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(54) **Pair of carrying and drawing grippers for weaving loom**

Bringergreifer und Nehmergreifer für Webmaschinen

Griffe porteuse et griffe tireuse pour les métiers à tisser

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**DE-A1-102005 014 107 JP-A- 2002 173 851**  
**US-A- 4 259 997**

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention refers to a pair of improved carrying and drawing grippers, respectively, for a weaving loom. In particular, the invention concerns a pair of grippers which have a higher degree of safety in connection with the interference relationship with the warp yarns as well as a longer useful life.

### BACKGROUND ART

**[0002]** It is known that in modern high-speed looms the path of the grippers carrying the weft into the warp shed is characterised by an ever more frequent interference of the grippers with the warp yarns. As a matter of fact, on the one hand, in order to reduce the stresses on the warp yarns, the opening degree of the shed tends to be ever smaller; on the other hand, due to the increasing speed of the looms, it is necessary to advance the starting time of the shed closing to a time in which the grippers are still inside the shed. The interference of the warp yarns with the gripper surface is hence inevitable.

**[0003]** Such interference implies problems both in terms of the integrity of the warp yarns - which can remain entangled on the gripper and hence be cut or deviated by the movement of the gripper, causing the halt of the loom or the presence of weaving defects - and in connection with gripper wear with the formation of possible fine cracks and notches. The presence of these micro-defects on the surfaces of the grippers in contact with the warp yarns increases of course the frequency of the cases of warp yarn catching by the grippers and furthermore determines dangerous trigger points of fatigue failure, so that the useful life duration of the grippers is currently fully unsatisfactory.

**[0004]** US 4259997 describes a carrying gripper constructed of sheet metal parts which are plastically deformed, associated among them through screws.

### PROBLEM AND SOLUTION

**[0005]** The problem underlying the invention is hence that of suggesting a particular structure of a pair of carrying and drawing grippers for weaving looms which allows to overcome the mentioned drawbacks and which hence allows to dramatically reduce the frequency of the cases of warp yarn catching by the grippers and furthermore to remarkably increase the duration of the useful life thereof.

**[0006]** This object is achieved through a pair of carrying and drawing grippers having the features reported in claim 1. The dependent claims disclose further preferred features of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** Further features and advantages of the pair of grippers of the invention are in any case more evident from the following detailed description of a preferred embodiment of the same, given purely as a non-limiting example and illustrated in the attached drawings, wherein:

fig. 1 A is a perspective view of an extruded piece from which the body of the carrying gripper of the present invention is obtained;

fig. 1B is an enlarged-scale section view of the extruded piece of fig. 1;

fig. 2A is a perspective view of the carrying gripper of the invention, on the reed side;

fig. 2B is a perspective view of the carrying gripper of the invention, on the side opposite to the one of fig. 2A;

fig. 3A is a side view of the drawing gripper of the invention, with the weft gripping device in a closed position;

fig. 3B is an enlarged-scale view of the front part of the gripper shown in fig. 3A, with the weft gripping device in an open position.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0008]** According to a main feature of the present invention, the body of the carrying gripper is built starting from a segment of metal profile 1, preferably an extruded piece made of light alloy, through mechanic machining operations by simple shaving removal. The shape of such extruded piece is clearly visible in figs. 1A and 1B and has a generally D-shaped hollow section 1 of the central body thereof wherefrom a base element 2, a middle shelf 3 and an upper tile 4 project. The curved portion of the D-shaped section 1 (on the right in fig. 1B), which corresponds in the finished gripper to the side facing the reed, is radiussed in a continuous manner to tile 4 and separated from the base element by a deep guiding groove 5. In correspondence of the straight portion of the D-shaped section (on the left in fig. 1B), the middle shelf 3 projects in a crosswise direction, said shelf representing a fastening element for the gripper control belt in the finished gripper. Tile 4 projects laterally to a greater extent than middle shelf 3 and represents a protection element of the weft gripping devices G, fastened in the inner portion of the gripper, as clearly visible in fig. 2B.

**[0009]** This particular building system of the gripper allows to have a gripper, which central body consists of a single piece having high structural rigidity and devoid of any notch effects due to the connections between different elements typical of the grippers of the prior art. The gripper hence displays increased fatigue resistance and high stability and shape reproducibility, so that the usual adjustment and corrective operations by the weaver upon gripper replacement can be fully eliminated.

Moreover, the majority of the outer surfaces of the gripper, which are intended to come into rubbing contact with the warp yarns, consist of the extrusion surfaces of the extruded profile and hence already have per se a smoothness degree which does not require further machining operations.

[0010] Since extruded piece 1 already comprises all the essential gripper elements, the mechanic machining operations by shaving removal through which the finished carrier gripper is obtained are extremely simple and fast, also in the undercut areas, so that the carrying gripper of the invention is also a gripper of inexpensive manufacturing compared to the high technical performances it offers.

[0011] As visible in figs. 2a and 2B, the mechanical machining operations of extruded piece 1 are performed so that the carrying gripper P of the present invention has the tip thereof aligned on the side facing towards the reed (the front side in fig. 2A), so as to leave a wide space inside the gripper for the housing of the weft gripping devices G, which devices - as already mentioned above - are fully protected by tile 4 with respect to any possible interference with the warp yarns.

[0012] The drawing gripper T of the present invention is illustrated in figs. 3A and 3B and is of the type wherein the wedge-like end tip C, in order to free the gripped weft, is equipped with a first longitudinal movement according to arrow F, controlled by lever L in opposition to spring M, and with a second crosswise movement according to arrow H, which allows to accomplish a wide opening between the wedge-like end tip C and a hook-shaped element B very rapidly.

[0013] This type of wedge-like tips with opening according to two perpendicular movements are already known in the art, however, in known devices also the second movement is accomplished with a lever and spring system. This causes a certain complexity and bulk of the system and therefore a necessary greater bulk of the drawing gripper, this system being furthermore subject to occasional jamming.

[0014] According to the present invention, the lateral displacement of the wedge-like tip is instead obtained through the use of a permanent magnet 6, embedded in the body of the drawing gripper and capable of imparting a force of attraction on control rod 7 of wedge-like tip C as soon as said control rod, through the longitudinal movement according to arrow F, has freed itself of a counter-wedge 8, formed on the opposite side of the hook (G). As a matter of fact, counter-wedge 8 prevents a premature lowering of the rod and hence the contact between rod 7 and magnet 6, until the end of the longitudinal travel of rod 7, thus avoiding any chafing of rod 7 on magnet 6, which chafing would impair the duration in time thereof.

[0015] This structure of the control device of the wedge-like tip has an extremely limited bulk, so that the gripper may have a much thinner design than known grippers and is hence capable of coming out of the shed

without interfering with the warp yarns, even when the closing of the shed is advanced.

[0016] In consideration of the extremely limited size of the gripper and hence of the thin sections it consists of, the drawing gripper of the invention is preferably made of steel.

[0017] Finally, according to another important feature of the invention, common to both carrying and drawing grippers, the outer surface of the grippers is subject to an electrolytic coating treatment of a very thin surface layer of ceramic material through a technology known as PEO (Plasma Electrolytic Oxidation) which allows precisely to coat the gripper surfaces with dense and very hard layers of ceramic material having an extremely small thickness, for example preferably 20-30 micrometres, tightly gripped to the base material.

[0018] This surface ceramic layer determines, as predictable, a net improvement of the useful life duration of the gripper, protecting the underlying metal material from the wear induced by the rubbing of the warp yarns. Due to the very small thickness of said ceramic layer furthermore does not change in any way the functional features of the gripper nor the mechanic details of the same, so that such treatment can be applied as final treatment at the end of all mechanic finishing operations.

[0019] Such ceramic layer furthermore determines, even though indirectly and in a fully surprising way, a dramatic abatement of the fatigue failure of the grippers, supposedly because the forming of micro-cracks and micro-notches is eliminated or strongly reduced, which act as trigger points for such fatigue failure. The useful life duration of the grippers of the present invention is hence extended by a great deal.

[0020] However, it is understood that the invention must not be considered limited to the particular arrangement illustrated above, which represents only an exemplifying embodiment thereof, but that a number of variants are possible, all within the reach of a person skilled in the field, without departing from the scope of protection of the invention, as defined by the following claims.

## Claims

1. Pair of carrying (P) and drawing (T) grippers for a weaving loom, **characterised in that** the body of the carrying gripper is formed by a machined segment of an extruded metal profile (1).
2. Pair of grippers as claimed in claim 1), wherein said extruded metal profile (1) has a generally D-shaped section of the central body thereof wherefrom a base element (2), a middle shelf (3) and an upper tile element (4) project.
3. Pair of grippers as claimed in claim 2), wherein the curved portion of the D-section of the extruded profile (1) is continuously radiused to the tile element (4)

and separated from the base element (2) by a deep guiding groove (5).

4. Pair of grippers as claimed in claim 2), wherein from the straight portion of the D-shaped section of the extruded profile (1) said middle shelf 3 projects in a transversal direction, which middle shelf - in the finished gripper - represents the fastening element of a control belt of the gripper.
5. Pair of grippers as claimed in claim 2), wherein said carrying gripper also comprises weft gripping devices (G) fastened in the inner portion of said gripper and wherein said tile element (4) projects laterally by more than said middle shelf (3) does and represents a protection element of said weft gripping devices (G).
6. Pair of grippers as claimed in any one of the preceding claims, wherein said drawing gripper is of the type comprising a wedge-like end tip (C), for gripping the weft against a hook-shaped element (B), provided with a first longitudinal movement and with a second movement transversal to the first one for determining a wide and quick opening between said wedge-like end tip (C) and said hook-shaped element (B), **characterised in that** said second movement is obtained through a permanent magnet (6) integrated in the gripper body and apt to impart a force of attraction on the control rod (7) of the wedge-like end tip (C).
7. Pair of grippers as claimed in claim 6), wherein said hook-shaped element (B) is furthermore provided with a counter-wedge (8), on the opposite side of the hook-shaped element (B), which prevents contact between the control rod (7) and the magnet (6) until the end of said first longitudinal opening movement.
8. Pair of grippers as claimed in any one of the preceding claims, wherein on at least one portion of the outer surface of the grippers a coating of a dense, hard and thin surface layer of ceramic material is applied.
9. Pair of grippers as claimed in claim 8), wherein said layer of ceramic material is formed on the grippers downstream of all mechanical processing on the same.
10. Pair of grippers as claimed in claim 9), wherein the thickness of said layer of ceramic material is of 20-30 micrometres.

#### Patentansprüche

1. Paar von Bringer-(P) und Nehmergreifern (T) für ei-

nen Webstuhl, **dadurch gekennzeichnet, dass** der Grundkörper des Bringergreifers durch ein maschinell bearbeitetes Segment eines extrudierten Metallprofils (1) gebildet ist.

2. Paar von Greifern nach Anspruch 1, **dadurch gekennzeichnet, dass** das genannte extrudierte Teilprofil (1) einen im Ganzen D-förmigen Querschnitt des zentralen Grundkörpers davon aufweist, von dem ein Basiselement (2), ein mittleres Fach (3) und ein oberes Dachplattenelement (4) vorstehen.
3. Paar von Greifern nach Anspruch 2, **dadurch gekennzeichnet, dass** der gekrümmte Abschnitt des D-Querschnitts des extrudierten Profils (1) einen kontinuierlichen Radius zu dem Dachplattenelement (4) aufweist und von dem Basiselement (2) durch eine tiefe Führungsnut (5) getrennt ist.
4. Paar von Greifern nach Anspruch 2, **dadurch gekennzeichnet, dass** von dem geraden Abschnitt des D-förmigen Querschnitts des extrudierten Profils (1) das genannte Fach (3) in einer Querrichtung vorsteht, wobei das mittlere Fach - in dem fertigen Greifer - das Befestigungselement eines Steuergurts des Greifern darstellt.
5. Paar von Greifern nach Anspruch 2, **dadurch gekennzeichnet, dass** der Traggreifer weiterhin Schussfadengreifvorrichtungen (G) aufweist, die in dem inneren Abschnitt des Greifers befestigt sind, und wobei das genannte Dachplattenelement (4) in Querrichtung weiter vorsteht als das mittlere Fach (3) und ein Schutzelement der Schussfadengreifvorrichtungen (G) darstellt.
6. Paar von Greifern nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Zuggreifer von der Bauart ist, die eine keilförmige Endspitze umfasst, um den Schussfaden gegen ein hakenförmiges Element (B) zu erfassen, versehen mit einer ersten Längsbewegung und einer zweiten Längsbewegung der zu der ersten, zum Festlegen einer Weiten- und Schwellenöffnung zwischen der keilförmigen Endspitze (C) und dem hakenförmigen Element (B), **dadurch gekennzeichnet, dass** die genannte zweite Bewegung durch einen Permanentmagneten (6) erhalten wird, der in dem Greiferkörper integriert ist und geeignet ist, eine Anziehungskraft auf die Steuerstange (7) der keilförmigen Endspitze (C) auszuüben.
7. Paar von Greifern nach Anspruch 6, **dadurch gekennzeichnet, dass** das hakenförmige Element (B) weiterhin mit einem Gegenkeil (8) versehen ist, auf der gegenüberliegenden Seite des hakenförmigen Elements (B), welches einen Kontakt zwischen der Steuerstange (7) und dem Magneten (6) bis zum En-

de der genannten ersten längs gerichteten Öffnungsbewegung verhindert.

8. Paar von Greifern nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest auf einem Teil der äußeren Oberfläche der Greifer eine Beschichtung aus einer dichten, harten und dünnen Oberflächenschicht eines keramischen Materials aufgebracht ist.
9. Paar von Greifern nach Anspruch 8, **dadurch gekennzeichnet, dass** die genannte Schicht aus keramischem Material nach Abschluss aller mechanischen Bearbeitungsschritte der Greifer auf diese aufgebracht wird.
10. Paar von Greifern nach Anspruch 9, **dadurch gekennzeichnet, dass** die Dicke der genannten Schicht aus keramischem Material 20 bis 30 Mikrometer beträgt.

#### Revendications

1. Paire de pinces porteuse (P) et tireuse (T) pour métier à tisser, **caractérisée en ce que** le corps de la pince porteuse est formé par un segment usiné d'un profilé métallique extrudé (1).
2. Paire de pinces selon la revendication 1, dans laquelle ledit profilé métallique extrudé (1) a généralement une section en forme de D de son corps central à partir de laquelle font saillie un élément formant base (2), une tablette centrale (3) et un élément formant tuile supérieur (4).
3. Paire de pinces selon la revendication 2, dans laquelle la partie courbe de la section en D du profilé extrudé (1) est arrondie en continu jusqu'à l'élément (4) et séparée de l'élément formant base (2) par une rainure de guidage profonde (5).
4. Paire de pinces selon la revendication 2, dans laquelle, à partir de la partie droite de la section en forme de D du profilé extrudé (1), ladite tablette centrale (3) fait saillie dans une direction transversale, ladite tablette centrale - dans la pince finie - représente l'élément de fixation d'une courroie de commande de la pince.
5. Paire de pinces selon la revendication 2, dans laquelle ladite pince porteuse comprend également des dispositifs de pincage de trame (G) fixés dans la partie interne de ladite pince et dans laquelle ledit élément formant tuile (4) fait saillie latéralement davantage que ladite tablette centrale (3) et constitue un élément de protection desdits dispositifs de pincage de trame (G).

6. Paire de pinces selon l'une quelconque des revendications précédentes, dans laquelle ladite pince tireuse est du type comprenant une extrémité terminale cunéiforme (C) pour serrer la trame contre un élément en forme de crochet (B), ayant un premier mouvement longitudinal et un second mouvement transversal au premier mouvement pour déterminer une ouverture large et rapide entre ladite extrémité terminale cunéiforme (C) et ledit élément en forme de crochet (B), **caractérisée en ce que** ledit second mouvement est obtenu par le biais d'un aimant permanent (6) intégré dans le corps de pince et apte à communiquer une force d'attraction sur la tige de commande (7) de l'extrémité terminale cunéiforme (C).
7. Paire de pinces selon la revendication 6, dans laquelle ledit élément en forme de crochet (B) est, en outre, pourvu d'un contre-coin (8), sur le côté opposé de l'élément en forme de crochet (B), qui empêche un contact entre la tige de commande (7) et l'aimant (6) jusqu'à la fin dudit premier mouvement longitudinal d'ouverture.
8. Paire de pinces selon l'une quelconque des revendications précédentes, dans laquelle est appliquée, sur au moins une partie de la surface externe des pinces, un revêtement d'une couche de surface mince et dure, dense, de matériau céramique.
9. Paire de pinces selon la revendication 8, dans laquelle ladite couche de matériau céramique est formée sur les pinces en aval de tous les traitements mécaniques sur celles-ci.
10. Paire de pinces selon la revendication 9, dans laquelle l'épaisseur de ladite couche de matériau céramique est comprise entre 20 et 30 micromètres.

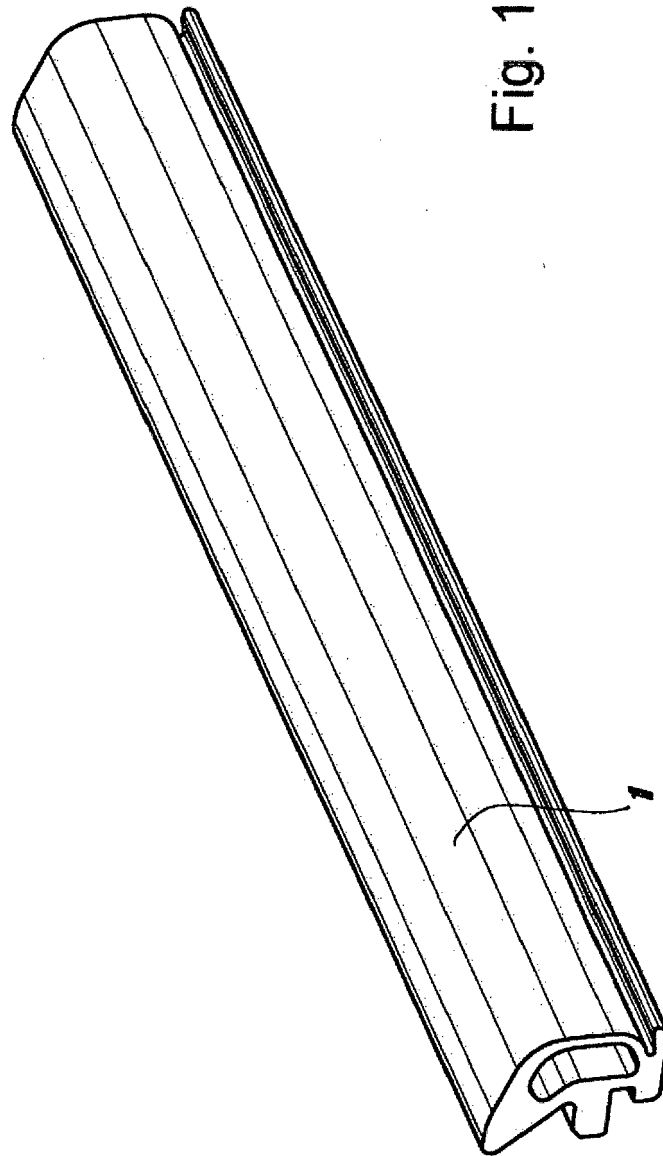


Fig. 1A

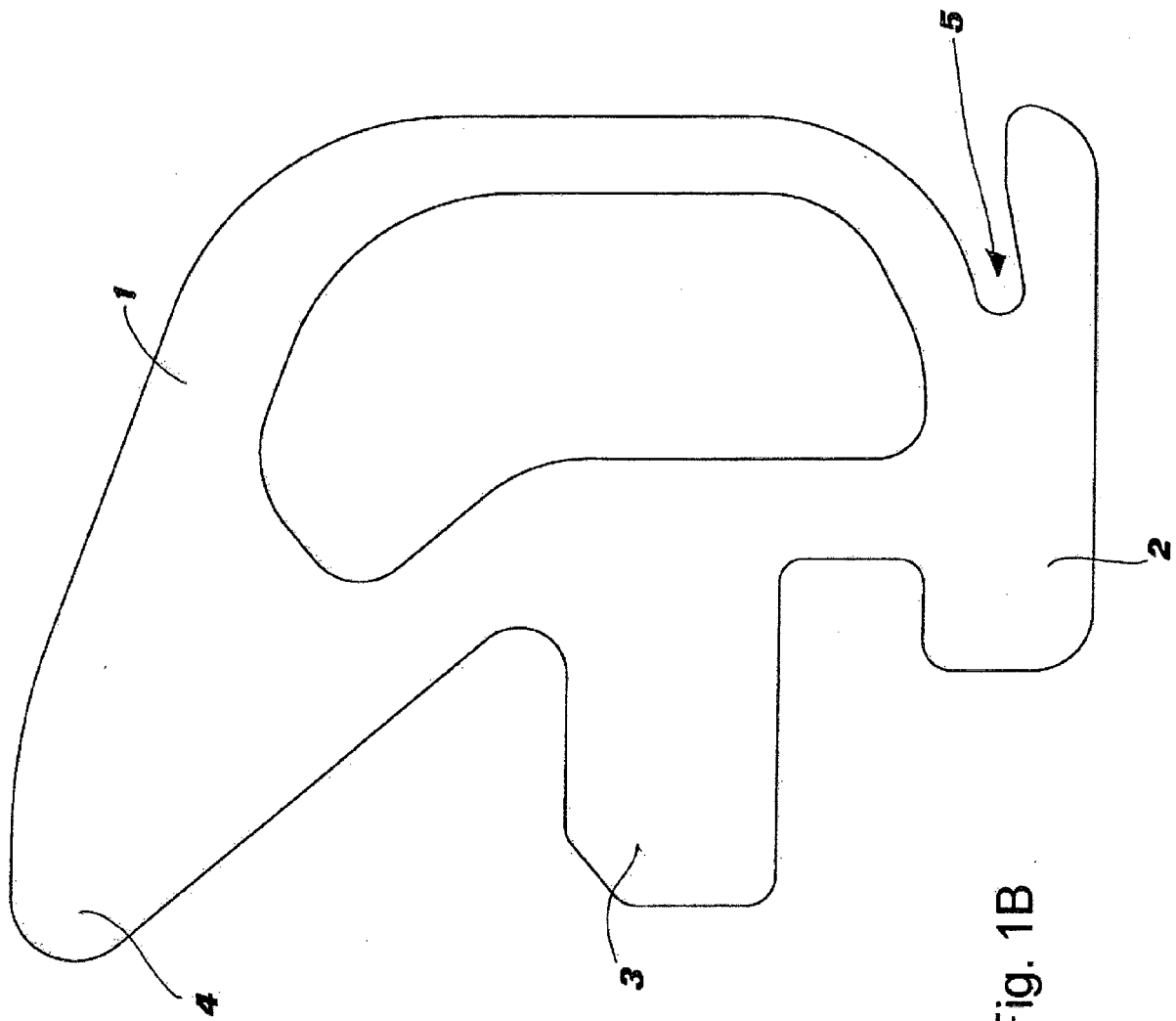
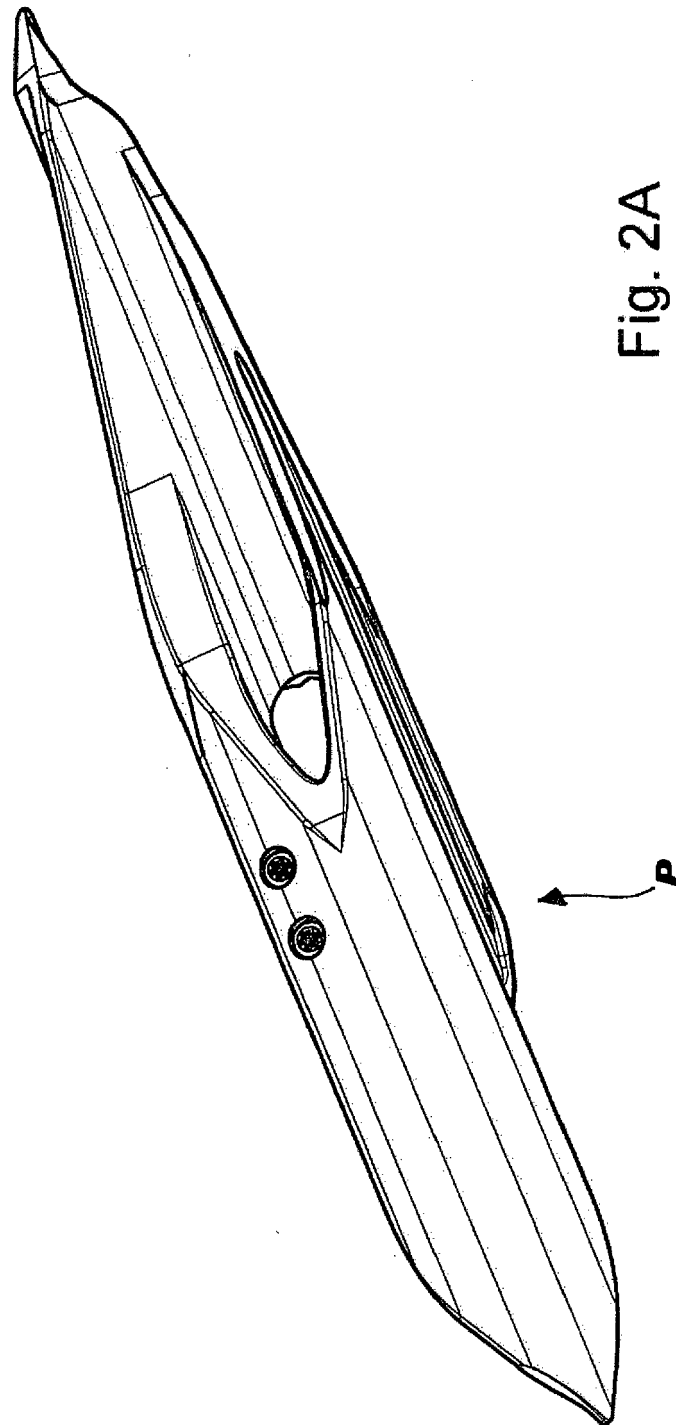


Fig. 1B





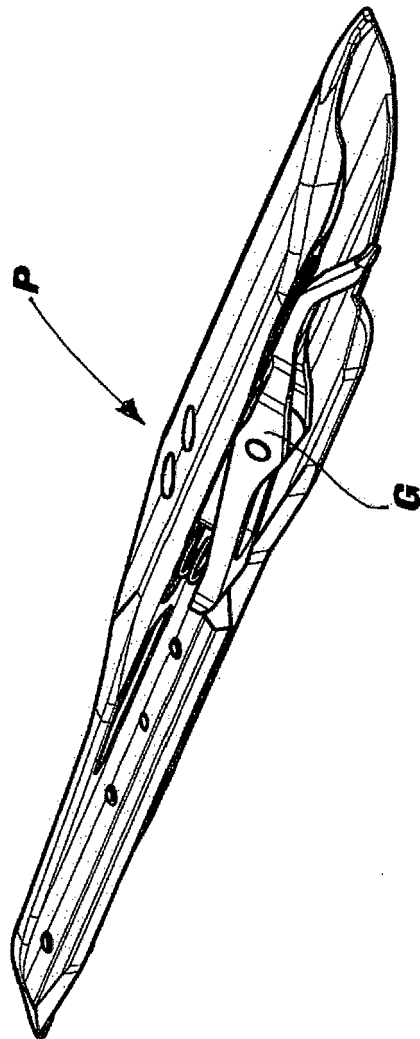


Fig. 2B

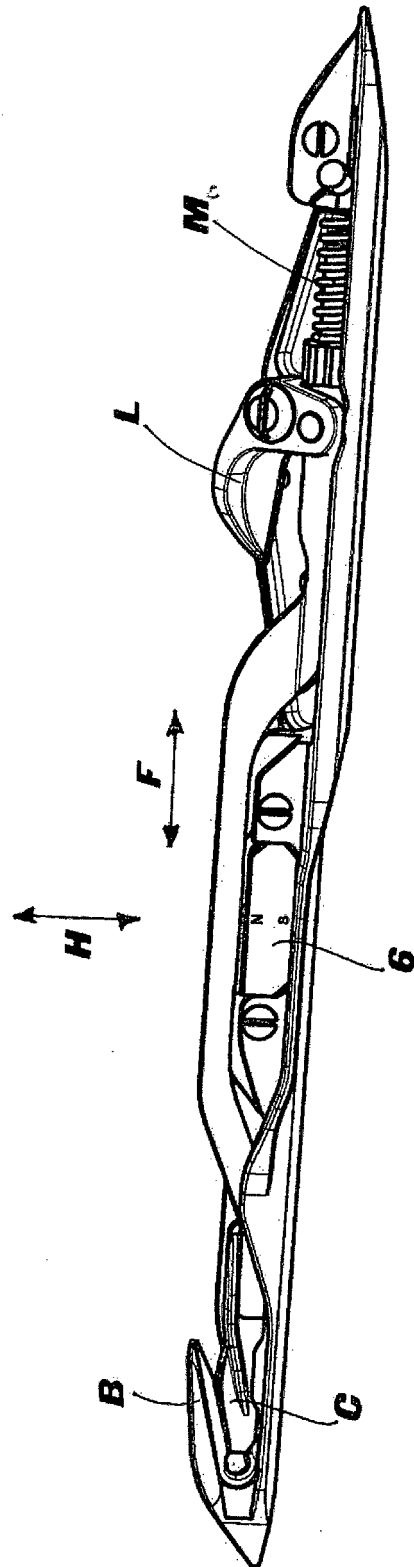
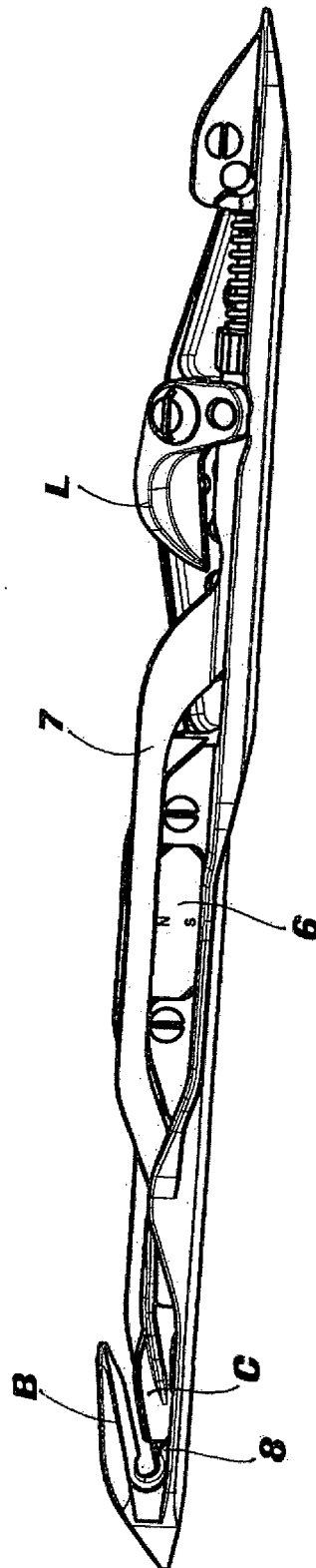


Fig. 3A



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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