,360, (CHEN), 23 February 1993. See Fig. 1.</td>
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X Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
   "A" document defining the general state of the art which is not considered
   to be part of particular relevance
   "E" earlier document published on or after the international filing date
   "L" document which may throw doubt on priority claim(s) or which is
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   special reason (as specified)
   "O" document referring to an oral disclosure, use, exhibition or other
   means
   "P" document published prior to the international filing date but later than
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   "T" later document published after the international filing date or priority
   date and not in conflict with the application but cited to understand the
   principle or theory underlying the invention
   "X" document of particular relevance; the claimed invention cannot be
   considered novel or cannot be considered to involve an inventive step
   when the document is taken alone
   "Y" document of particular relevance; the claimed invention cannot be
   considered to involve an inventive step when the document is combined
   with one or more other such documents, such combination
   being obvious to a person skilled in the art
   "&" document member of the same patent family

Date of the actual completion of the international search
24 AUGUST 1994

Date of mailing of the international search report
19 OCT 1994

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Authorized officer
RALEIGH CHIU
Telephone No. (703) 308-2247

Form PCT/ISA/210 (second sheet/July 1992)
**INTERNATIONAL SEARCH REPORT**

**Box I** Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 19 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

   Claim 19 is an improper claim as covered by PCT Rule 6.2(a).

3. ☐ Claims Nos.: 5-18, 24-37 because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II** Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.