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(54) **Striking implements**

Schlaggerät

Dispositif de frappe

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Description

This invention relates to a handheld striking implement which includes a vibration-damping element isolating the portion which is held from the portion used for striking.

Various attempts have been made to manufacture sports implements e.g. tennis rackets or cricket bats which incorporate some form of vibration-damping mechanism to minimise the risk of injury to the player. Problems in making such articles are that intricate multi-component manufacturing steps are often necessary whereas relatively unskilled labour is required to keep costs down. Also, any feature which adds weight to the final product is undesirable.

In British Patent Application No. 2149311A (Tarr) a novel racket is described in which the handle is discontinuous and the two parts are adjustably held together by a tensioning means (e.g. a spring, rod and screw assembly) and between the said two parts is a damping means.

The present invention provides a striking implement such as a tennis racket which has a discontinuity between the part gripped in use and the part used to strike. It incorporates features in which elements extending from each of the separate parts of the implement overlap in a unique manner and are bonded where they overlap by a vibration-damping material such that the parts are strongly joined together and yet are mechanically isolated one from another so that shock waves and vibration passing from the striking part to the gripping part are substantially absorbed. The product is strong but light and is easy to manufacture.

Although the present invention will be described with particular reference to a games racket or a cricket bat it is not to be construed as limited thereto as it is applicable equally to other striking implements such as sports equipment e.g. hockey sticks, golf clubs, baseball bats, hurley sticks, polo sticks, croquet mallets, and also batons, truncheons and shillelaghs.

The present invention provides a striking implement which comprises a hollow handle portion and a striking portion, in which the striking implement is discontinuous in that it comprises two parts one part including the striking portion and the other part including at least a part of the hollow handle portion, the said two parts having complementary formations which are assembled to overlap axially with a vibration-damping material interposed therebetween characterised in that the vibration-damping material is bonded to said formations and is in substantially mutually perpendicular planes parallel to the longitudinal axis of the handle portion, whereby said formations are inseparably connected together but mechanically isolated one from another by the vibration-damping material.

Preferably the complementary formations assemble so as to constitute a substantially identical cross-section to that of the remainder of the handle portion. Examples of complementary formations are:

(i) two, three or more fingers which interdigitate when assembled,

(ii) a cone and socket, and

(iii) a pin and socket.

The axial overlap of the complementary formations means that the confronting faces extend in planes angled to each other and in a preferred embodiment these planes are substantially perpendicular to each other. Where the complementary formations are substantially identical but merely rotated through 90° in the final assembly it is possible and convenient to mould in one piece hollow handle portions with formations, cut through the formations, rotate one of the handle portions 90° and then assemble the complementary formations. The assembly must be suitably jigged to align the components prior to the vibration-damping material being injected to fill the gap between the said complementary formations.

The vibration-damping material may suitably be a thermosetting or a thermoplastics material and especially an injectable material, for example a polyurethane resin. A suitable material may be based upon an elastomeric material compounded to produce the properties of a vibration-damping material.

A preferred polyurethane resin comprises an injectable thermosetting elastomeric material particularly in the form of a two-part, curable polyurethane which is mixed in liquid form and can therefore be readily injected and subsequently cures in situ. Such a material is available from Compounding Ingredients Limited as CILCAST 101 (which is cured by the addition of CILCURE B). The words CILCAST and CILCURE are Registered Trade Marks. (The hardness and resilience of the vibration-damping materials are measured according to British Standards (B.S.) tests which are internationally available and familiar to the skilled artisan). Such a material has the properties desirable for the vibration-damping material of the present invention being of a hardness greater than 60° SHORE A measured according to BS 2782 Part 3 "Indentation Hardness by Durometer (Shore A)" and resilience below 20% when measured according to BS 903 Part A8 Method B "Method for Rebound Resilience". More preferably the vibration-damping material has a hardness in the range 70 to 95° SHORE A measured according to BS 2782 Part 3 "Indentation Hardness by Durometer (Shore A)", the preferable resilience for the vibration-damping material being in the range 5 to 15% measured according to BS 903 Part A8 Method B "Method for Rebound Resilience".

Preferably the vibration-damping material is self-bonding to the complementary formations of the two parts of the striking implement i.e. no separate adhesive is required. The aforementioned two-part curable polyurethanes have this desirable property.

Preferably the handle portion includes only one discontinuity according to the present invention but the handle portion itself may be joined to the striking portion rather than being integral therewith.

The present invention is particularly applicable for use in a cricket bat where it is important for the handle to be light, strong and able to absorb at least some of the shock received when the striking portion (i.e. the blade) strikes a cricket ball. Preferably the part which includes the handle portion is designed so that the formations are substantially in a plane perpendicular to the face of the striking portion (blade) and thus the formations of the part which includes the blade are in a plane substantially parallel to the face of the blade. This arrangement will improve shock absorbency of the final product.

Particularly where the formation of one part consists of 2 or more fingers which interdigitate with the corresponding 2 or more fingers of the other part it may be preferable to provide a web between the fingers of one said part to reduce bending of the formations when the implement is used for striking and thus to reduce the strain imposed on the bond between the complementary formations. To take advantage of this potential improvement the web should be provided between the formations, the free ends of which will be nearer to the striking portion when the striking implement is in use.

Preferred materials for the handle portion are of fibres e.g. of carbon or glass impregnated with a thermosetting or thermoplastics resin. Such compositions can be moulded to give hollow, and thus light, strong handle portions. Particularly for striking implements where there is a high degree of shock in use, e.g. a cricket bat or hockey stick, the fibres may be of material with increased shock absorbency properties e.g. aramid or polyethylene fibres.

The present invention will be illustrated merely by way of examples in the following description and with reference to the accompanying drawings in which:-

Figure 1 is a side elevation of part of a handle portion with two fingers according to one embodiment of the present invention;

Figure 2 is a sectional view along the line A-A of Figure 1;

Figure 3 is a side elevation of the part handle portion of Figure 1 assembled with and bonded to its complementary part handle portion;

Figure 4 is a sectional view along the line B-B of Figure 3;

Figure 5 is a side elevation of part of a handle portion with three fingers according to a second embodiment of the present invention;

Figure 6 is a sectional view along the line C-C of Figure 5;

Figure 7 is a side elevation of the part handle portion of Figure 5 assembled with and bonded to the complementary handle portion;

Figure 8 is a sectional view along the line D-D of Figure 7;

Figure 9 is a front elevation of a cricket bat according to a further embodiment of the present invention;

Figure 10 is a sectional view along the line E-E of Figure 9.

Figure 11 is a side elevation of part of a handle portion with two fingers joined partly by a web according to a further embodiment of the present invention;

Figure 12 is a side elevation of part of a striking portion with formations complementary to those of the part handle portion of Figure 11; and

Figures 13 and 14 are side elevations of the part handle portion of Figure 11 assembled with, and in Figure 14 bonded to, the part striking portion of Figure 12.

Referring to Figures 1, 2, 3 and 4 a part handle portion 1 has formations (fingers) 2 and 3. The part handle portion 1 is hollow and made by wrapping layers of resin impregnated fibre in fabric or 'warp sheet' form around an inflation tube and then moulding under heat and internal pressure, as is well known to those skilled in the art of making hollow articles from polymer composite materials. Alternatively the inflation tube may be replaced by a plastic material capable of expanding under the action of heat to produce the necessary internal consolidating pressure. Fibre alignment of the wrapping layers is chosen to produce the desirable directional strength in the handle portion, and the fibre type may be chosen to produce desirable properties of enhanced shock absorbency over and above that provided by the vibration-damping material interposed between the complementary formations. Such fibres with good shock absorbency are glass fibres, aramid fibres and polyethylene fibres, and such fibres may be used in combination with each other or with carbon fibres to achieve the desirable properties. A part handle portion 4 is made in the same way and has formations 5 and 6 (which lies behind formation 3 in Figure 3). The complementary formations (fingers) of these two part handle portions are assembled so as to interdigitate and vibration-damping material 7 is injected between the said formations. When the vibration-damping material 7 sets it bonds to the formations. Thus the part handle portions are mechanically isolated but strongly bonded by the vibration-damping material. Such an assembly may be used e.g. as part of a games racket.

Referring to Figures 5 to 8, the construction is of a very similar principle to that shown in Figures 1 to 4 but uses instead complementary formations of three fingers each.

Referring to Figures 9 and 10, a cricket bat which incorporates a further embodiment of the present invention consists of a part handle portion 8 with formations 9, 10 assembled with and bonded via a vibration-damp-

ing material 11 to complementary formations 12, 13 of part handle portion 14. The handle assembly is hollow and of consolidated resin impregnated fibre composite and is bonded to a wooden blade 15.

The main direction in which a cricket ball will strike is shown by the arrow F in Figure 10. In this arrangement the formations 9, 10 of the part handle portion 8 are in a plane perpendicular to the face of the bat and thus there will be improved shock absorbency compared to an arrangement where the formations 9, 10 are in a plane parallel to the face of the bat.

Referring to Figure 11, the part handle portion 16 has hollow fingers 17 and 18 joined along part of their length by an integral web 19. Referring to Figure 12, the part handle portion 20 has hollow fingers 21 and 22 (22 lies behind 21). The complementary formations (fingers) of the two part handle portions shown in Figures 11 and 12 are assembled so as to interdigitate as shown in Figure 13. Vibration-damping material 23 is injected between the said formations including transversely 24 of the longitudinal axis of the striking implement and then set to bond to the formations as shown in Figure 14. The arrow F indicates the direction of the force which will be experienced by the striking implement, whether it be a cricket bat or tennis racket, during use. Thus the web 19 resists the opening of the fingers 17 and 18 which would otherwise occur during use of the striking implement.

Claims

1. A striking implement comprises a hollow handle portion and a striking portion, in which the striking implement is discontinuous in that it comprises two parts, one part including the striking portion and the other part including the hollow handle portion or a part thereof, the said two parts having complementary formations which are assembled to overlap axially with a vibration-damping material interposed therebetween characterised in that the vibration-damping material (11) is bonded to said formations (9,10 and 13,12), and is in substantially mutually perpendicular planes parallel to the longitudinal axis of the handle portion, whereby said formations (9,10 and 13,12) are inseparably connected together but mechanically isolated one from another by the vibration-damping material (11).

2. A striking implement according to Claim 1 characterised in that the complementary formations (9,10 and 13,12) each consist of at least two fingers which interdigitate when assembled.

3. A striking implement according to Claim 1 or 2, characterised in that the vibration-damping material (11) is a thermosetting material.

4. A striking implement according to any preceding claim, characterised in that the vibration-damping material (11) is an injectable material.

5. A striking implement according to any preceding claim, characterised in that the vibration-damping material (11) comprises an elastomer.

6. A striking implement according to any preceding claim, characterised in that the vibration-damping material (11) comprises a polyurethane.

7. A striking implement according to any preceding claim, characterised in that the vibration-damping material (11) has a hardness greater than 60° SHORE A measured according to B.S. 2782 Part 3 "Indentation Hardness by Durometer (Shore A)" and resilience below 20% when measured according to B.S. 903 Part A8 Method B "Method for Rebound Resilience".

8. A striking implement according to Claim 7, characterised in that the vibration-damping material (11) has a hardness in the range 70 to 95° SHORE A measured according to B.S. 2782 Part 3 "Indentation Hardness by Durometer (Shore A)".

9. A striking implement according to Claim 7 or 8, characterised in that the vibration-damping material (11) has a resilience in the range 5 to 15% measured according to B.S. 903 Part A8 Method B "Method for Rebound Resilience".

10. A striking implement according to Claim 1,2,3,4,5,6,8 and 9, characterised in that the vibration-damping material (11) comprises an injectable, thermosetting polyurethane elastomer and has a hardness of 70 to 95° SHORE A measured according to BS. 2782 Part 3 "Indentation Hardness by Durometer (Shore A)" and a resilience in the range 5 to 15% measured according to B.S. 903 Part A8 Method B "Method for Rebound Resilience".

11. A striking implement according to any preceding claim characterised in that the striking implement consists of two parts having complementary formations (9,10 and 12,13) connected by means of vibration-damping material (11).

12. A striking implement according to any preceding claim characterised in that the vibration-damping material (11) is self-bonded to the complementary formations (9,10 and 12,13) without a separate adhesive.

13. A striking implement according to any preceding claim. characterised in that the complementary formations each consist of at least two fingers (17,18 and 21,22) which interdigitate when assembled and one of the complementary formations of at least two fingers (17,18) has a web (19) connecting the fingers partially along the length thereof.

14. A striking implement according to any preceding claim characterised in that the vibration-damping material (11) is interposed between and bonded to said formations (9,10 and 12,13) in two substantially mutually perpendicular planes intersecting on the axis of symmetry of said assembled two parts (8,14).

15. A striking implement according to Claim 14 characterised in that at least one of the mutually perpendicular planes passes through the longitudinal axis of the striking implement.

16. A method of making a striking element comprises providing a hollow handle portion (8) and a striking portion (14,15), effecting complementary formations (9,10 and 12,13) in the hollow handle portion and the striking portion, assembling axially the complementary formations, providing a vibration-damping material (11) between the complementary formations in substantially mutually perpendicular planes and causing or allowing the vibration-damping material (11) to bond said complementary formations so that the hollow handle portion and the striking portion are mechanically isolated one from the other but are inseparably joined together.

17. A method according to Claim 16 characterised in that the hollow handle portion and the striking portion are moulded in one piece which is then cut through, the resulting hollow handle portion (8) and the striking portion (14,15) having complementary formations (9,10 and 12,13) are then rotated with respect to each other and the said complementary formations are assembled axially so as to interdigitate with each other.

18. A striking implement according to any of Claims 1 to 15 characterised in that the vibration-damping material also extends transversely (24) of the longitudinal axis of the striking implement.

Patentansprüche

1. Ein Schlaggerät mit einem hohlen Griffteilstück und einem Schlagteilstück, wobei das Schlaggerät darin diskontinuierlich ist, daß es zwei Teile umfaßt, das eine Teil, das das Schlagteilstück einschließt, und das andere Teil, das das hohle Griffteilstück oder einen Teil davon einschließt, und die zwei Teile komplementäre Ausformungen aufweisen, welche zusammengebaut sind, um sich axial mit einem Vibrationsdämpfungsmaterial zu überlappen, das dazwischen angeordnet ist,
dadurch gekennzeichnet,
daß das Vibrationsdämpfungsmaterial (11) mit den Ausformungen (9, 10 und 13, 12) verbunden ist und in im wesentlichen wechselseitig senkrechten Ebenen parallel zu der longitudinalen Achse des Griffteilstucks liegt, wodurch die Ausformungen (9, 10 und 13, 12) durch das Vibrationsdämpfungsmaterial (11) untrennbar miteinander verbunden aber mechanisch voneinander isoliert sind.

2. Ein Schlaggerät nach Anspruch 1, dadurch gekennzeichnet, daß die komplementären Ausformungen (9, 10 und 13, 12) jeweils aus wenigstens zwei Fingern bestehen, welche, wenn sie zusammengebaut sind, ineinandergreifen.

3. Ein Schlaggerät nach Anspruch 1 oder 2, dadurch gekennzeichenet, daß das Vibrationsdämpfungsmaterial (11) ein thermisch härtendes Material ist.

4. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) ein spritzbares Material ist.

5. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) ein Elastomer umfaßt.

6. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) ein Polyurethan umfaßt.

7. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) eine Härte, die größer als 60° SHORE A ist, gemessen gemäß B.S. 2782 Teil 3 "Eindruckhärte durch Durometer (Shore A) ", und eine Elastizität aufweist, die unter 20% liegt, wenn sie gemäß B.S. 903 Teil A8 Verfahren B "Verfahren für Rückprallelastizität" gemessen wird.

8. Ein Schlaggerät nach Anspruch 7, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) eine Härte im Bereich von 70 bis 95° SHORE A aufweist, gemessen gemäß B.S. 2782 Teil 3 "Eindruckhärte durch Durometer (Shore A)".

9. Ein Schlaggerät nach Anspruch 7 oder 8, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) eine Elastizität im Bereich von 5 bis 15% aufweist, gemessen gemäß B.S. 903 Teil A8 Verfahren B "Verfahren für Rückprallelastizität".

10. Ein Schlaggerät nach Anspruch 1, 2, 3, 4, 5, 6, 8 und 9, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) ein spritzbares, thermisch härtendes Polyurethanelastomer umfaßt und eine Härte von 70 bis 95° SHORE A, gemessen gemäß BS. 2782 Teil 3 " Eindruckhärte durch Durometer (Shore A)", und eine Elastizität im Bereich von 5 bis 15% aufweist, gemessen gemäß B.S. 903 Teil A8 Verfahren B "Verfahren für Rückprallelastizität".

11. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Schlaggerät aus zwei Teilen mit komplementären Ausformungen (9, 10 und 12, 13) besteht, die mittels eines Vibrationsdämpfungsmaterials (11) verbunden sind.

12. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) mit den komplementären Ausformungen (9, 10 und 12, 13) ohne ein separates Haftmittel selbstverbunden ist.

13. Ein Schlaggerät nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß die komplementären Ausformungen jeweils aus wenigstens zwei Fingern (17, 18 und 21, 22) bestehen, welche, wenn sie zusammengebaut sind, ineinandergreifen, und eine der komplementären Ausformungen von wenigsten zwei Fingern (17, 18) ein Gewebe (19) aufweist, das die Finger teilweise längs der Länge davon verbindet.

14. Ein Schlaggerät nach einem vorhergehenden Anspruch dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial (11) zwischen den Ausformungen (9, 10 und 12, 13) in zwei im wesentlichen wechselseitig senkrechten Ebenen, die sich auf der Symetrieachse der zusammengebauten zwei Teile (8, 14) schneiden, angeordnet und mit diesen verbunden ist.

15. Ein Schlaggerät nach Anspruch 14, dadurch gekennzeichnet, daß wenigstens eine der wechselseitig senkrechten Ebenen durch die longitudinale Achse des Schlaggerätes verläuft.

16. Ein Verfahren zur Herstellung eines Schlagelements welches die Schritte umfaßt, daß ein hohles Griffteilstück (8) und ein Schlagteilstück (14, 15) vorgesehen werden, daß komplementäre Ausformungen (9, 10 und 12, 13) in dem hohlen Griffteilstück und dem Schlagteilstück bewirkt werden, daß die komplementären Ausformungen axial zusammengebaut werden, daß ein Vibrationsdämpfungsmaterial (11) zwischen den komplementären Ausformungen in im wesentlichen wechselseitig senkrechten Ebenen vorgesehen werden und daß Vibrationsdämpfungsmaterial (11) veranlaßt wird, oder diesem erlaubt wird, die komplementären Ausformungen zu verbinden, so daß das hohle Griffteilstück und das Schlagteilstück mechanisch voneinander isoliert aber untrennbar zusammengefügt sind.

17. Ein Verfahren nach Anspruch 16, dadurch gekennzeichnet, daß das hohle Griffteilstück und das Schlagteilstück in einem Stück geformt werden, welches dann durchgeschnitten wird, daß das resultierende hohle Griffteilstück (8) und das Schlagteilstück (14, 15), die komplementäre Ausformungen (9, 10 und 12, 13) aufweisen, dann in Bezug zueinander gedreht werden und die komplementären Ausformungen axial zusammengebaut werden, um ineinanderzugreifen.

18. Ein Schlaggerät nach einem der Ansprüche 1 bis 15, dadurch gekennzeichnet, daß das Vibrationsdämpfungsmaterial sich auch quer (24) zu der longitudinalen Achse des Schlaggerätes erstreckt.

Revendications

1. Instrument de frappe comprenant une partie formant manche creuse et une partie de frappe, instrument de frappe qui est discontinu en ce sens qu'il se compose de deux éléments dont l'un comprend la partie de frappe et l'autre la partie formant manche creuse, ou une partie de celle-ci, lesdits deux éléments ayant des structures complémentaires qui sont assemblées pour se chevaucher axialement, tandis qu'un matériau amortisseur de vibrations est interposé entre celles-ci, caractérisé en ce que le matériau amortisseur de vibrations (11) est assemblé par adhérence avec lesdites structures (9, 10 et 13, 12) et s'étend dans des plans sensiblement perpendiculaires entre eux et parallèles à l'axe longitudinal de la partie formant manche, pour qu'ainsi lesdites structures (9, 10 et 13, 12) soient reliées l'une à l'autre d'une manière inséparable tout en étant isolées mécaniquement l'une de l'autre par le matériau amortisseur de vibrations (11).

2. Instrument de frappe selon la revendication 1, caractérisé en ce que les structures complémentaires (9, 10 et 13, 12) se composent chacune d'au moins deux doigts qui s'imbriquent lorsqu'ils sont assemblés.

3. Instrument de frappe selon la revendication 1 ou 2, caractérisé en ce que le matériau amortisseur de vibrations (11) est un matériau thermodurcissable.

4. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) est un matériau injectable.

5. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) comprend un élastomère.

6. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) comprend un polyuréthane.

7. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) possède une dureté supérieure à 60° SHORE A mesurée conformément à la Norme Britannique B.S. 2782, Partie 3 "Détermination de la Dureté à la Pénétration par un Duromètre (Dureté Shore A)" et une élasticité inférieure à 20% mesurée conformément à la Norme Britannique B.S. 903, Partie A8, Méthode B "Méthode relative à l'Elasticité de Rebondissement".

8. Instrument de frappe selon la revendication 7, caractérisé en ce que le matériau amortisseur de vibrations (11) possède une dureté qui se situe dans la plage de 70 à 95° SHORE A mesurée conformément à la Norme Britannique B.S. 2782, Partie 3 "Détermination de la Dureté à la Pénétration par un Duromètre (Dureté Shore A)".

9. Instrument de frappe selon la revendication 7 ou 8, caractérisé en ce que le matériau amortisseur de vibrations (11) possède une élasticité qui se situe dans la plage de 5 à 15% mesurée conformément à la Norme Britannique B.S. 903, Partie A8, Méthode B "Méthode relative à l'Elasticité de Rebondissement".

10. Instrument de frappe selon la revendication 1, 2, 3, 4, 5, 6, 8 ou 9, caractérisé en ce que le matériau amortisseur de vibrations (11) comprend un élastomère de polyuréthane thermodurcissable injectable et possède une dureté de 70 à 95° SHORE A mesurée conformément à la Norme Britannique B.S. 2782, Partie 3 "Détermination de la Dureté à la Pénétration par un Duromètre (Dureté Shore A)" et une élasticité qui se situe dans la plage de 5 à 15% mesurée conformément à la Norme Britannique B.S. 903, Partie A8, Méthode B "Méthode relative à l'Elasticité de Rebondissement".

11. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que l'instrument de frappe se compose de deux éléments ayant des structures complémentaires (9, 10 et 12, 13) reliées au moyen d'un matériau amortisseur de vibrations (11).

12. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) est assemblé par auto-adhérence avec les structures complémentaires (9, 10 et 12, 13) sans adhésif séparé.

13. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que les structures complémentaires se composent chacune d'au moins deux doigts (17, 18 et 21, 22) qui s'imbriquent lorsqu'ils sont assemblés, et en ce que l'une des structures complémentaires composée d'au moins deux doigts (17, 18) possède une nervure (19) qui relie partiellement les doigts dans le sens de leur longueur.

14. Instrument de frappe selon l'une quelconque des revendications précédentes, caractérisé en ce que le matériau amortisseur de vibrations (11) est interposé entre lesdites structures (9, 10 et 12, 13) et assemblé par adhérence avec celles-ci dans deux plans sensiblement perpendiculaires entre eux qui se coupent sur l'axe de symétrie desdits deux éléments (8, 14) assemblés.

15. Instrument de frappe selon la revendication 14, caractérisé en ce que l'un au moins des plans perpendiculaires entre eux passe par l'axe longitudinal de l'instrument de frappe.

16. Méthode de fabrication d'un instrument de frappe comprenant les étapes qui consistent à définir une partie formant manche (8) creuse et une partie de frappe (14, 15), à réaliser des structures complémentaires (9, 10 et 12, 13) dans la partie formant manche creuse et dans la partie de frappe, à assembler axialement les structures complémentaires, à disposer un matériau amortisseur de vibrations (11) entre les structures complémentaires dans des plans sensiblement perpendiculaires entre eux et à obliger ou à autoriser le matériau amortisseur de vibrations (11) à assembler par adhérence lesdites structures complémentaires afin que la partie formant manche creuse et la partie de frappe soient isolées mécaniquement l'une de l'autre tout en étant reliées l'une à l'autre de manière inséparable.

17. Méthode selon la revendication 16, caractérisée en ce que la partie formant manche creuse et la partie de frappe sont moulées sous la forme d'une seule pièce qui est ensuite découpée, en ce que la partie formant manche (8) creuse et la partie de frappe (14, 15) résultantes qui ont des structures complémentaires (9, 10 et 12, 13) sont alors soumises à une rotation l'une par rapport à l'autre, et en ce que lesdites structures complémentaires sont assemblées axialement afin de s'imbriquer l'une avec l'autre.

18. Instrument de frappe selon l'une quelconque des revendications 1 à 15, caractérisé en ce que le matériau amortisseur de vibrations s'étend également transversalement (24) par rapport à l'axe longitudinal de l'instrument de frappe.

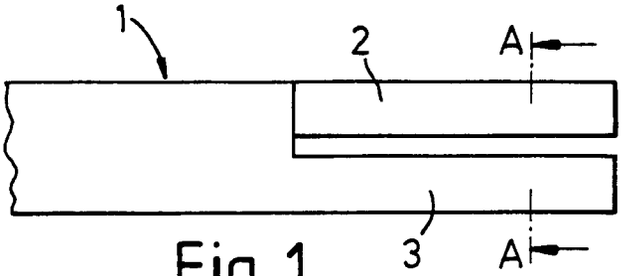


Fig. 1

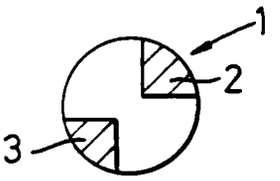


Fig. 2

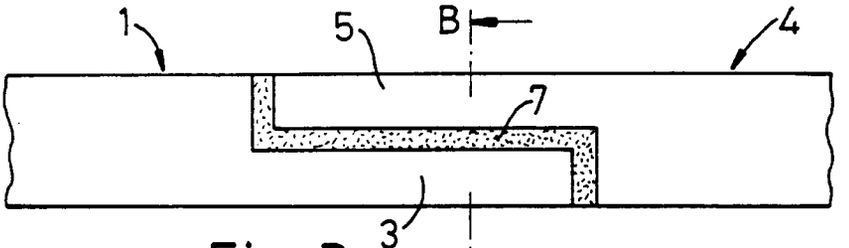


Fig. 3

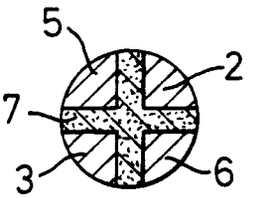


Fig. 4

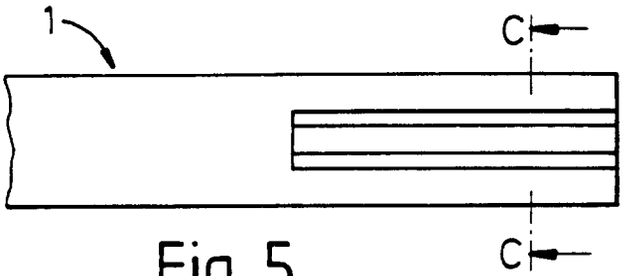


Fig. 5

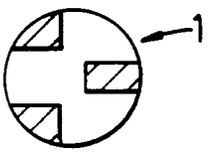


Fig. 6

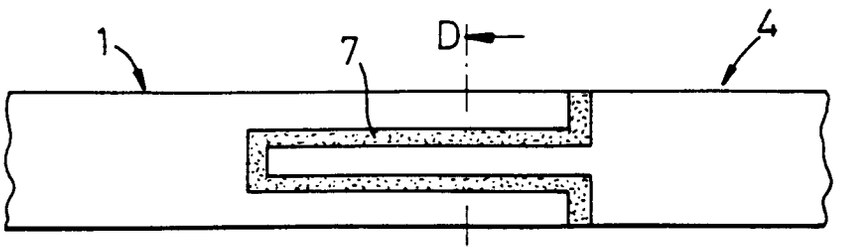


Fig. 7

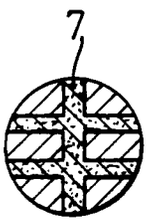


Fig. 8

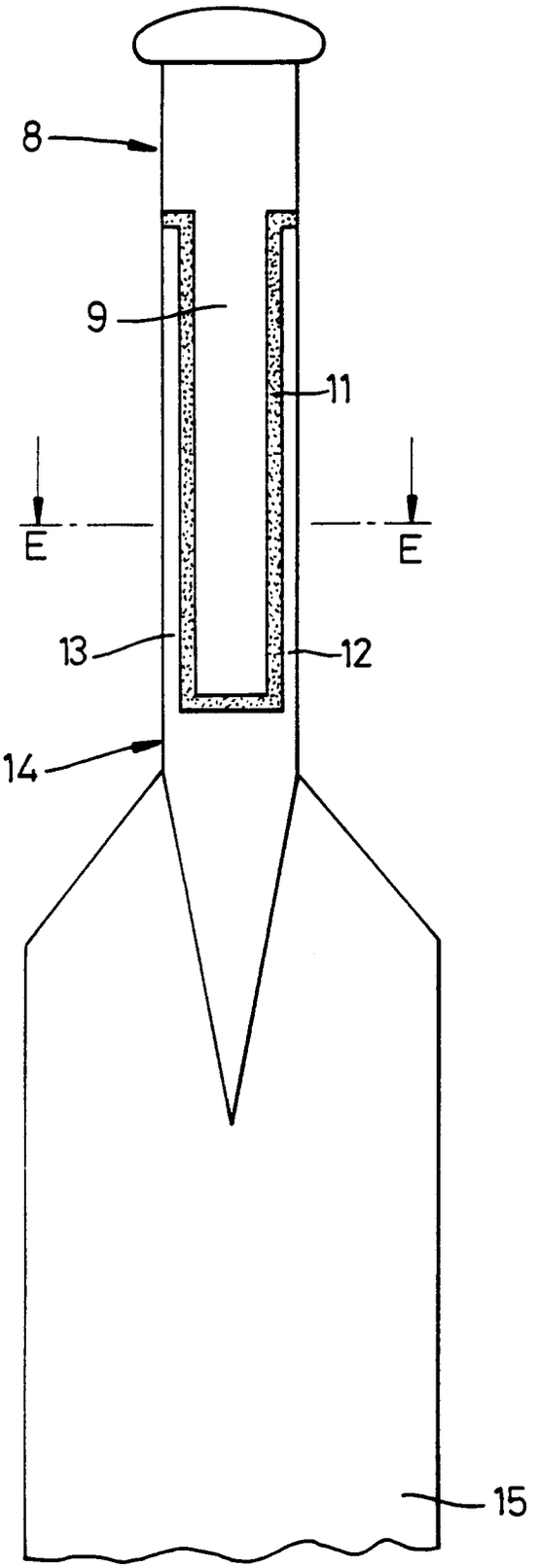


Fig. 9

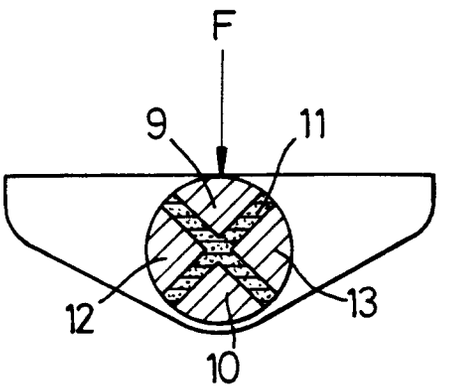


Fig. 10

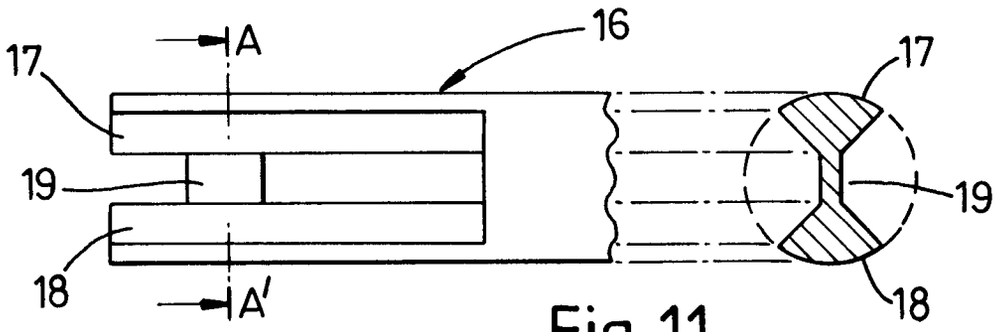


Fig. 11

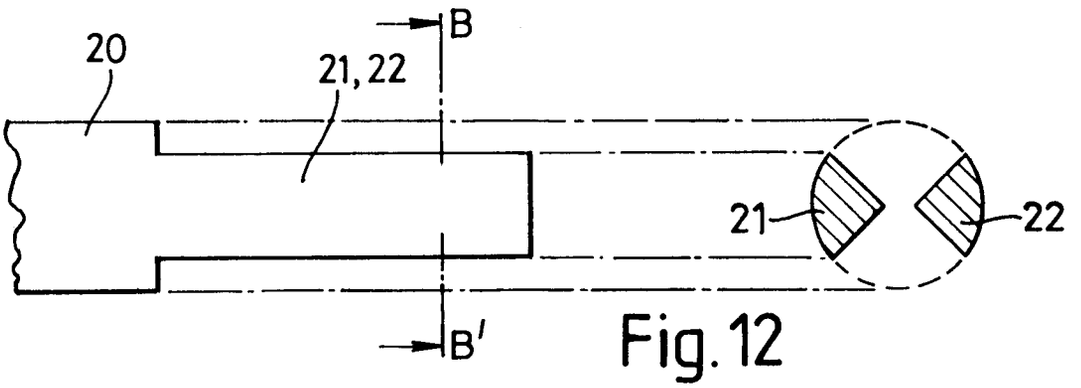


Fig. 12

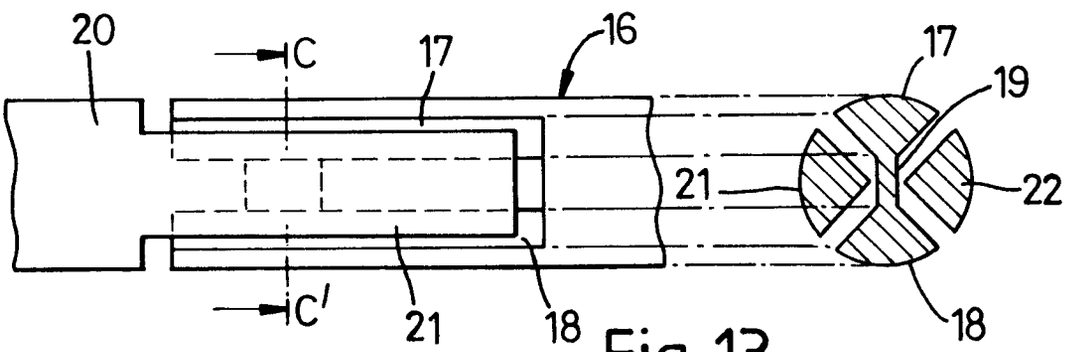


Fig. 13

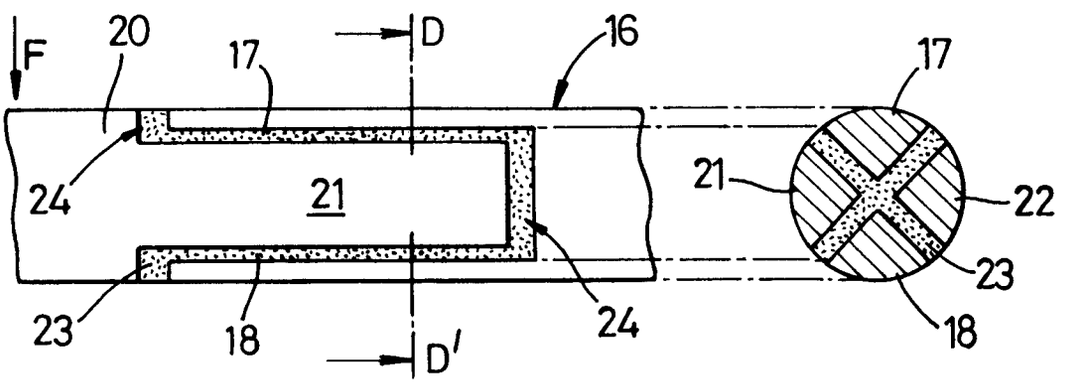


Fig. 14