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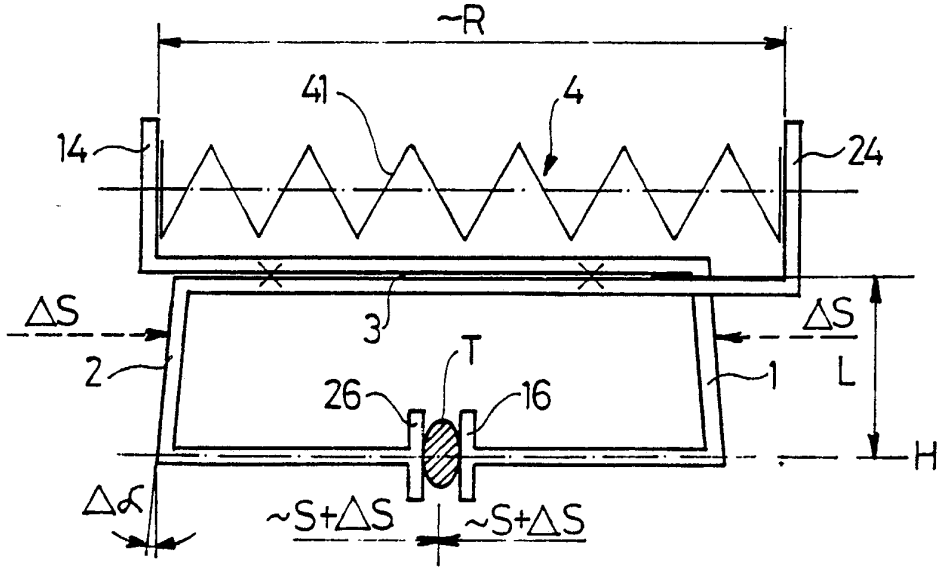

(57) Abstract

The invention provides a clamping device for releasably clamping an article such as clothing on rails, drying ropes or the like. The clamping device comprises a pair of opposed arm members (1, 2) provided with clamping jaws (16, 26) at their one end. The arm members are interconnected kinematically so as to be capable of relative movement with respect to each other and said clamping device further comprises a spring assembly urging said arm members and thus, the clamping jaws (16, 26) toward one another to grip the article therebetween. The arm members (1, 2) are interconnected by means of a loose fit linear slide guide (3) arranged, in a distance (L), parallelly with and thus, in clearly spaced relationship to the influence line (H) of the clamping force (S) that is exerted by said clamping jaws (16, 26) on the article (T) gripped therebetween. The spring assembly (4) is pre-stressed and located within the nearest proximity of the slide guide (3).

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Clamping device

Technical Field of the Invention

The invention relates to a clamping device for releasably clamping an article such as clothing on rails, drying ropes or the like. Such clamping device comprises a pair of opposed arm members provided with clamping jaws at their one end. The arm members are interconnected kinematically so as to be capable of relative movement with respect to each other. The clamping device further comprises a spring assembly urging the arm members and thus, the clamping jaws toward one another to grip the article therebetween.

Background Art

The following U.S. patents pertain to spring clamps, clips and similar devices. None of these, however, discloses a clamp having the features of the present invention. U.S. Pat. Nos.: 2,524,537 and 3,203,061. U.S. Patent Specification No. 4,388,747 discloses a clip provided with a hinge that is materially integral with the pair a clamping arms. The whole device is made of thermoplastics, and the arms are substantially extenuated in the area of the hinge.

For a wide range of applications, clamping devices provided with clamping jaws or jaw-forming members that are movable along a linear path have also become known. The Hungarian Patent Specification No. 102,024 describes a clamping head of such type for a memo-pad, while U.S. Patent No. 4,368,823 discloses a hanging necktie holder that holds ties through the use

of clamps which press the ties against the crossarm over which they are draped. In U.S. Pat. No. 4,106,508 a surgical clamp for the occlusion of blood vessels or other tubular conduits in human or other animal bodies is described that also follows the principle of linear jaw movement. The common characteristic feature of all prior art devices lies in that the attainable clamping force never exceeds the force stored in the spring element used, and release of the clamping device to allow removal of the article from between the jaw-forming members has to be effected by squeezing the handle portions of the device toward one another to open the jaws against the full spring action.

Summary of the Invention

An important object of the present invention is to provide a clamping device by which a clamping or gripping force that exceeds the force stored in the tensioned, compressed spring element of the clamp can be exerted and maintained onto the article between the clamping jaws of the device. Another object of the invention is to provide a clamping device in which the increased gripping force mentioned above yields in increased clamping and holding safety while easy handling and releasing characteristics, together with simple, aesthetic design and appearance are also achieved. A still further object of the present invention lies in the provision of a clamping device that would be usable on the largest field of practical applications.

Generally considered the clamping device of the present invention is composed of a pair of opposed arm members provided with clamping jaws at their one end.

The arm members are interconnected kinematically so as to be capable of relative movement with respect to each other. The clamping device further comprises a spring assembly urging the arm members and thus, the clamping jaws toward one another to grip the article therebetween. The novel features of the above described clamping device according to the present invention are characterized in that the arm members are interconnected by means of a loose fit linear slide guide which is arranged parallelly with and in a definite spaced relationship to the influence line of the clamping force that is exerted by the clamping jaws on the article gripped therebetween, and that the spring assembly is pre-stressed and located within the nearest proximity of the slide guide.

In a preferred embodiment, the arm members are inter- or overcrossed whereby the clamping jaws are urged to grip the article clamped therebetween by a compression force stored in the pre-stressed spring assembly, and the spring assembly comprises at least one preferably coil-type compression spring the influence line of which is aligned or at least very closely parallel with the slide guide.

In a further preferred embodiment the arm members of the clamping device have matching wall partitions and/or key ribs registering in slots forming the slide guide at their one ends when mounted together. The arm members are designed and shaped as substantially rigid component parts preferably made of a suitable thermoplastic material, and they are assembled and held together by the loose fit linear slide guide.

In a still further preferred embodiment the ends of the arm members that form the slide guide when

mounted together, are shaped so as to provide an at least partially closed spring casing having wall partitions, and also rear walls that are substantially perpendicular to the influence line of the at least one compression spring located within the spring casing whereby the rear walls serve as spring end supports for the at least one compression spring.

In order to enlarge the field of applicability, preferred embodiments of the clamping device according to the present invention may also have a suspender or connecting member provided with a tongue end that protrudes, between and substantially parallelly with the spring supporting rear walls, into the spring casing for relative movement from and toward the rear walls, and the spring assembly comprises a pair of preferably coil-type compression springs supported, at their one ends, by the rear walls, and separated and supported, at their other ends, by the protruding tongue end of the suspender or connecting member.

The end of at least one of the arm members that forms one part of the loose fit slide guide and/or the suspender or connecting member may also be provided with a means, particularly with a thoroughfare hole or an eye, for stringing the clamping device on a rope- or rod-like holder, preferably a drying rope, a clothes rack or the like. Simultaneously or alternatively, the end of at least one of the arm members that forms one part of the slide guide may be designed and shaped for being capable of attaching or fastening the clamping device either directly or by using a distance adapter member, to a plane, preferably vertical bearing surface, particularly to any suitable wall surface.

Brief Description of the Drawing

Fig. 1 shows the basic kinematic structure of the clamping device according to the present invention,

Fig. 2 is a diagrammatic drawing of the clamping-device of the invention for the purpose of describing its mode of operation,

Fig. 3 shows the basic structure of another preferred embodiment of the invention,

Fig. 4 is a perspective view of an embodiment of the clamping device, partly in section whereby the compression spring is also shown,

Fig. 5 is a diagrammatic perspective sketch of the pair of arm members forming the loose fit slide guide and the spring casing at their one end when mounted together, while

Figs. 6 to 8 are schematic illustrations, by way of example only, of some preferred embodiments of the clamping device according to the present invention whereby some fields of application are demonstrated.

Modes for Carrying Out the Invention

Referring now more particularly to the accompanying drawing and initially to Figs. 1 to 3, from the very simplified basic kinematic structure of the clamping device as shown it becomes apparent that the clamping device according to the present invention essentially comprises a pair of opposed arm members 1,

2 provided with clamping jaws 16, 26 at their one end. The arm members 1, 2 are capable of linear movement with respect of each other since they are interconnected kinematically by means of a loose fit linear slide guide 3. A spring assembly 4 urges the arm members 1, 2 and thus, the clamping jaws 16, 26 toward one another to grip an article T therebetween as it is clearly shown in Fig. 2. The loose fit linear slide guide 3 is arranged in a distance L parallelly with and thus, in a definite spaced relationship to the influence line H of the clamping force S that is exerted by the clamping jaws 16, 26 on each other when the spring assembly 4 (comprising a slightly pre-stressed compression spring 41) is in its initial, normal position of operation with no article clamped between the clamping jaws 16, 26. The spring assembly 4, in particular said compression spring 41, is located within the nearest proximity of the slide guide 3.

If friction forces are disregarded, the clamping force S corresponds with spring force R stored in the pre-stressed compression spring 41 initially (Fig. 1). This force S has to be overcome when the clamping device is opened. Obviously, the compression force S increases linearly with the structural thickness of the article T to be gripped. From the point of view of the present invention this, however can be neglected as it will be clear and apparent from the following description of the mode of operation of the device with reference to Fig. 2 of the attached drawing.

Fig. 2 illustrates the embodiment of the clamping device according to Fig. 1 in a state of gripping an article T between the clamping jaws 16, 26. For the sake of easier understanding the drawing figures 1 to 3

are distorted considerably. Because of the relative small thickness of the article T, the spring force stored in the pre-stressed compression spring 41 will approximately be equal the value R.

After having placed and clamped the article T between the clamping jaws 16 and 26, in an area between the slide guide 3 and the influence line H of the clamping force S (which are, according to the spirit of the present invention, in spaced relationship with respect of each other by a distance L) an additional clamping force amounting to ΔS is applied against the arm members 1 and 2 from both sides manually. As a result, a slight deformation (illustrated by an angular displacement $\Delta \alpha$ in Fig. 2) of said arm members 1, 2 is generated. Such deformation is allowed by the immanent elasticity of the (otherwise rigid) arm members 1, 2 due to their proper choice of material and, by the loose fit within the slide guide 3. Such deformation is practically not perceptible, but it still causes the two fitting parts of the slide guide 3 to additional relative movement with respect of each other until their mutual self-locking state, well known to those duly skilled in the art of slide guides, is reached. At this stage, it should be noted that the additional clamping force ΔS applied manually can usually be considerably greater than the normal clamping force S resulting from the relatively tender spring force R. In the self-locking stage of the linear slide guide 3 however, the increased clamping force of $S+\Delta S$ exerted on the article T is preserved (stored) and maintained within the clamping device until further manual intervention. This means however, that even after ceasing the manual impact on the arm members in the area as mentioned above,

a secure and constant gripping force of $S+\Delta S$ is maintained against the article T clamped between the clamping jaws 16, 26 without further action.

Release of the clamping device to allow removal of the article T from between the clamping jaws 16, 26 is effected by squeezing the arm members 1, 2 toward one another manually, preferably in the area of their ends opposite to the other ends forming the clamping jaws 16, 26. These ends are indicated in Figs. 1 to 3 by rear walls 14, 24 supporting the ends of the compression spring 41 (Figs. 1 and 2) or compression springs 42, 43 (Fig. 3) which will be dealt with in detail further below.

The main advantage of the clamping device according to the present invention, namely its capability of durably exerting an increased gripping force on the article clamped between the clamping jaws clearly results from the spirit of the invention which is duly described above. Despite of using a relatively tender spring assembly with minimum spring force stored by initial pre-stressing a considerably high clamping force can be exerted on the article to be clamped whereby a durably secure gripping effect is achieved and maintained. In addition to this, release of the clamping device can also be effected easily. The same applies to holding the device open while the article to be clamped is being inserted in the area between the opened jaws.

Fig. 3 shows another preferred embodiment of the clamping device in the same very simplified manner of illustration. Here, a suspender or connecting member 5 (not fully shown) provided with a tongue end 50 that protrudes, between and substantially parallelly with the spring supporting rear walls 14, 24, is also guided for

relative movement from and toward said rear walls 14, 24. The spring assembly 4 comprises a pair of coil-type compression springs 41, 42 being identical and pre-stressed to store a spring force of R1, R2 each, respectively. Since the compression springs 41, 42 are connected in series, the resulting spring force will amount to R = R1 + R2, while R1 = R2. With these conditions maintained the mode of operation of this embodiment is in full conformity with what has already been described further above with reference to Figs. 1 and 2. The compression springs 42, 43 are supported, at their one, outer ends by the rear walls 14, 24 while in the middle at their other ends they are separated and supported by the movably guided protruding tongue end 50 of the suspender or connecting member 5. The latter may perform different functions such as hanger hook, means for attaching or ranging a number of clamping devices to or next to each other etc. When using it for suspending the clamping device, the main advantage of the above described design as per Fig.3 lies in that said suspender or connecting member 5 always maintains its symmetrical position with respect of the arm members 1, 2 and thus, the clamping jaws 16, 26, this position being substantially aligned with the vertical influence line of gravity independently from the thickness of the article T clamped between the jaws.

Figs. 4 and 5 show a particular, preferred embodiment of the clamping device according to the present invention in a fully detailed manner for the purpose of clear understanding. From Figs. 4 and 5 it is apparant that the arm members are intercrossed or rather intercrossing each other so that the clamping jaws 16, 26 are urged to grip the article to be clamped therebetween by a compression force stored in the pre-stressed spring assembly 4 which comprises a coil-type compression spring 41 the influence line of which is very close to and

parallel with the slide guide 3. The arm members 1 and 2 have matching wall partitions 11, 12, 13 and 21, 22, 23 and in addition to this, key ribs 25 registering in slots 15, whereby the loose fit slide guide 3 is formed at their one ends when mounted together. The arm members 1, 2 are provided with clamping jaws 16, 26 of indented gripping surface. It can clearly be seen that they are designed and shaped as substantially rigid component parts which can preferably be manufactured of any suitable thermoplastic material e.g. by injection moulding. The upper ends of the arm members 1, 2 that are joined together and form the slide guide 3 when the clamping device is mounted are shaped so as to provide a closed spring casing 40 formed by the wall partitions 11, 12, 13 and 21, 22, 23 and by rear walls 14, 24 that are perpendicular to the influence line of the compression spring 41 located within the spring casing 40. Thus, the rear walls 14, 24 serve as spring end supports for the slightly pre-stressed compression spring 41. Such embodiments of the clamping device according to the present invention provide aesthetically attractive and decorative structural units wherein the compression spring 41 is hidden and well protected, and the wall surfaces can (besides increasing inertia and thus, rigidity of the arm members) serve the purpose of being covered by graphical elements, patterns, advertisments or any other surfacial finishing of decorative character.

Although not shown in the drawing figures, the rear walls 14, 24 can be provided with co-axial thoroughfare bores aligned with the longitudinal axis line of the coil-type compression spring 41. If so, a number of clamping devices can be stringed on any rope- or rod-type holder, preferably a drying rope, a clothes

rack or the like.

In one of the wide field of applications, the clamping device according to the invention may be used for gripping garment or clothing draped over a drying rope 9 as shown in Fig. 6 so as to prevent the clothing from slipping off the rope. Another preferred embodiment of the clamping device according to the present invention is illustrated in Fig. 7 of the drawing. At the upper end of one of the arm members an eye 17 is integrally formed. By using such eye 17 the clamping device can be stringed on a clothes rack 6 having a handle hook 60.

Fig. 8 shows a slightly modified embodiment of the present invention in another field of application. Here, the end of at least one of said arm members 1, 2 that forms one part of the slide guide 3 is designed and shaped for being capable of fastening the clamping device either directly or by using a distance adapter member 7 as shown in Fig. 7 to a plane, preferably vertical bearing surface, particularly to any suitable wall surface 8 as per Fig. 7 of the attached drawing.

Industrial Applicability

From the above detailed description of the invention it will readily be apparant that besides embodiments of the clamping device as household article of mass product character, garment clamp for drying purposes, candle holder clip for Christmas trees etc. it also can be used for clipping stationary, for developing and drying photographs, for clipping note pads, drawings and diagrammes onto vertical bearing surfaces, for use as a fashion article (badge, ear clip,

etc.), as a hair-clip or for different other commercial purposes.

Technological fields of application are e.g. welding of metal parts such as carbodies where it can be shaped and used as a spring-actuated quick clamp. Further applications are possible in laboratories both for research and medicine as an instaneous forceps or vascular clamp for use for non-permanent occluding blood vessels and other fluid ducts in an animal or a human body.

A primary advantage of the clamping device according to the present invention lies in that it maintains any additional gripping force through self-locking of the slide guide whereby the attainable clamping force is independent of the spring force. The thickness of the articles to be clamped may vary in a wide range while substantially the same gripping characteristics of the device are maintained. The gripping surfaces of the clamping jaws remain parallel in every position. Thus, optimum surface gripping for every application can be provided for. The device can be manufactured of any suitable and available material. The spring assembly and the linear slide guide surfaces are hidden and well protected against corrosion and/or damage.

Design and working principle of the device enable one-hand manipulation of the clamp for the user. The clamping device according to the present invention can be manufactured as a mass product in large series at very low cost.

The foregoing is considered as illustrative only of the principles of the invention. Further, since

numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described. Accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

Claims

1. A clamping device for releasably clamping an article (T) such as clothing on rails, drying ropes or the like, said clamping device comprising a pair of opposed arm members (1, 2) provided with clamping jaws (16, 26) at their one end, said arm members (1, 2) being interconnected kinematically so as to be capable of relative movement with respect to each other and said clamping device further comprising a spring assembly (4) urging said arm members (1, 2) and thus, said clamping jaws (16, 26) toward one another to grip the article (T) therebetween, said clamping device being characterized in said arm members (1, 2) being interconnected by means of a loose fit linear slide guide (3) arranged, in a distance (L), parallelly with and thus, in a definite spaced relationship to the influence line (H) of the clamping force (S) that is exerted by said clamping jaws (16, 26) on the article (T) gripped therebetween, said spring assembly (4) being pre-stressed and located within the nearest proximity of said slide guide (3).

2. A clamping device as claimed in Claim 1 characterized in said arm members (1, 2) being inter- or overcrossed whereby the clamping jaws (16, 26) are urged to grip the article (T) clamped therebetween by a compression force stored in the pre-stressed spring assembly (4), and that said spring assembly (4) comprises at least one preferably coil-type compression spring (41 or 42, 43) the influence line of which is aligned or at least closely parallel with said slide guide (3).

3. A clamping device as claimed in Claim 1 or 2 characterized in said arm members (1 and 2) having matching wall partitions (11, 12, 13 and 21, 22, 23) and/or key ribs (25) registering in slots (15) forming

said slide guide (3) at their one ends when mounted together, said arm members (1, 2) being provided with clamping jaws (16, 26) of preferably indented gripping surface at their other ends, and said arm members (1, 2) being designed and shaped as substantially rigid component parts preferably made of any suitable thermoplastic material that are assembled and held together by said loose fit linear slide guide (3).

4. A clamping device as claimed in Claim 3 characterized in that the ends of the arm members (1, 2) that form said slide guide (3) when mounted together are shaped so as to provide an at least partially closed spring casing (40) having wall partitions (11, 12, 13 and 21, 22 23), and said spring casing (40) also having rear walls (14, 24) that are substantially perpendicular to the influence line of said at least one compression spring (41 or 42, 43) located within said spring casing (40) whereby said rear walls (14, 24) serve as spring end supports for said at least one compression spring (41 or 42, 43).

5. A clamping device as claimed in Claim 4 characterized in also having a suspender or connecting member (5) provided with a tongue end (50) that protrudes, between and substantially parallelly with said spring supporting rear walls (14, 24), into said spring casing (40) and is guided within said spring casing (40) for relative movement from and toward said rear walls (14, 24), and said spring assembly (4) comprising a pair of preferably coil-type compression springs (42, 43) supported at their one ends by said rear walls (14, 24), and separated and supported, at their other ends, by said protruding tongue end (50) of said suspender or connecting member (5).

6. A clamping device as claimed in any of the Claims 3 to 5 characterized in that the end of at least one of said arm members (1, 2) that forms one part of said loose fit slide guide (3) and/or said suspender or connecting member (5) is/are also provided with a means, particularly with a thoroughfare hole or an eye (17), for stringing said clamping device on a rope- or rod-type holder, preferably a drying rope (9), a clothes rack (6) or the like.

7. A clamping device as claimed in any of the Claims 3 to 6 characterized in that the end of at least one of said arm members (1, 2) that forms one part of said slide guide (3) is designed and shaped for being capable of attaching or fastening the clamping device either directly or by using a distance adapter member (7) to a plane, preferably vertical bearing surface, particularly to any suitable wall (8) surface.

List of Reference Signs of the Drawings

1 arm member
- 11, 12, 13 wall partition
- 14 rear wall
- 15 slot
- 16 clamping jaw
- 17 eye

2 arm member
- 21, 22, 23 wall partition
- 24 rear wall
- 25 key rib
- 26 clamping jaw

3 slide guide

4 spring assembly
- 40 spring casing
- 41, 42, 43 compression spring

5 suspender or connecting member
- 50 tongue end

6 clothes rack
- 60 handle hook

7 distance member

8 wall

9 drying rope

S clamping force

H influence line

R, R1, R2 spring force

T article

L distance

$\Delta\alpha$ angular displacement

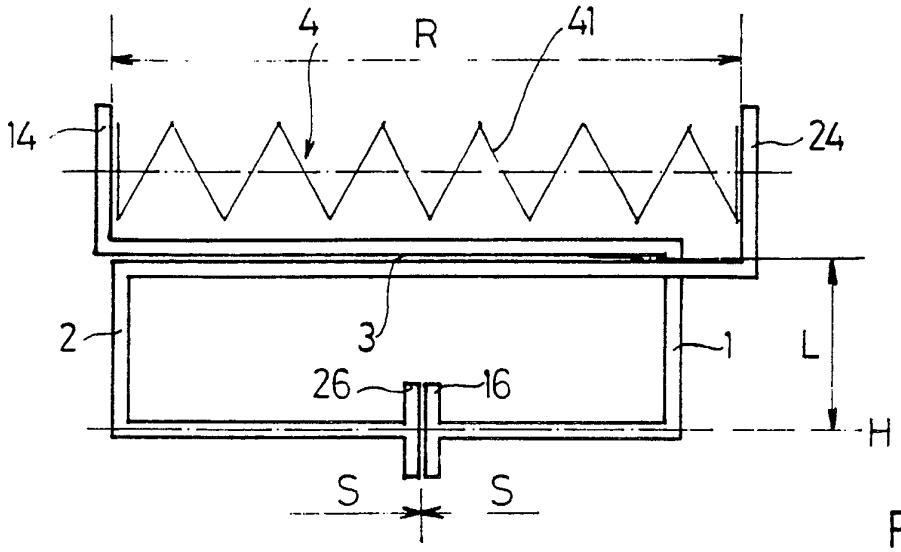

Fig.1

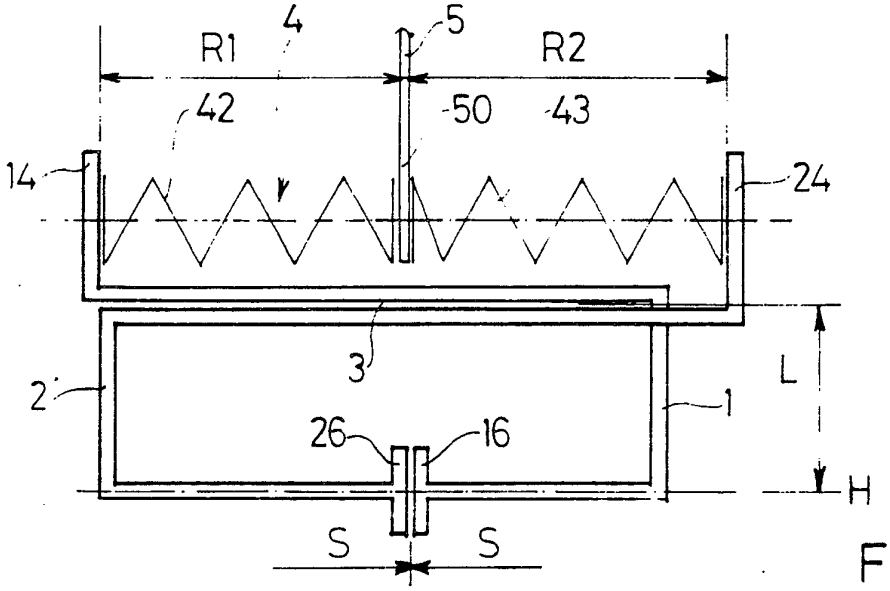

Fig.3

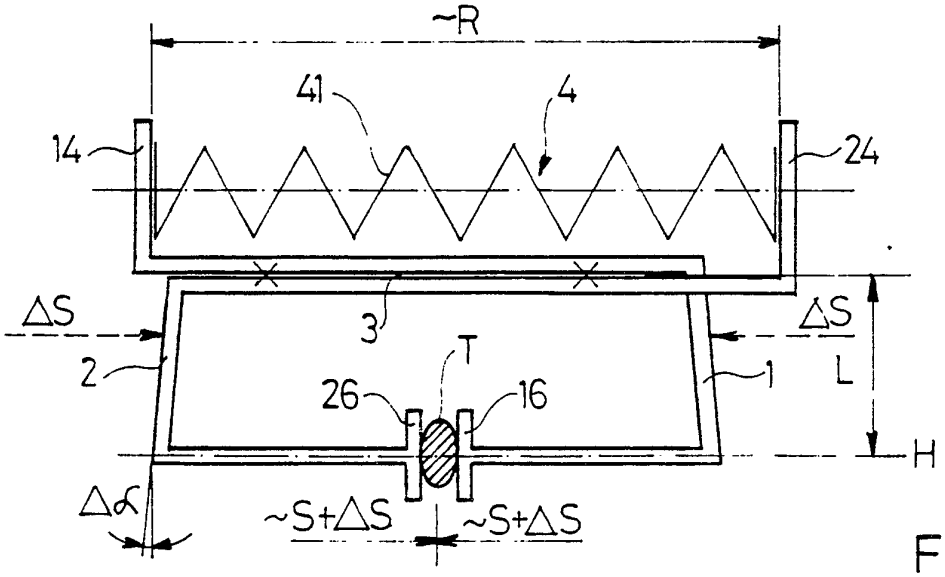

Fig.2

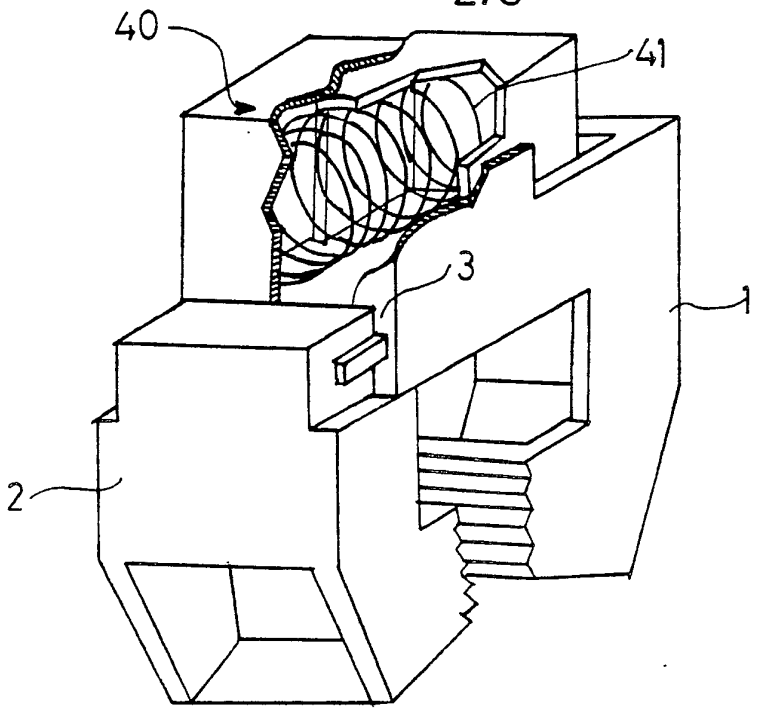

Fig. 4

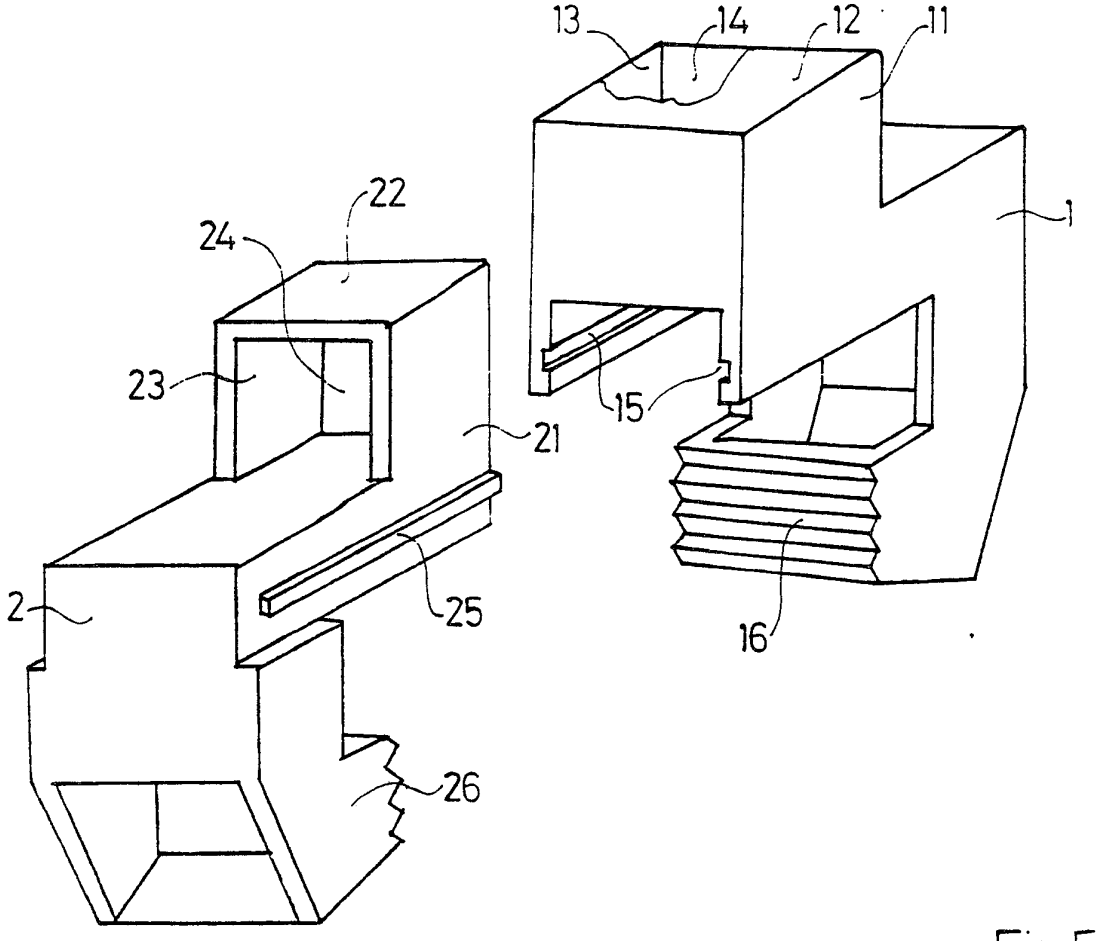

Fig 5

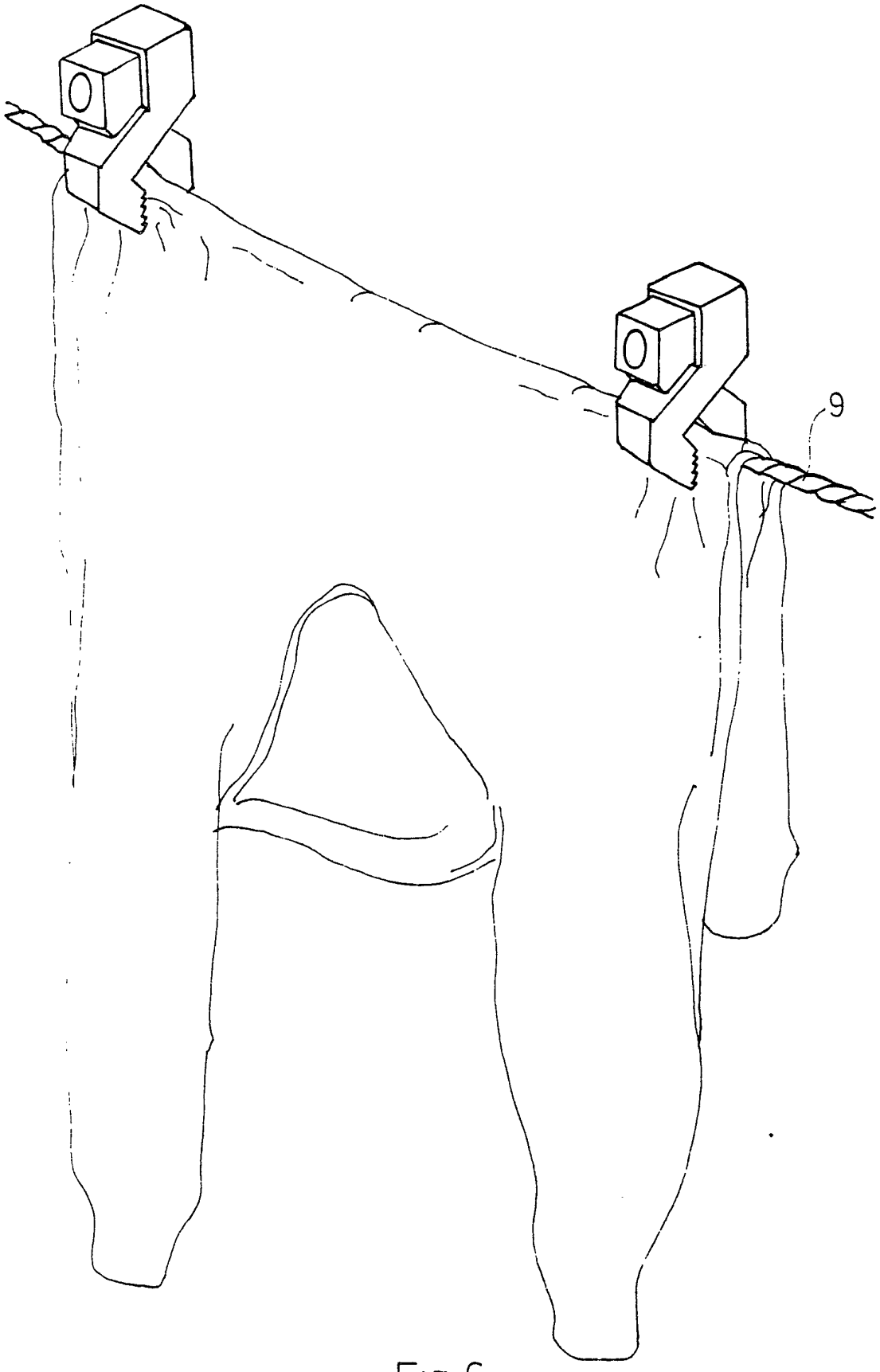

Fig. 6

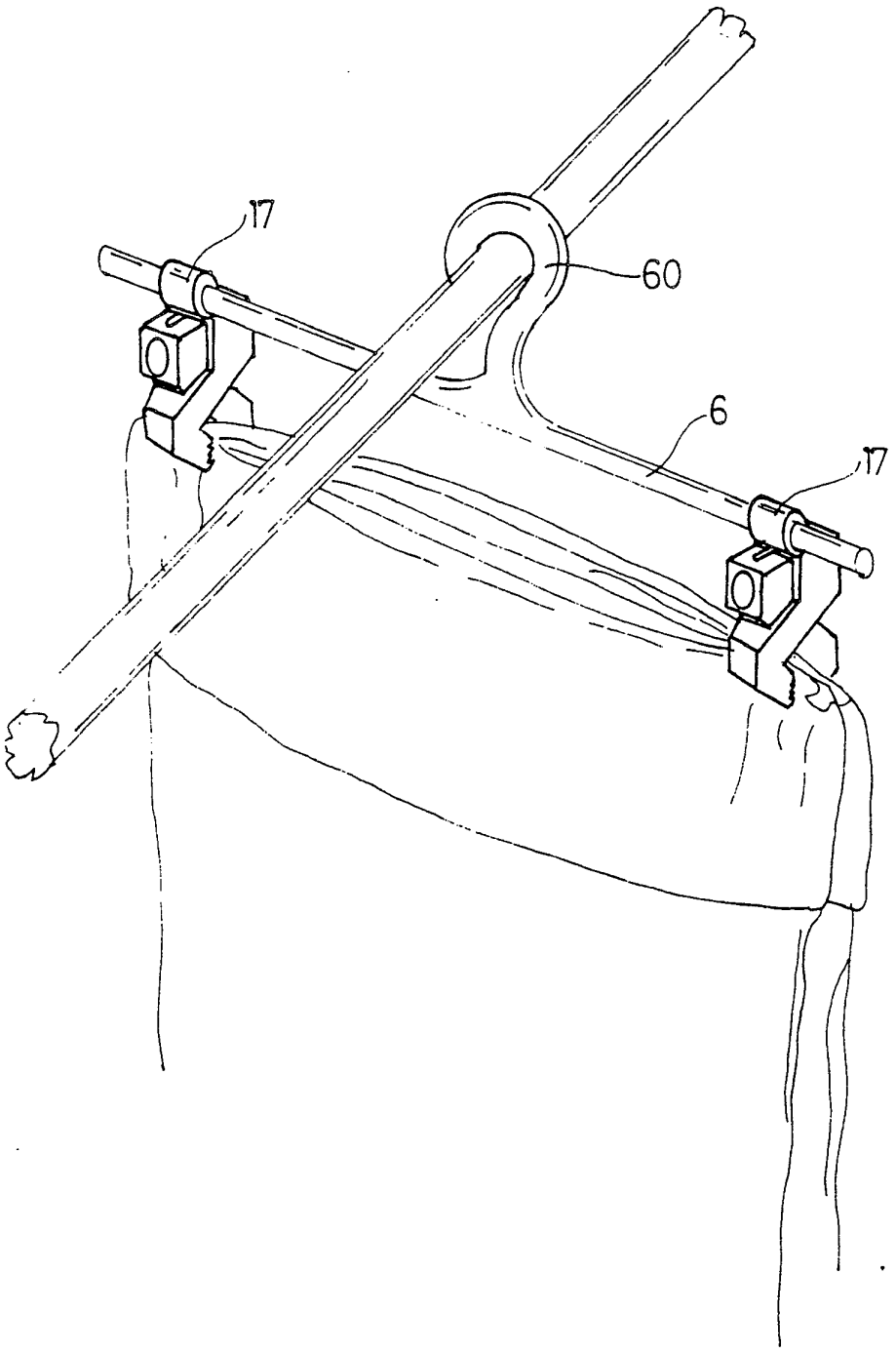

Fig. 7

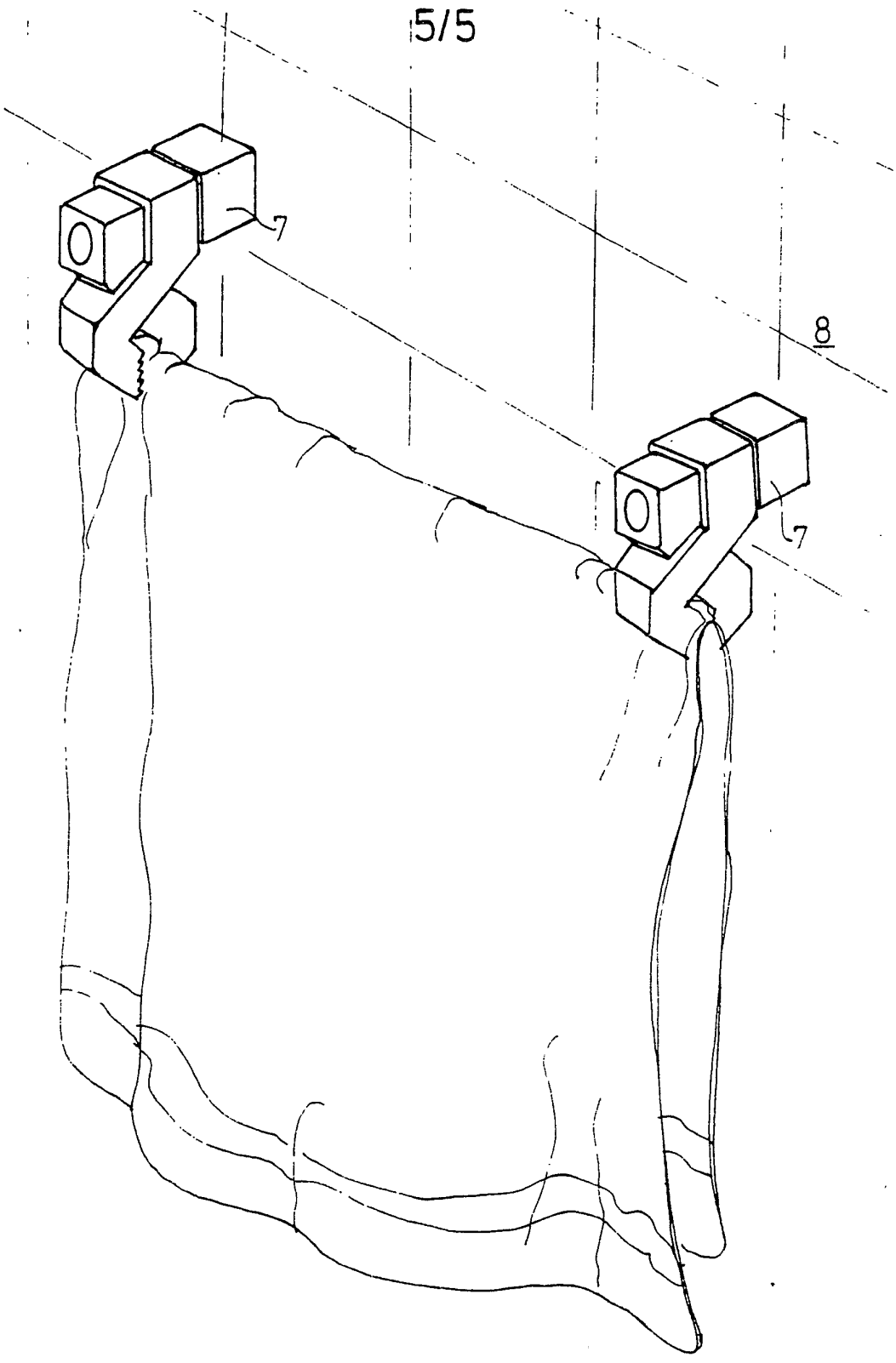

Fig 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 88/00060

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: D 06 F 55/00,55/02; A 47 F 7/08

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int.Cl.[4]	D 06 F 55/00,55/02; A 47 F 7/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 4 669 615 (ZIGMAN) 02 June 1987 (02.06.87), see fig. 1.	(1,2,6)
A	US, A, 2 482 625 (KUNKEL) 20 September 1949 (20.09.49), see fig. 1-3.	(1,2)
X	GB, A, 815 952 (URICH) 01 July 1959 (01.07.59), see fig. 1,2,4.	(1,2,3,4)
A	US, A, 904 595 (BARMORE) 24 November 1908 (24.11.08), see fig. 1,2.	(1,2)
A	CH, A, 31 724 (GUSCHAUSCKI) 15 May 1905 (15.05.05), see fig. 2.	(1,2)
A	HU, B, 102 024 (BOROS) 02 March 1931 (02.03.31).	
A	US, A, 2 524 537 (OSMONSON) 19 February 1947 (19.02.47).	
A	US, A, 3 203 061 (THOMAS) 31 August 1965 (31.08.65).	

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
28 November 1988 (28.11.88)	02 December 1988 (02.12.88)
International Searching Authority	**Signature of Authorized Officer**
AUSTRIAN PATENT OFFICE	Pippan

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4 106 508 (BERLIN) 15 August 1978 (15.08.78).	
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Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/HU 88/00060

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned International search report. The Austrian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche internationale visé ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office autrichien des brevets.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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