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Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) Bread slicer with knives arranged in a wave- or v-shape.

(57) The device for slicing loafs or breads and other mainly elongated objects into slices, is constructed of two reciprocal oscillating supporting frames (6, 7) with in longitudinal direction fixed knives (5', 5) on one side, which in top view are applied in layers such as a wave- or V-shape to minimalize the compression of the bread with all its advantages and in which the mentioned knives (5', 5) are sharpened on one side in cross-section, in which in longitudinal direction the knives (5', 5) on the other side slide through a light guiding frame (11), in which the mentioned supporting frames (6, 7) move an eccentric mechanism (8) up and down or forth and back and the bread is pushed through the knives (5', 5) by a pusher (3).

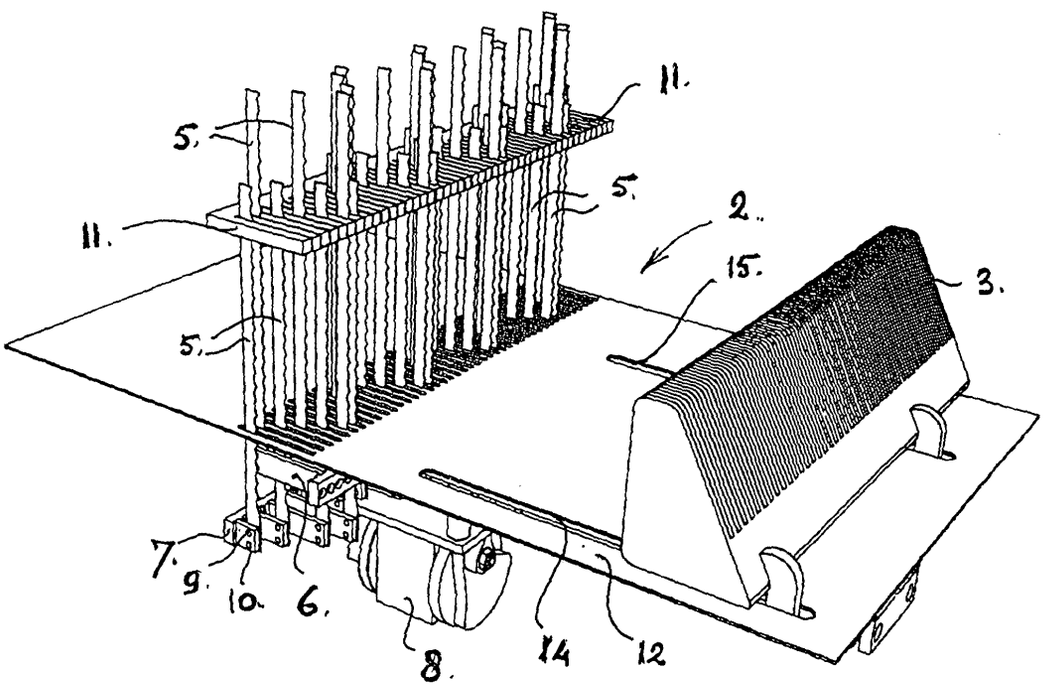

FIG. 3.

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Description

[0001] The present invention relates to a device for cutting loafs and other mainly spacial products into slices, mostly in order to offer the sliced bread packed to the client, in which in the mentioned device specially constructed blades are mounted, in which supporting and guiding plates or means for slicing loafs or breads have been applied, in which the mentioned loaf or bread is moved with a pusher towards a number of oscillating or moving cutting instruments with an approximate equal mutual distance and placed transverse on the bread, in which the mentioned distances between the cutting instruments is done in such a way to allow compression compensation, in which the movement or the oscillating movement in the longitudinal axis of the mentioned cutting instrument is done by means of a special driving mechanism, in which the whole is mostly provided with a housing to protect the user, in which an intake and outlet opening is included.

[0002] A somewhat similar device is known e.g. from the American Patent document US 1 975 942, titled: "Bread Slicer", of HARTMAN, William, Walter, Los Angeles, California. Patent is issued on 09-10-1934. Here, it concerns a cutting mechanism for bread slicers. A cutting head consists of multiple lateral, at a distance placed knives in parallel planes, in which at one side the knives are connected to a crankshaft and at the other side are tensioned with draw springs in a rimmed stretcher, which must be constructed rather heavily due to the many springs. The drawing springs on the top side of the knives are suspended in a blunt V-shape, through which the knives start cutting the bread practically at the same time, but first the outer knives and then step by step inwardly the next pairs of knives are used, through which the bread is not pulled apart. The mentioned V-shape is achieved singularly over the whole length of the loaf or bread, through which the staggering of the knives, also due to the very blunt inner angle, is very small and in which the knife staggering is not completely used. The set-up of the knives shows an almost complete overlap, through which a high compression is created on the loaf per slice. Actually the knives form half a cone and due to the crankshaft only one cone with a very small top angle is possible. Due to the mentioned crankshaft and the V-shaped set-up of the drawing springs, the thin knives will start vibrating sooner and due to the tension of the springs of a large quantity of drawing springs a lot of energy is necessary to keep the device going to cut through the loaf or bread. Further, the exerted pressure of the pusher cannot be too high because the knives almost simultaneously cut into the loaf or bread, through which the resistance is large due to the cutting and the slices are crushed together. This is not beneficial for a beautiful result of the sliced bread.

[0003] The above described solution for a bread slicer has a number of disadvantages, such as the heavy frames, the relatively large driving power to move the knives with drawing springs up and down and to move the compressed slices between the mutual overlapping knives by means of friction and next also the driving power for the pusher, which also leads to vibrations.

[0004] Further, research has shown that the set-up of the knives and the construction thereof has a large influence on the compression of, for example, cutting a bread and has further consequences, as shown hereafter.

[0005] In the known bread slicers the knives are mostly placed in almost an overlapping row. The knives, which are tensioned with a spring load of approximately 200 to 400 N and depending on the make of the slicer, have a varied thickness of 0,4 en 0,5 mm, an average of 0,45 mm, in which they are sharpened double sided. For the compression of the bread with a length of 400 mm and a required slice thickness of approximately 10 mm, can be determined with a usual thickness of the knives of 0,45 mm, e.g. In this case 400:10=40 knives with a thickness of 0,45 mm are active. Herewith, the whole bread is forced to compress 40×0,45mm=18mm. This compression has friction as the most important disadvantage, which develops between the knives and the bread due to the applied compression forces. The consequences are:

- wear of the knives;
- crumbling;
- sticking of the bread on the knives when the bread is still warm and/or sticky;
- pulling the bread apart between two knives moving in a different direction;
- when the feed or push speed (pusher speed) of the bread is too fast, the bread is compressed, in which the slices are permanently deformed or even broken.

[0006] Further, the tension of the known knives of 200 to 400 Newton leads to a large bending moment in the stretcher, which leads to large dimensions and has disadvantages regarding the dynamic behaviour of the bread slicer.

[0007] The aim of the present invention concerns to provide a bread slicer, which has a number of advantages in relation to the above described bread slicers, in which the knives play an important role and which knives are not suspended spring tensioned. The aimed advantages concern a larger speed overlap of the knives, a lighter construction by avoiding the needed heavy stretcher and therefore less vibrations and wear and finally a much smaller exertion of force of the knives as total set exerted on the loaf, by providing a step by step cutting of the bread and that it is minimally pushed together lengthwise, by sharpening the knives in a suitable way and placing the sharpened knives in a certain manner in the double oscillating supporting frame.

[0008] In short, the aim of the present invention is to provide a very efficient bread slicer, which has a light

construction, minimally crunches and/or damages the bread, needs little driving power and in which the knives can easily be changed and the reversely placed knives are still useable. Further, sharpening such knives should be as cheap as possible.

[0009] In order to achieve the abovementioned aim, respectively advantages, a bread slicer according to the invention is developed in a very inventive way, characterized in that, the mentioned oscillated driven cutting instrument is constructed of two sets of reciprocal driven rigidly restrained specially constructed knives, which in top view on one side are mounted in a saw-tooth shape placeable in various layers constructed in a wave- or V-shape alternating in a first or a second supporting frame, in which the set-up of the knifes does not show a mutual overlap, in which the first and the second supporting frames move the mentioned phase shifted sets of knifes oscillating in their longitudinal axis.

[0010] The aim of minimum power, little vibrations and minimum damage to the bread or other object is achieved.

[0011] By using knives which are sufficiently thick and broad, knives are created which are sufficiently rigid to prevent tensioning and bending. This means, that the knives are fixed and driven on one end. Through the other end of the knife only a guide is applied. The chosen thickness of the knives lies between 0,6 and 3 mm. The width of the knives lies preferably between 5 and 15 mm. By placing the single sided sharpened knives according to a certain configuration in different layers (wave or V-shape), the compression of the bread is herewith organized in such a way, that cutting the bread leads to a lower compression. Each two cooperating knives exert a reciprocal cutting movement.

[0012] Further, the device according to the invention is further developed, characterized in that, the mentioned rigidly restrained knives are rigidly fixed in the mentioned supporting frame on one end and on the other end oscillate in a slotted guiding construction, in which both ends of the knives are constructed as reversible use useable, and in which the mentioned knives are sharpened on one side.

[0013] The advantages are a fast changing of the knives and minimum deformation of the bread.

[0014] Furthermore, the device according to the invention is further developed, characterized in that, the mentioned saw-tooth shaped set-up of the knives in a first or second supporting frame, wherein the supporting frames are driven in such a way that they mutually are moving in a reciprocal oscillating way with an eccentric gear, in which the set-up knives are sharpened per pair in one layer facing each other.

[0015] The advantages are, that the pairs of knives always move reciprocal oscillating in relation to each other and that sharpening the knives on one side is much cheaper.

[0016] The preferred construction of the invention will be described by way of example, and with reference to the accompanying drawing.

[0017] In which:

Fig. 1	shows a schematic view in oblique projection of the set-up of the bread slicer according to a preferred embodiment of the invention;
Fig. 2	shows a side view of the bread slicer according to a preferred embodiment of the bread slicer applied in figure 1;
Fig. 3	shows a view in oblique projection of the preferred embodiment of the cutting mechanism and pusher of the bread slicer;
Fig. 4	shows a bottom view in oblique projection of the cutting mechanism of the bread slicer according to figure 3;
Fig. 5	shows a bottom view in oblique projection of the supporting frame with the knives according to the invention, in which the reciprocal movement of the supporting frame is clearly visible.
Fig. 6A up to 6C	show top views of the end of the knife for the usable fast fixing in the mentioned supporting frame of figure 5; and
Fig. 7	here, the reciprocal movement of the knives is shown schematically.

Figure 1 schematically shows the set-up 1 of a bread slicer with the cutting mechanism 2 and pusher 3. Further a guard 4 is applied over the cutting mechanism.

Figure 2 shows in side view the cutting mechanism 2 at an angle α of approximately 60 degrees. Here, the knives 5', 5 are shown and how they are fixed in the supporting frames 6 and 7, which can be driven with an eccentric gear 8. Here, the reciprocal movement of the knives 5', 5 is clearly seen. The knives are herewith placed in a V-shape in 5 rows (see figures 7 and 8).

Figure 3 shows a view in oblique projection of the preferred embodiment of the cutting mechanism 2. In this figure it is clearly shown that the knives 5', 5 are fixed at the bottom side in the supporting frames 6 and 7 by means of two pins, bolts or clamps 9, 10. The pusher 3 can be moved over the supporting plate 12 with the bread on it (all at 60 degrees) towards the knives 5', 5. The moving mechanism (not indicated) with guiding slots 14, 15 of the pusher 3 is clearly shown in figure 4. The movement is done by means of an electromotor, which drives the guide block 16 along the axis 17, 18. The supporting frame 6 for the knives 5', 5 moves with a bush construction 19 along the axis 20. This is done in the

same way at the supporting frame 7. The eccentric mechanism 8 with the eccentric rod 21 are clearly visible.

[0018] In figure 5 the supporting frames 6 and 7 are enlarged. The supporting frame 7 has a bush construction 22 and axis 23.

[0019] Figure 6A shows in top view the end 24 with a knife 5 with a first preferred embodiment or concept of the attachment recesses 25, 26 for the means 9, 10 of the previous figures 3, 4, 5.

[0020] Figures 6B and 6C show a second embodiment or concept of the ends of the knives 5' with the same cutting profile as knives 5, but with another attachment recess 27 for fixing into the supporting frames 6 and 7, which is done with a bent away laminated suspension spring 28 and which bent away laminated suspension spring 28 can be unlocked with a special unlocking pin 29. During use, the bent away laminated suspension spring 28 locks the knives 5'. Thus, the knives 5' can be placed in a very simple way and can be removed with an unlocking pin 29 to be placed. The extreme position of the unlocking pin 29 is against knife 5' and with that it is avoided, that the laminated suspension spring 28 is pulled further than its elastic permissible stress.

[0021] Figure 7 schematically shows the set-up of the knives in layers and the single sided sharpened direction of the knives, in which the reciprocal movement of the knives 5', 5 is indicated per pair, in which, for example, the knives 5', 5 with a + are moved upwards and the knives with a - are moved downwards at the same time.

[0022] Further, it must be noted that the mutual distance of the knives 5" can be reduced in such a way, that these lay against each other or can be joined together to a single knife 5", which gives a double sharpened knife. The movement direction of the bread is indicated with arrow A.

[0023] Finally it has to be emphasized, that the above description constitutes preferred embodiments of the invention, but that further variations and modifications are still possible without departing the scope of this patent document.

Claims

1. Device for cutting loafs or breads and other mainly spacial products into slices, mostly in order to offer the sliced bread packed to the client, in which in the mentioned device specially constructed blades are mounted, in which supporting and guiding plates or means for slicing loafs or breads have been applied, in which the mentioned bread is moved with a pusher towards a number of oscillating or moving cutting instruments with an approximate equal mutual distance and placed transverse on the bread, in which the mentioned distances between the cutting instruments is done in such a way to allow compression compensation, in which the movement or the oscillating movement in the longitudinal axis of the mentioned cutting instrument is done by means of a special driving mechanism, in which the whole is mostly provided with a housing to protect the user, in which an intake and outlet opening is included, **characterized in that**, the mentioned oscillated driven cutting instrument is constructed of two sets of reciprocal driven rigidly restrained specially constructed knives (5', 5), which in top view on one side are mounted in a saw-tooth shape placeable in various layers constructed in a wave- or V-shape alternating in a first or a second supporting frame (6, 7), in which the set-up of the knifes does not show a mutual overlap, in which the first and the second supporting frames (6, 7) move the mentioned phase shifted sets of knifes (5', 5) oscillating in their longitudinal axis.

2. Device as claimed in claim 1, **characterized in that**, the mentioned rigidly restrained knives (5', 5) are rigidly fixed in the mentioned supporting frame (6, 7) on one end and on the other end oscillate in a slotted guiding construction (11), in which both ends of the knives are constructed as reversible use useable.

3. Device as claimed in claims 1 - 2, **characterized in that**, the mentioned knives (5', 5) are sharpened on one side.

4. Device as claimed in claims 1 - 3, **characterized in that**, the mentioned saw-tooth shaped set-up of the knives (5', 5) in a first or second supporting frame (6, 7), wherein the supporting frames are driven in such a way that they mutually are moving in a reciprocal oscillating way.

5. Device as claimed in claims 1 - 4, **characterized in that**, the set-up knives (5', 5) are sharpened per pair in one layer facing each other.

6. Device as claimed in claims 4 and 5, **characterized in that**, each pair of knives making a cut at that moment are sharpened facing each other and each time the separate knife is mounted in the first or the second supporting frame (6, 7) and thus execute a reciprocal oscillating movement in relation to each other.

7. Device as claimed in claim 6, **characterized in that**, the mentioned knives (5', 5) have a knurl, saw-tooth, smooth or another saw shape.

8. Device as claimed in claim 7, **characterized in that**, in cross-section the mentioned knives (5', 5) have a blade thickness between 0,6 and 3 mm, a

width between 5 and 15 mm and a knife length of approximately 300 mm.

9. Device as claimed in claim 8, **characterized in that**, the material of the knives is blade steel or teflonized steel.

10. Device as claimed in claim 6, **characterized in that**, the driving of the first and the second supporting frame (6, 7) is constructed by means of a balanced disc with an eccentric rod (21) connected with an eccentric mechanism (8)

Amended claims in accordance with Rule 86(2) EPC.

1. Device for cutting loafs or breads and other mainly spacial products into slices, mostly in order to offer the sliced bread packed to the client, in which in the mentioned device specially constructed blades are mounted, in which supporting and guiding plates or means for slicing loafs or breads have been applied, in which the mentioned bread is moved with a pusher towards a number of oscillating or moving cutting instruments with an approximate equal mutual distance and placed transverse on the bread, in which the mentioned distances between the cutting instruments is done in such a way to allow compression compensation, in which the movement or the oscillating movement in the longitudinal axis of the mentioned cutting instrument is done by means of a special driving mechanism, in which the whole is mostly provided with a housing to protect the user, in which an intake and outlet opening is included, **characterized in that,** the mentioned oscillated driven cutting instruments are two sets of reciprocal driven rigidly executed specially constructed knives (5', 5), which knives are completely fixed at one end in an oscillately driven supporting frame in plate form, which set of knives are mounted in top view on one side in a saw-tooth shape placeable in more than two layers constructed in a wave- or V-shape alternating in a first or a second supporting frame (6, 7), in which the set-up of the knifes does not show a mutual overlap, in which the first and the second supporting frames (6, 7) move the mentioned phase shifted sets of knifes (5', 5) oscillating in their longitudinal axis.

2. Device as claimed in claim 1, **characterized in that,** the mentioned rigidly executed knives (5', 5) are rigidly fixed in the mentioned supporting frame (6, 7) on one end and on the other end oscillate in a slotted guiding construction (11), in which both ends of the knives are constructed as reversible use useable.

3. Device as claimed in claims 1 - 2, **characterized in that,** the mentioned knives (5', 5) are sharpened on one side.

4. Device as claimed in claims 1 - 3, **characterized in that**, the mentioned saw-tooth shaped set-up of the knives (5', 5) in a first or second supporting frame (6, 7), wherein the supporting frames are driven in such a way that they mutually are moving in a reciprocal oscillating way.

5. Device as claimed in claims 1 - 4, **characterized in that,** the set-up knives (5', 5) are sharpened per pair in one layer facing each other.

6. Device as claimed in claims 4 and 5, **characterized in that**, each pair of knives making a cut at that moment are sharpened facing each other and each time the separate knife is mounted in the first or the second supporting frame (6, 7) and thus execute a reciprocal oscillating movement in relation to each other.

7. Device as claimed in claim 6, **characterized in that**, the mentioned knives (5', 5) have a knurl, saw-tooth, smooth or another saw shape.

8. Device as claimed in claim 7, **characterized in that**, in cross-section the mentioned knives (5', 5) have a blade thickness between 0,6 and 3 mm, a width between 5 and 15 mm and a knife length of approximately 300 mm.

9. Device as claimed in claim 8, **characterized in that,** the material of the knives is blade steel or teflonized steel.

10. Device as claimed in claim 6, **characterized in that**, the driving of the first and the second supporting frame (6, 7) is constructed by means of a balanced disc with an eccentric rod (21) connected with an eccentric mechanism (8)

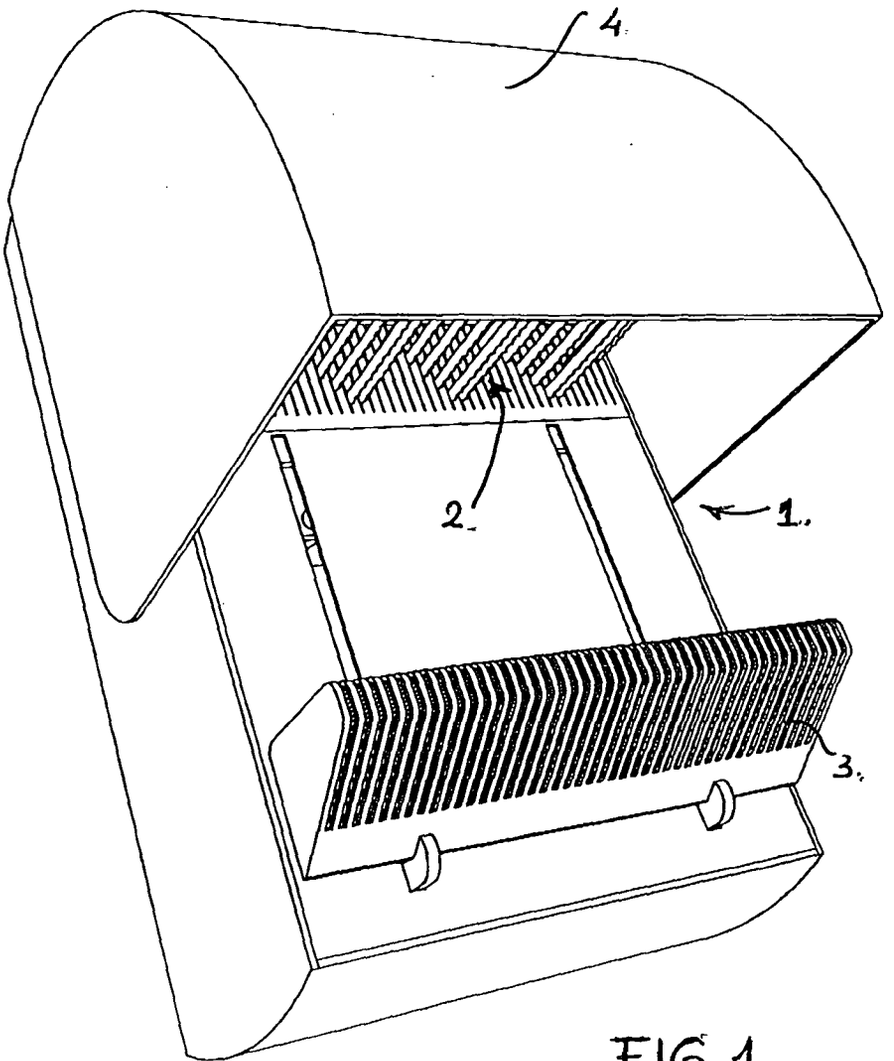

FIG.1.

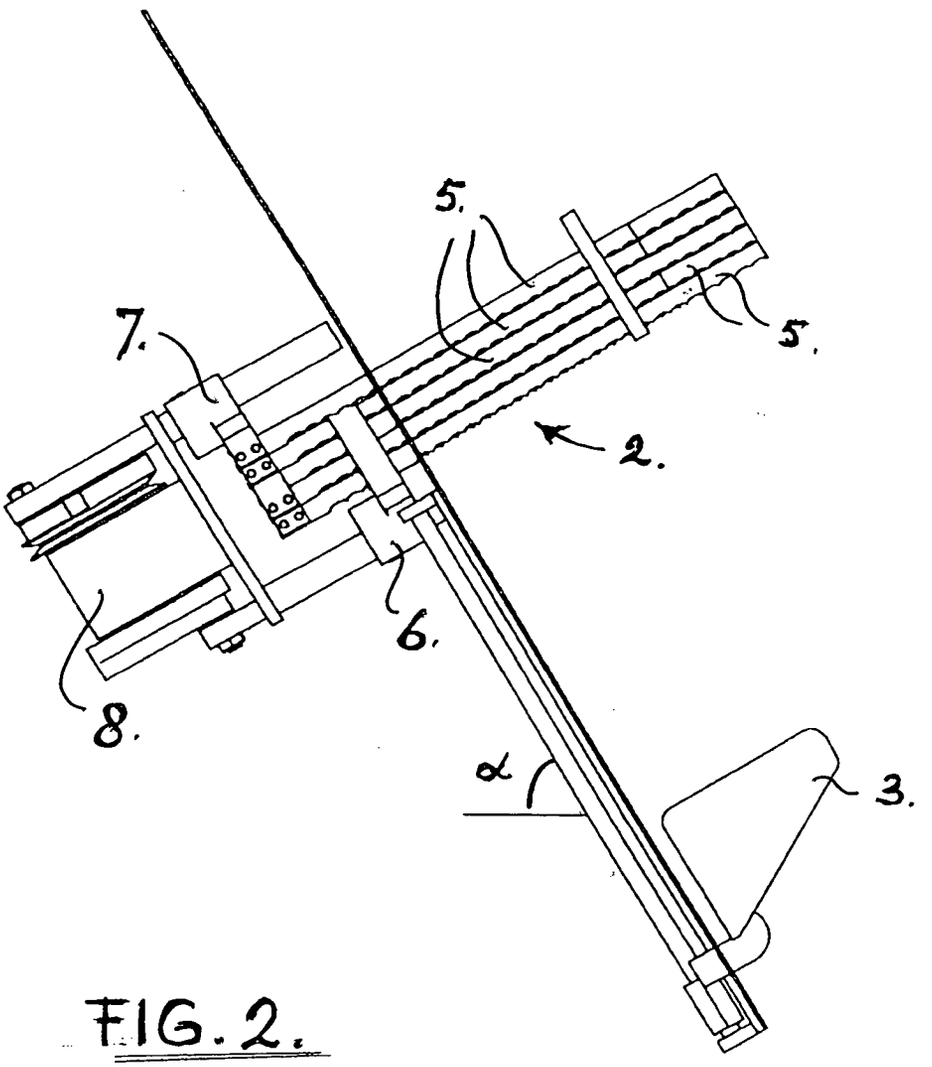

FIG. 2.

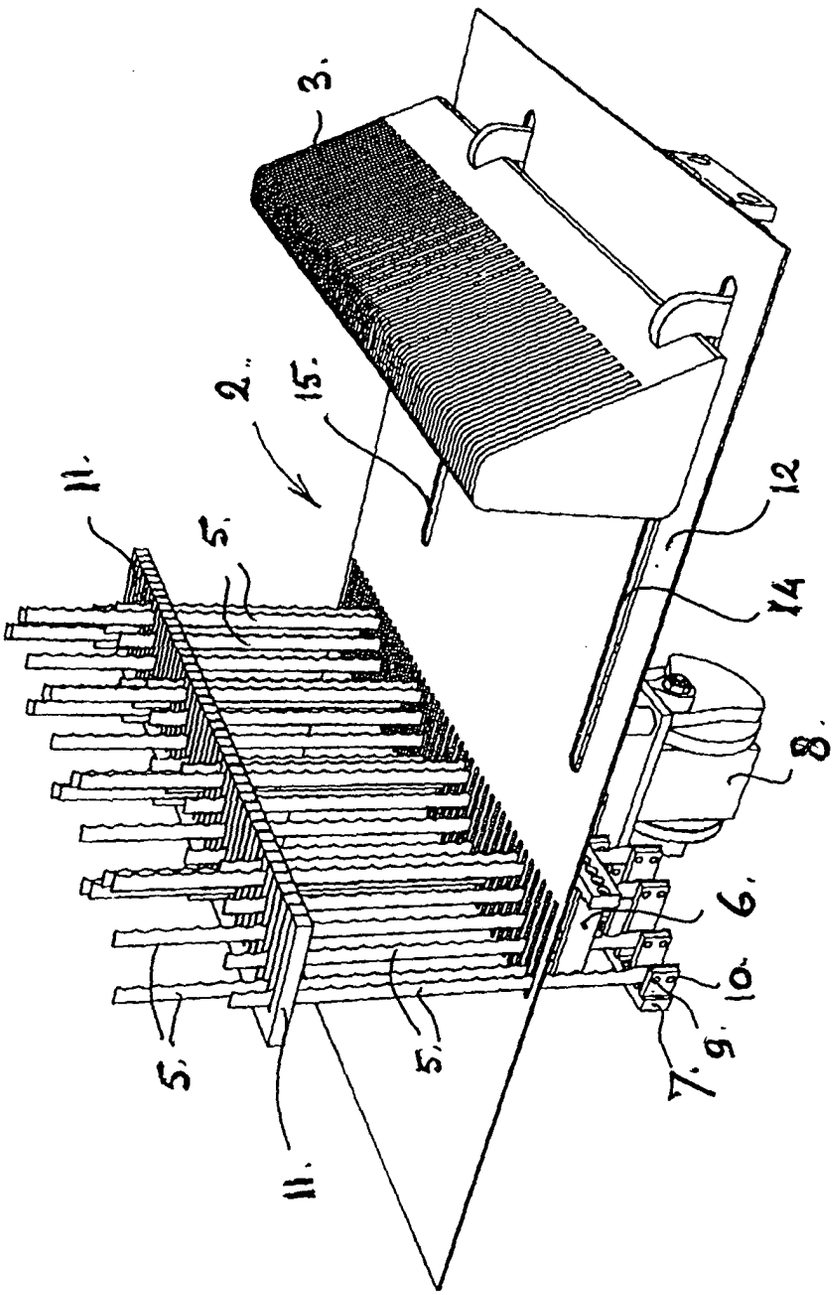

FIG. 3.

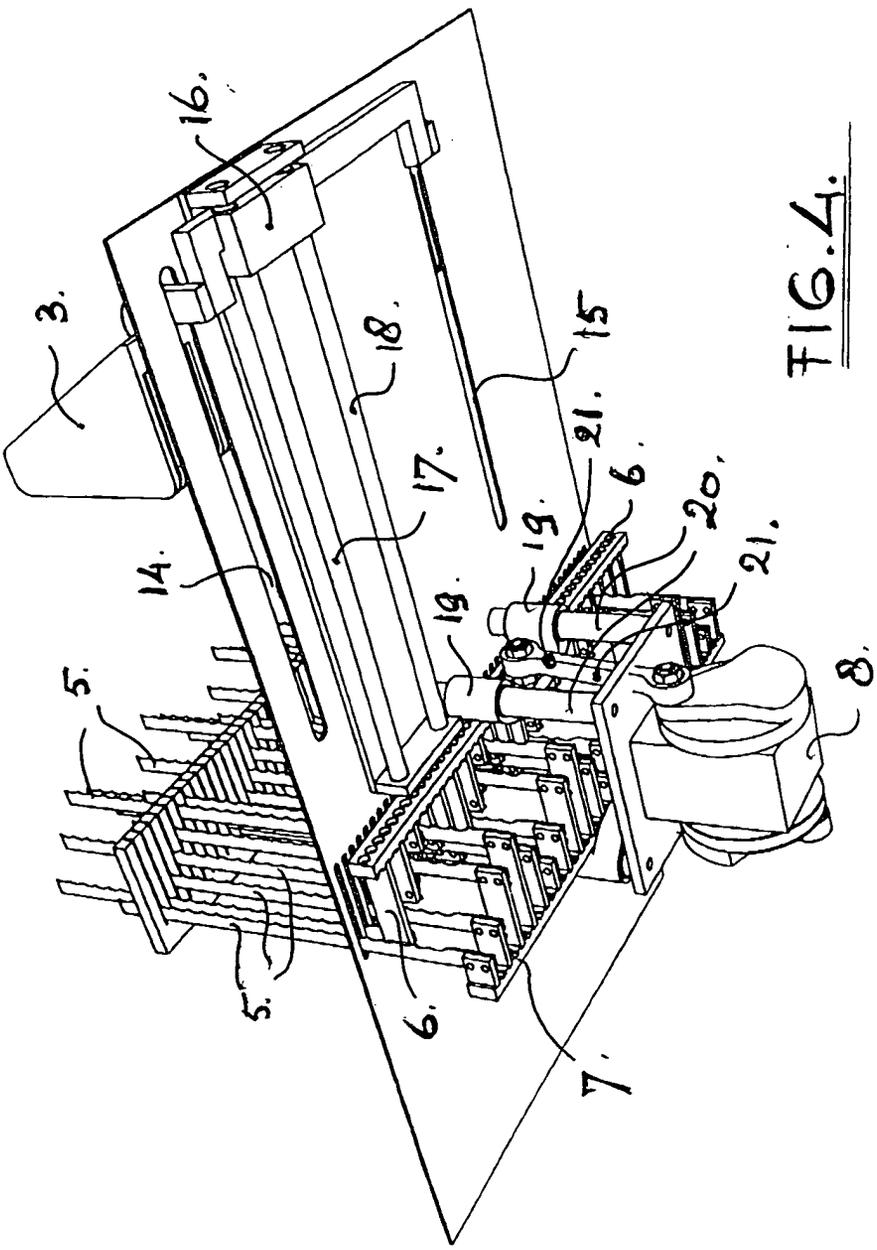

FIG.4.

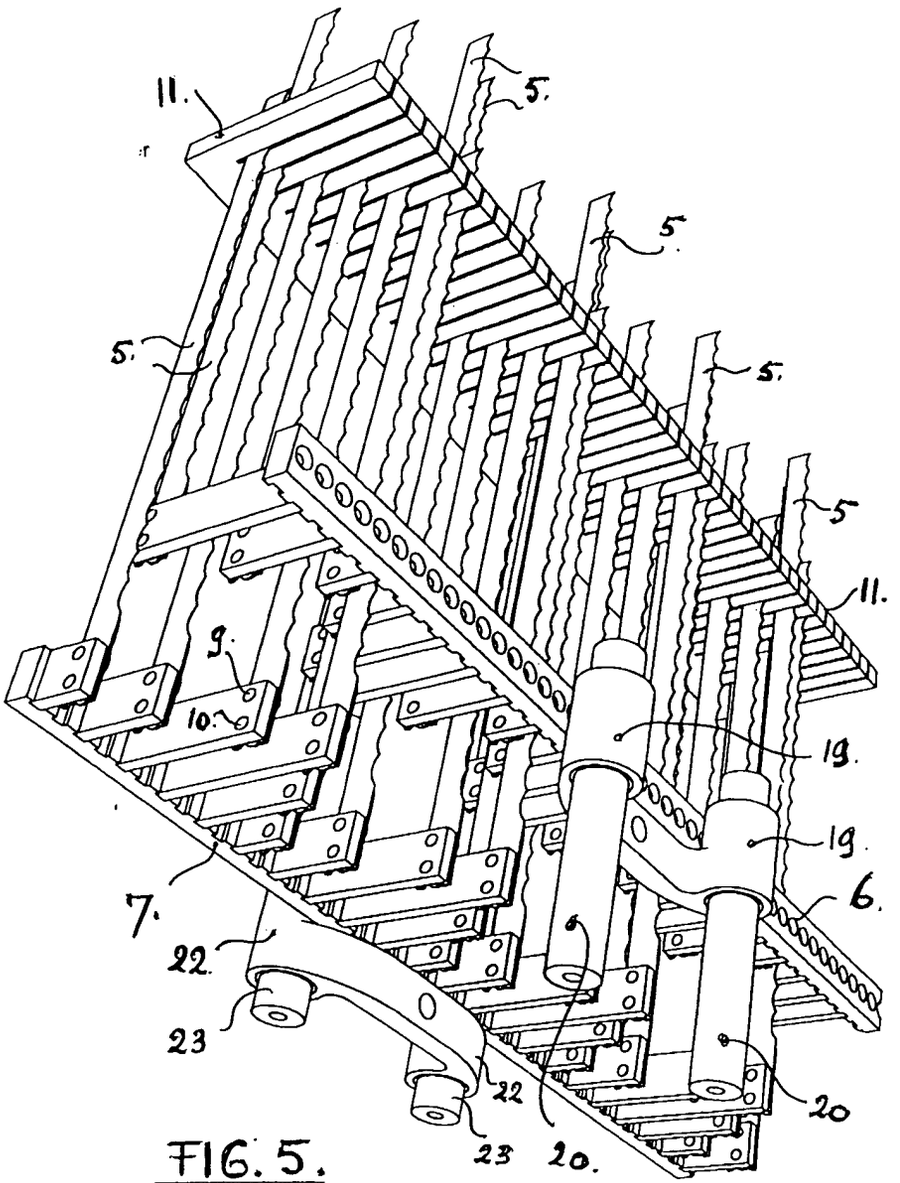

FIG. 5.

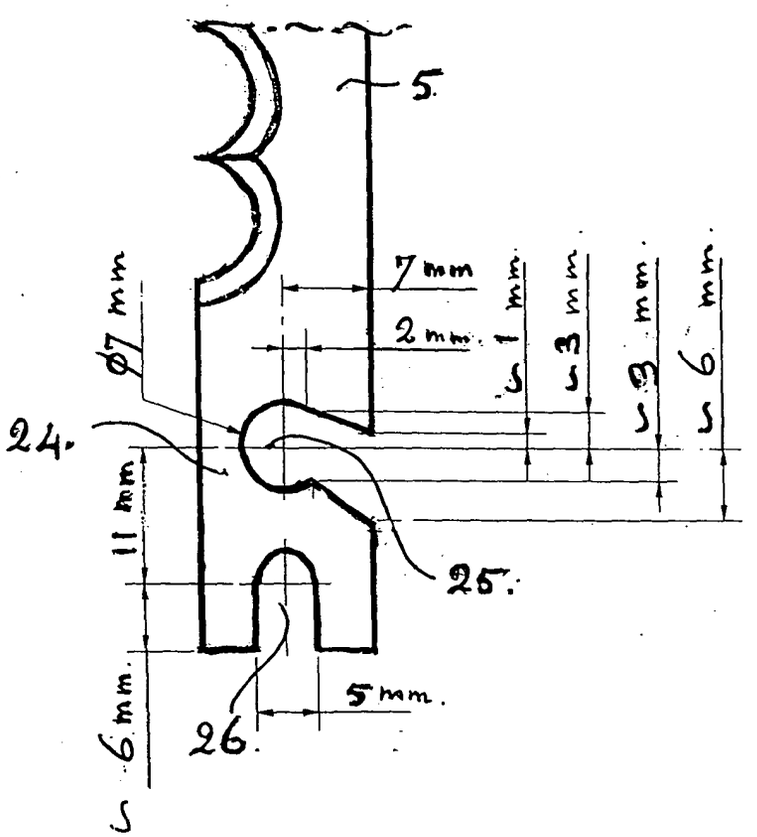

FIG. 6A.

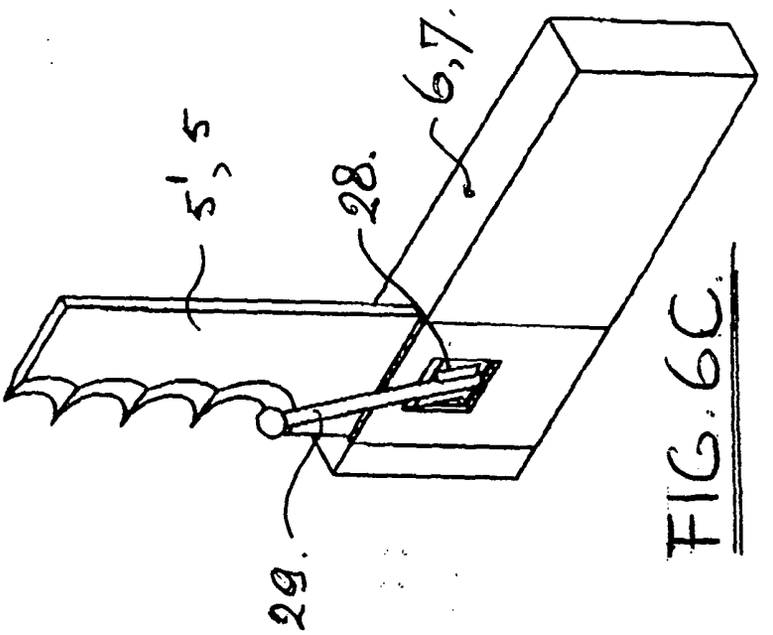

FIG. 6C.

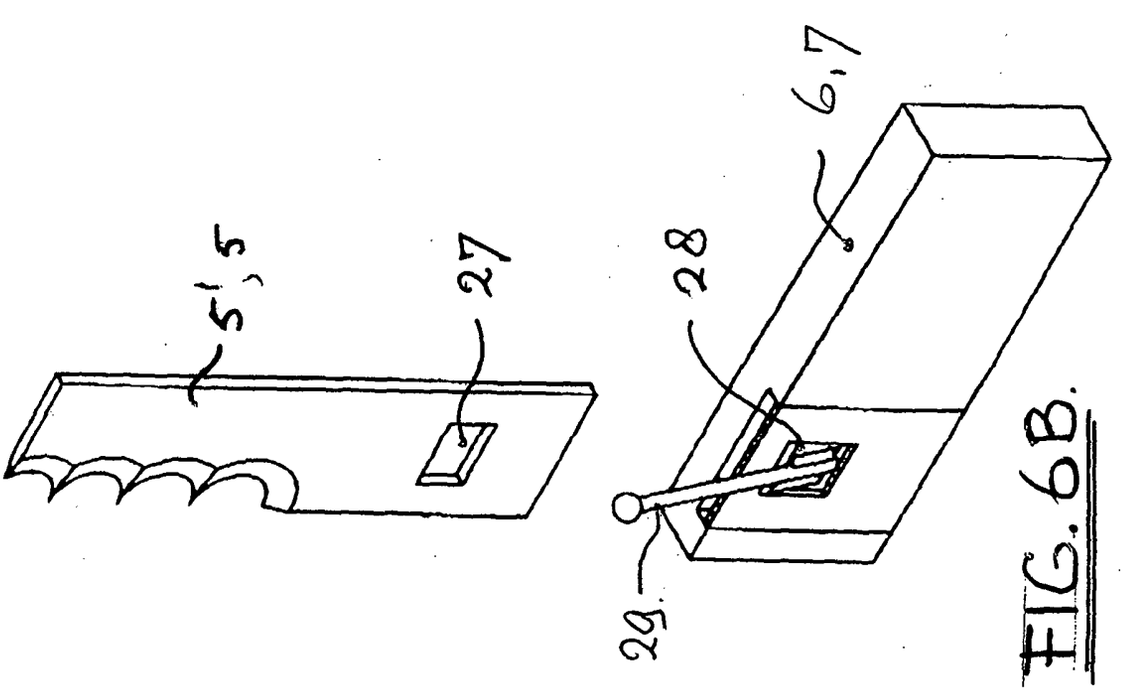

FIG. 6B.

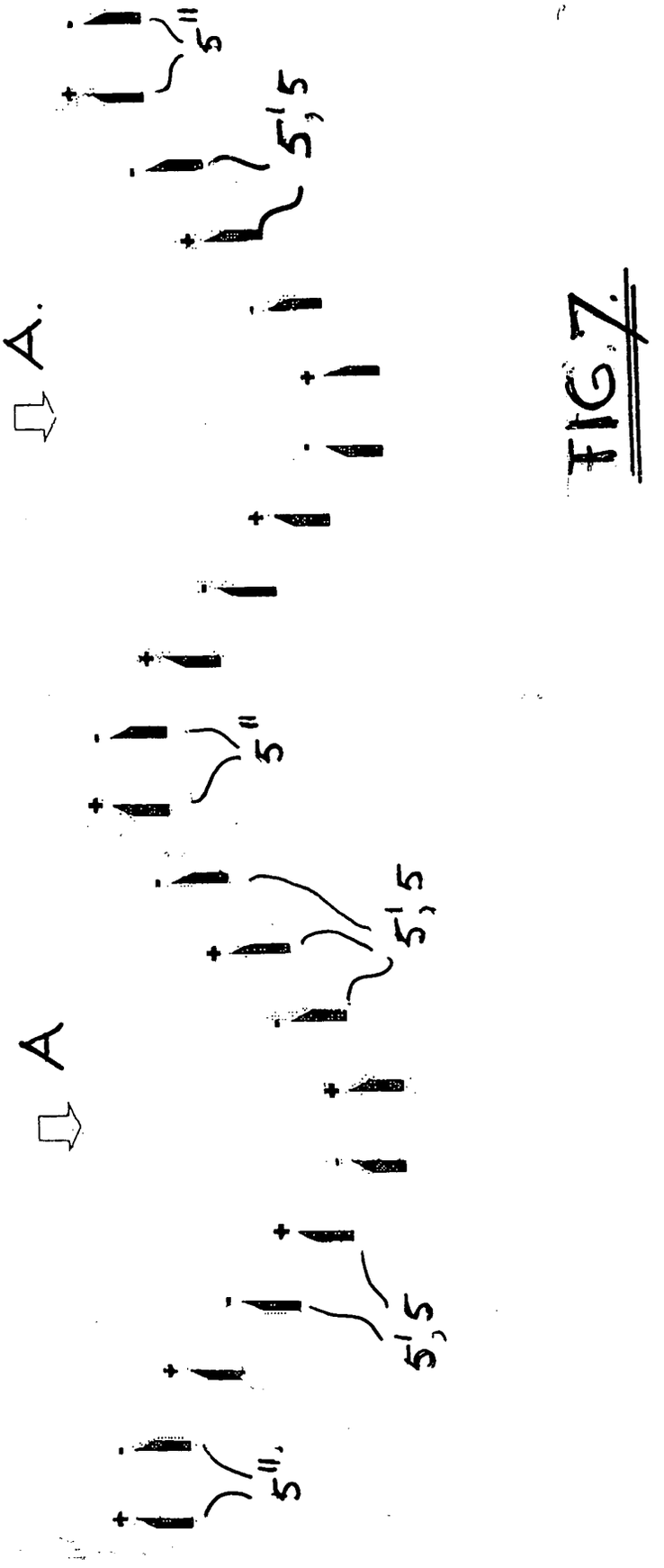

FIG 7.

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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 5770

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.7)
X	US 2 092 276 A (GELLMAN ISRAEL C) 7 September 1937 (1937-09-07) Suitably narrowed and rewritten, claims 2 and 3 would be new. * the whole document *	1,3,4	B26D1/553 B26D1/00
X	GB 798 883 A (MUELLER JOSEF) 30 July 1958 (1958-07-30) * page 1, line 11 - line 35; figures 1,2 *	1	
A	US 2 023 362 A (WALMA THEODORE K) 3 December 1935 (1935-12-03)		
A	US 2 528 853 A (MORRIS BRUSTOWSKY) 7 November 1950 (1950-11-07)		
A,D	US 1 975 942 A (WALTER HARTMAN WILLIAM) 9 October 1934 (1934-10-09)		

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B26D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 August 2004	Rabolini, M

CATEGORY OF CITED DOCUMENTS

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