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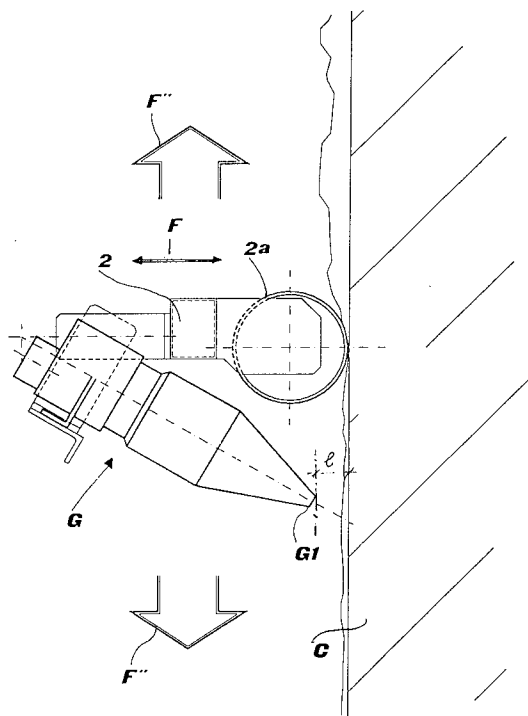
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AT CH DE ES FR GB LI(71) Applicant: **OFFICINA MECCANICA SESTESE
S.p.A.**
Via Borgomanero, 30
I-28040 Paruzzaro (Novara)(IT)(72) Inventor: **Tacchini, Franco**
Via S. Salvatore, 14
I-28010 Nebbiono, Novara(IT)(74) Representative: **Faggioni, Giovanmaria, Dr. et
al**
Fumero-Studio Consulenza Brevetti
Franz-Joseph-Strasse 38
D-80801 München (DE)(54) **Apparatus with hot air jets to wrap palletized products with a film of thermoretractable plastic material.**

(57) Apparatus to apply a film wrapping of thermoretractable plastic material over a palletized load (C), comprising means to support a heat source, which surround the load and are vertically movable. Said means comprise slides (1-4) horizontally movable towards and away from the vertical surface of the load, on each of said slides there being mounted at least one feeling roller (2A), bearing onto the load surface, and a plurality of low-power heat sources, as electric hot air generators (G). Such generators are positioned under the roller, at a short distance from the thermoretractable film.

**FIG.3****EP 0 595 108 A1**

It is a known and widely used system to store and transport loads, particularly loads consisting of material in pieces or boxes, piled up on pallets. It is also widely known, in these systems, to wrap the load with a film of plastic material which has the double function of protecting the load from external agents and of keeping it steadily anchored onto the pallet.

Two main techniques are adopted at present for applying said film of plastic material:

One of said techniques consists in carrying out a true and proper wrapping with several layers of a thin film of stretch material. Said film is in the form of a strap of flexible plastic material resisting to tensile stress, as low-density polyethylene having a thickness of 20/30 μm . Said film is applied under tension on the palletized load and it sticks thereon by simple mutual adhesion of the single layers. As known, the drawback of such a wrapping is its scarce capability to hold together the load, the fastening action being essentially limited to the transversal direction.

The other technique consists in slipping over the palletized load a piece of tubular film of thermoretractible material, as polyethylene having a thickness of 80/120 μm . Said tubular film is slipped over the load in a loose state and is then tightened, through heat, up to strictly adhering to the load. Machines of this type are known, for example, from EP-A1-0 076 867 or EP-A1-0 395 919. The main drawback of this technique lies in the fact that, in order to cause a sufficient shrinking without risking to damage (burn) the film, it is necessary

- on one hand, to approach the heat source to the film at a distance of 10-15 cm, so as to take into account any irregularities in the transversal dimensions of the load and the consequent risk to burn the film;
- on the other hand, to use a heat source with very powerful hot smokes, usually consisting of gas burners, so as to make sure that the heat is distributed over the whole film at a temperature which - in spite of the aforementioned distance of 10-15 cm - is still sufficiently high to guarantee the thermoretraction of said film.

As known, however, much attention is dedicated now-a-days to ecological problems, especially those concerning energy consumption, which leads, on one hand, to reduce whenever possible the power of the heat sources and, on the other hand, to replace the gas burners by less polluting and dangerous sources, for instance sources wherein heat is obtained by means of electric resistors. These problems are however difficult to solve, since the above requirements are substantially contrasting.

The main object of the present invention is therefore to realize an apparatus allowing to apply a thermoretractible film over the load in a simple and precise manner, but making use, first of all, of a low-power heat source. A further object of the present invention is to allow making use of a scarcely polluting heat source, for instance obtained by infrared rays, or by air heated with resistors.

In an apparatus of the aforementioned type, comprising means to support a heat source which surround the load and are vertically movable along its surface, the object of the present invention is reached due to the fact that said support means comprise slides horizontally movable towards and away from the vertical surface of the load, on each of said slides there being mounted at least one feeling member bearing onto the load surface, and at least one low-power heat source shortly spaced from the feeling member, this latter - preferably consisting of a roller freely rotatable about a horizontal axis parallel to the surface of the load - being apt, on one hand, to apply the thermoretractible film over the surface of the load and, on the other hand, to determine the distance between the heat source and the film surface.

In actual fact, an apparatus making use of low-power heat sources was already described in the Italian Patent Application MI92A000632, filed on 18.3.92 by the same Applicant. In this case, however, the apparatus was fairly complex, it being provided with means to control and progressively release the film of plastic material. Whereas, according to the invention, it has surprisingly been found that it is not necessary to control the stretching out of the film, but it is sufficient to make sure that the film is applied on the load surface and to precisely determine the position of the heat source in proximity to said surface.

Further characteristics and advantages of the apparatus according to the invention will anyhow be more evident from the following detailed description of a preferred embodiment thereof, given by way of example and illustrated on the accompanying drawings, in which:

Fig. 1 is a diagrammatic plan view of a wrapping apparatus provided with a heating system according to the invention;

Fig. 2 is a diagrammatic, partial, elevation view of the same apparatus of fig. 1, on a slightly enlarged scale; and

Fig. 3 shows, on a very enlarged scale, the detail indicated by A in fig. 2.

As shown on the drawings, the apparatus according to the present invention comprises a plurality of known-type hot air generators G, each comprising a motorfan, heating resistors, and a nozzle distributing hot air jets. In the embodiment illus-

trated on the drawings, the generators G are mounted in sets of three, on parallel longitudinal support slides 1 and 2 positioned on the two opposite lateral sides of the load C, and in sets of two, on parallel transversal slides 3 and 4 positioned on the opposite end sides of the load C.

The slides 1 and 2 are slidable - in the direction of arrows F - along horizontal transversal guides (not shown); their movement is controlled by cylinder-piston units 5 which simultaneously move them towards or, respectively, away from the load C. The slides 3 and 4 are in turn slidable - in the direction of arrows F' - along horizontal longitudinal guides (not shown); their movement is equally controlled by cylinder-piston units 6 which simultaneously move them towards or, respectively, away from the load C.

The cylinder-piston units 5 and 6 do not control directly the movements of the slides 1, 2, and 3, 4, but through elastic means - for example springs - allowing a certain possibility of horizontal displacement of said slides, for the purpose specified hereinafter. Stop means, provided with position adjustment means, are moreover associated in known manner to the units 5 and 6.

An alternative elastic system can be obtained with the same units 5 and 6, by using pneumatic means and regulating the feeding pressure to a sufficiently low extent to allow some oscillation of the piston into the cylinder chamber.

The horizontal guides (not shown) supporting the slides 1, 2, 3, 4, are in turn slidable in a vertical direction - arrows F'' in fig. 3 - along vertical guide rods (also not shown). The horizontal guides and vertical guide rods are not illustrated on the drawings, as their structure is within reach of any technician skilled in the art and does not strictly form part of the present invention.

Each of said slides 1, 2, 3 and 4, carries - as well as a set of generators G - also a roller 1a, 2a, 3a and, respectively, 4a, mounted freely rotatable about a horizontal axis parallel to the surface of the load C. Said rollers act as feeling members and their surface is provided with a lagging, for the purpose specified hereinafter.

As shown in fig. 3 - with reference to the feeling roller 2a - the rollers are mounted so that a vertical plane tangent to the periphery of the roller, on the side facing the load C, passes at a short distance - for instance, a distance l of about 30 to 50 mm - from the outlet nozzle G1 of the hot air generator G. The rollers are moreover mounted through position adjustment means, which allow to precisely adjust the distance l according to the type of thermoretractible material and to the power of the heat source.

Thanks to this short distance, the air - heated to about 350°C in the generator G - reaches the

film of thermoretractible plastic material without there being enough time for it to mix with ambient air: this helps to preserve its temperature.

Also the presence of the feeling roller helps to preserve the right temperature, since said roller is positioned just above the nozzle G1 and thus forms a sort of hood to prevent hot air from escaping towards the top.

Alternatively, the function of the roller - both as pressure or feeling member, and as hood or barrier to contain the hot air - can also be performed by a bar of semirigid or flexible material, as rubber.

In either cases, to perform the function of hood, it is important for the feeling member to be continuous along the whole line of contact with the surface of the load.

Taking into account the proximity and positioning of the hot air generators, and especially the presence of the cited barrier, it is thus possible to make use of low-power generators - also, in particular, of generators with heating resistors, or of electrically fed generators with infrared rays - being sure that the heat supplied by them will not be dispersed, but will be concentrated on the thermoretractible film, so as to allow it to reach a temperature sufficient to produce the required thermoretraction. It is possible, of course, to use also gas-fired generators, with the advantage that - according to the arrangement of the present invention - sharp-fire burners can be used.

As will be easily understood by a technician of the field, the working of the aforescribed apparatus is extremely simple:

- The thermoretractible film is applied on the load C in known manner, by being fitted over the top and down to the bottom, and being fixed under the pallet carrying the load. During this step, care will be taken to move away from the load surface - at a distance of at least 150 mm, so as to avoid any interferences - the heat sources, namely the hot air generators G, and the feeling rollers 1a, 2a, 3a, 4a, by way of the respective slides 1, 2, 3, 4.
- The slides are then approached to the load, up to carrying the feeling rollers in contact with the thermoretractible film, so as to press it against the load.
- The hot air generators are then started, while simultaneously controlling the vertical upward movement of the slides. The pressure of the feeling rollers keeps the thermoretractible film constantly in contact with the load, while the spring means associated to the slides supporting the rollers allow enough horizontal displacement to compensate the inevitable differences in height of the load surface. In practice, the feeling action of said rollers onto

the load surface is sufficient to guarantee a precise guiding of the nozzles G1, at the preset short distance from said surface; said distance can thus be neither increased (which would reduce the heating action and thus lead to an insufficient shrinking of the film), nor reduced (which could cause burning of the film).

The result is therefore an extremely uniform and precisely controlled application of the film, to the full benefit of the total protection and stability of the load.

It is quite evident to a technician of the field that the described arrangement is highly advantageous:

- both from a structural point of view, due to the possibility of using heat sources of small dimensions, which can easily be turned on and off and which are not too polluting;
- and from an economical point of view, because such small heat sources, being quite close to the film, require far less energy consumption.

It is anyhow understood that the invention is not limited to the particular embodiment described heretofore - which merely represents a non-limiting example of its scope - but that many embodiments can be conceived, both for what concerns the type of low-power heat generators, and for what concerns the type of feeling members, in the form of rollers or bars, allowing to control the distance of the nozzles from the film and to form the heat containment barrier, all such embodiments being within reach of a technician skilled in the art, without thereby departing from the scope of the invention itself.

Claims

1. Apparatus to apply a film wrapping of thermoretractible plastic material to contain and protect a palletized load, of the type comprising means to support a heat source which at least partially surround the load and are vertically movable along its surface, characterized in that, said support means comprise slides, horizontally movable towards and away from the vertical surface of the load, on each of said slides there being mounted at least one feeling member bearing onto the load surface, and at least one low-power heat source, shortly spaced from the feeling member, this latter being apt, on one hand, to apply the thermoretractible film over the surface of the load and, on the other hand, to determine the distance between the heat source and the film surface.
2. Apparatus as in claim 1), wherein a horizontally movable slide is provided on each side of the load, a plurality of heat sources being mounted on each slide.
3. Apparatus as in claim 1) or 2), wherein each of said feeling members consists of a roller, freely rotatable about a horizontal axis parallel to the surface of the load, said axis being carried by a respective slide.
4. Apparatus as in claim 3), wherein the surface of said roller is provided with a lagging.
5. Apparatus as in claim 2), wherein each heat source is mounted on the respective slide through position adjustment means, which determine the distance, horizontalwise, between the heat source and a vertical plane through the point of contact between said feeling member and the film surface.
6. Apparatus as in claim 1), wherein said low-power heat sources consist of hot air generators with heating resistors.
7. Apparatus as in claim 1), wherein said low-power heat sources consist of electrically fed generators with infrared rays.
8. Apparatus as in claim 1), wherein said low-power heat sources consist of sharp-fire gas burners.
9. Apparatus as in claim 1), comprising operating means consisting of cylinder-piston units, each unit acting on a pair of slides positioned on opposite sides of the load, so as to move them simultaneously in opposite directions.
10. Apparatus as in claim 1), comprising elastic means, allowing the feeling members to elastically bear onto the load surface under an adjustable pressure.
11. Apparatus as in claim 9) and 10), wherein said elastic means consist of spring means interposed between said operating means and said horizontally movable slides.
12. Apparatus as in claims 9) and 10), wherein said cylinder-piston units are operated by a low-pressure gaseous medium, this latter acting as said elastic means.
13. Apparatus as in claim 1) or 3), wherein said feeling members are positioned above the heat sources, so as to form a barrier or hood to

retain the hot air.

14. Apparatus as in claim 13), wherein said feeling members are positioned continuously along a horizontal contact line over the whole vertical surface of the load. 5
15. Apparatus as in claim 14), wherein said feeling members consist of a continuous bar of semi rigid or flexible material, as rubber or like. 10

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FIG.1

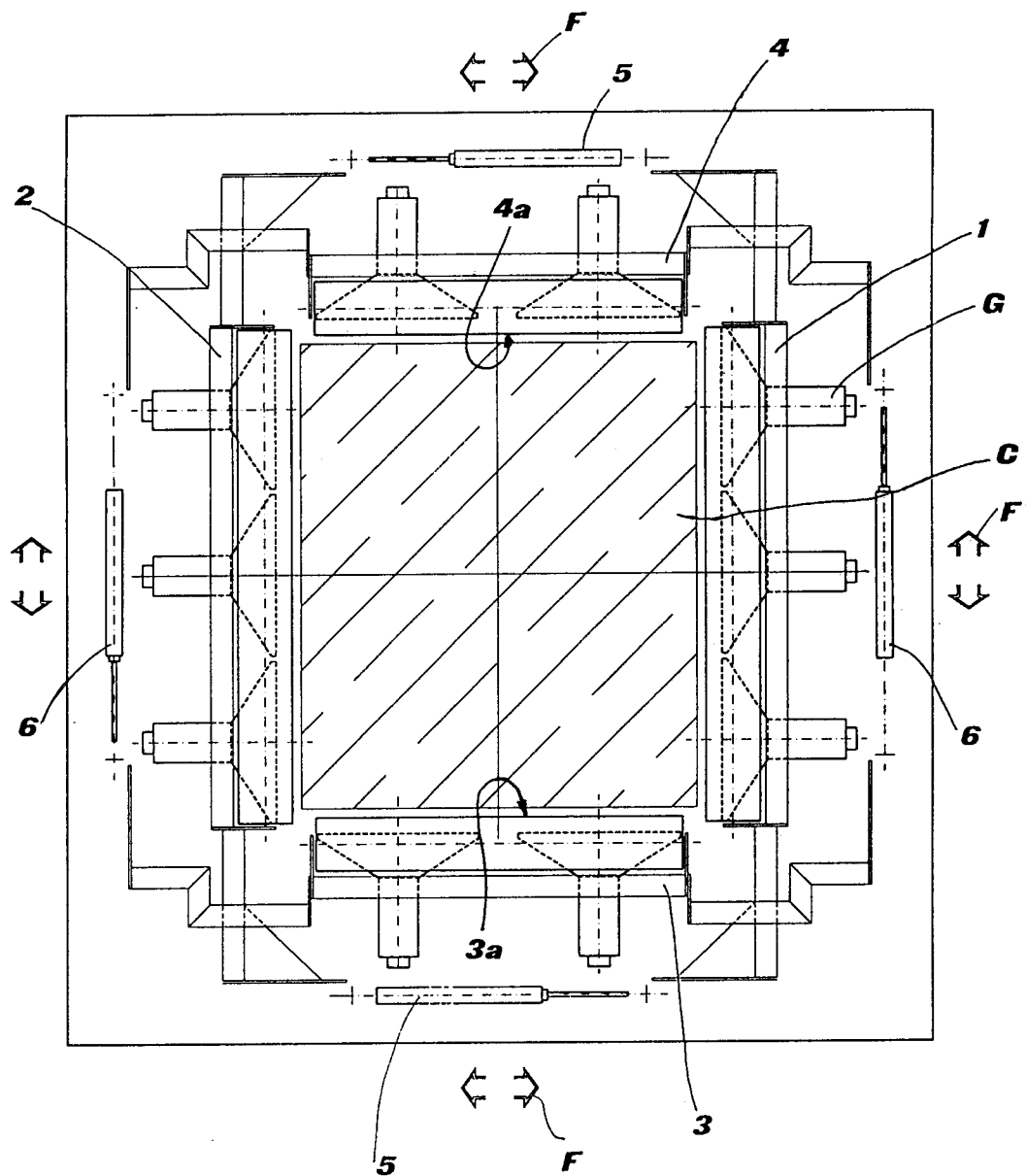
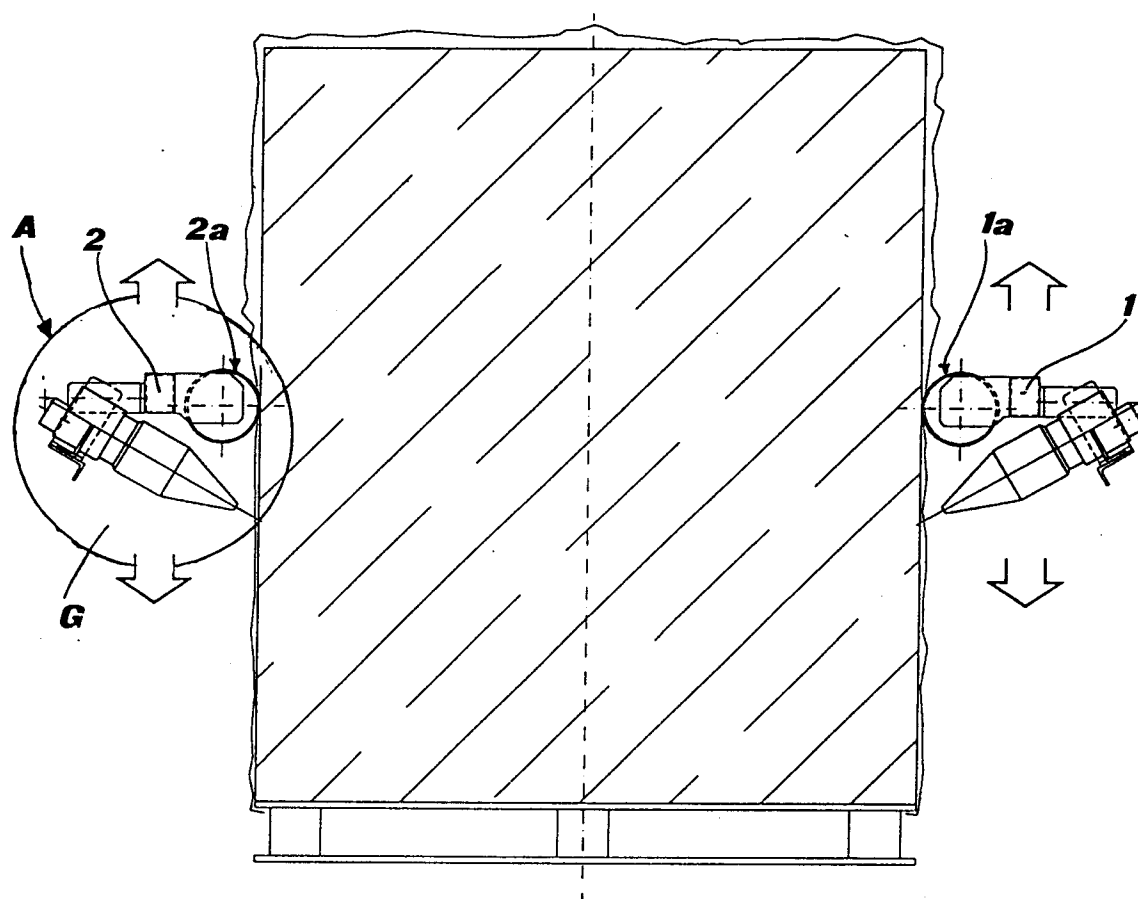


FIG.2



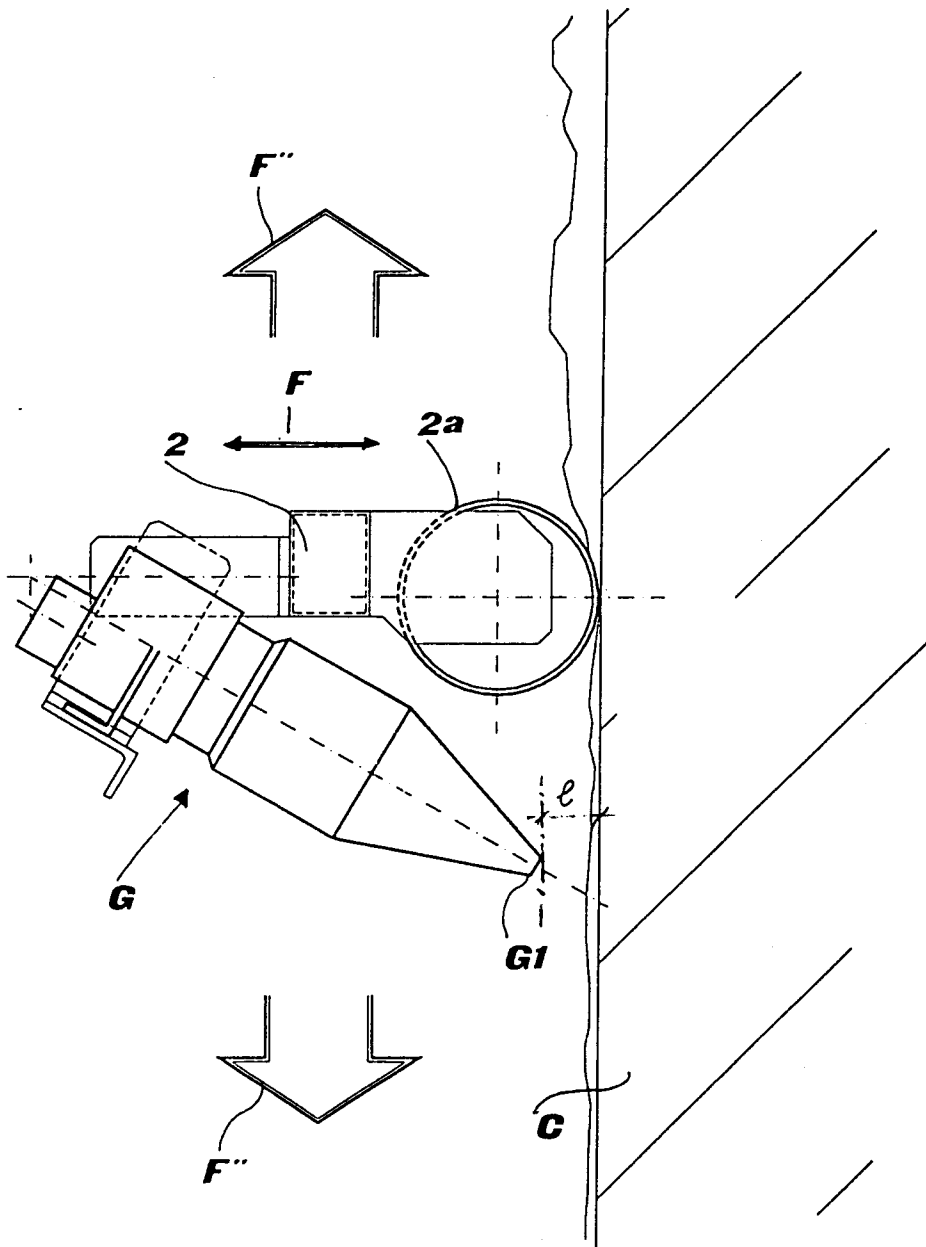


FIG.3



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EUROPEAN SEARCH REPORT

Application Number
EP 93 11 6515

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	DE-A-38 26 358 (KLUEPFEL) * abstract * * column 4, line 44 - column 5, line 17; figures 1-3 * ---	1,2,5,6	B65B53/06
A	GB-A-2 046 697 (LACHENMEIER) * abstract * -----	6,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 January 1994	Examiner Claeys, H
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