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(54) **Apparatus and method for packing pills in blister cavities**

(57) An apparatus and method for packing pills (16) in cavities (12) formed in a blister web (10) includes a plurality of downwardly directed flexible members (62), for example brushes, that are continuously cyclically

moved to contact and knock clown pills (16) that are not properly nested in respective blister cavities (12). The flexible members (62) are mounted parallel to and spaced apart from one another.

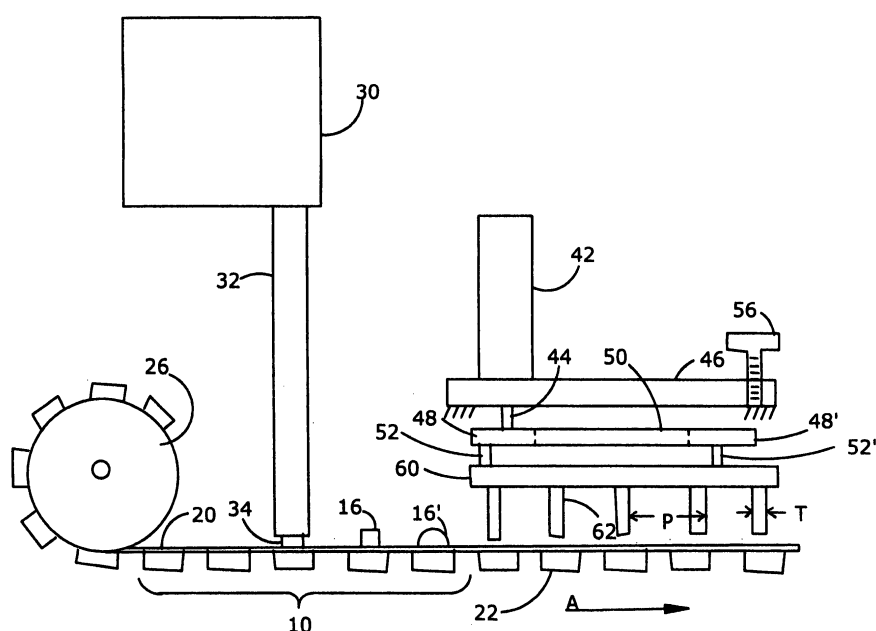


Fig. 3

Description

FIELD OF THE INVENTION:

[0001] The present invention relates to the field of pill packaging apparatus and methods, and more particularly to ensuring that pills being packaged in blister webs are properly nested in blister cavities.

BACKGROUND OF THE INVENTION:

[0002] Pills are frequently packaged for retail sale in blister web packaging, i.e. a semi-rigid sheet in which an array of depressions or cavities are formed. The sheet is typically plastic or aluminum for easy cavity forming and pill visibility. One pill is generally placed to nest entirely within each cavity, although occasionally two pills may be inserted. A protective cover sheet is adhered to the blister web after the pills are properly nested in the respective cavities. The term pill is used herein to include all types and shapes of compact oral medication, including tablets, capsules and caplets. Pills may be round, oval, triangular, square, etc. with flat or curved top and bottom surfaces.

[0003] Blister webs are normally formed from continuous strips of plastic or aluminum that pass beneath a feeder mechanism for placing one pill in each cavity. The blister web is moved to pass an empty blister web portion beneath the pill feeding mechanism. The pill feeding mechanism then drops a single pill into each cavity and the blister web is moved forward, allowing a subsequent blister web portion to be loaded with pills. The pills can be fairly light weight, the cavities are sized to accept the pills in a specific orientation, and the friction between the blister web portion pill and the cavity is significant relative to the pill weight. Furthermore, the dimensions of the pill relative to the dimensions of the cavity can have an adverse effect on proper placement in the cavity. Therefore, a number of pills do not nest in the desired orientation in the respective cavity. Hence, some pills are standing upright or tilted in the cavity rather than lying flat, leaving a portion of the pill above the top of the. The pills that are not properly nested must be repositioned, or knocked down, before the cover sheet can be affixed or the pills will be damaged during the sealing process, which is unacceptable.

[0004] Prior apparatus and methods have been developed for assuring the proper nesting of pills in blister web portions, two of which are discussed below.

U.S. Patent No. 6,494,022, entitled Orbital Motion Pill Packaging Device And Associated Method provides such a device. This patent teaches a device for pill packaging in which a resilient pad is brought into engagement with pills protruding from pill cavities, and the resilient pad is driven in an orbital motion to urge the protruding pills into the cavities.

U.S. Patent No. 6,925,782, entitled Vibrating Pill Packaging Device And Associated Method discloses a pack-

aging device for manipulating the pills into respective cavities formed in a web and conveyed by a conveyor. A first wiper device extends angularly across the web to engage pills protruding from cavities. A second wiper, downstream from the first wiper and perpendicular to the web, engages pills still protruding from the cavities. The first and second wipers are vibrated to cause the pills to nest properly in respective cavities.

10 SUMMARY OF THE INVENTION;

[0005] The invention disclosed herein provides a novel apparatus and method for causing pills that are not properly oriented to be nested in respective cavities in a blister web. A blister web is fed under a pill feeding mechanism that places a pill in each cavity. Certain of the pills remain an edge or at an angle to the blister web and are not properly nested in the cavity. The blister web loaded with a pill in each cavity is moved to a knock down station to pass beneath a set of brushes mounted in rows to a moveable tray. The tray and brushes are moved cyclically across the blister web to cause the standing pills to nest properly in the cavities.

25 BRIEF DESCRIPTION OF THE DRAWINGS:

[0006] The present Invention is best understood in conjunction with the accompanying drawing figures in which like elements are identified by similar reference numerals and wherein;

Figure 1 is a plan view of a single blister web portion for packaging pills.

Figure 2 is a side elevation view of the blister web portion of Figure 1 with three pills shown not properly nested in respective cavities.

Figure 3 is a diagrammatic side elevation of the apparatus for packing pills in blister cavities.

Figure 4 is a top plan view of a brush assembly of the invention.

Figure 5 is a perspective view of the brush assembly of Figure 4 in inverted orientation.

Figure 6 is a perspective view of a further embodiment.

45 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

[0007] Referring now to Figure 1, a typical blister web portion 10 is shown in plan view with a series of cavities 12 formed therein. Blister web portion 10 is a section of an elongate blister web that is wound into a supply roll for processing. At the completion of packaging, blister web portion 10 is to be separated from the balance of the blister web. Blister web portion 10 is formed of a sheet of plastic resin or aluminum. In blister web portion 10 shown, 20 cavities are formed to receive round pills. However, the Invention described pertains to packing pills of

many differing shapes in blister web portions having differing numbers of cavities.

[0008] Referring now to Figure 2, blister web portion 10 is shown in side elevation view after being loaded with pills. A first pill 16 is illustrated as not being properly nested and standing on edge, with pill 16 oriented along a line perpendicular to the plane of the drawing. A second pill 16' is shown as not being properly nested and tilted in cavity 12. A third pill 16" is shown as not being properly nested and standing on edge, with pill 16" oriented along a line parallel to the plane of the drawing. These three orientations of pills are representative of many pill orientations susceptible of being corrected and properly nested in the respective cavity of blister web portion 10 according to the invention disclosed. Additional pills fed on to blister web portion 10 are properly nested in respective cavities.

[0009] Referring now to Figure 3, an apparatus for packing pills in blister cavities is illustrated diagrammatically in side elevation view. A supply 26 of blister web 20 is rotatably mounted at the entry section of the pill packing apparatus to feed blister web 20 in the direction indicated by arrow A. Blister web 20 is fed incrementally, i.e. indexed, to position an empty blister web portion 10 for being filled with pills fed from supply chute 32. In a further embodiment, blister web 20 is fed continuously through the pill packing apparatus without interruption of motion. Whereas the pills being loaded into blister cavities are dropped, the operative mechanism of the invention apparatus is illustrated above blister web 20. In a subsequent movement, blister web portion 10 is in position beneath a tray 60 for improperly nested pills to be repositioned, or knocked down, into respective cavities. A pill hopper 30 is mounted above the path of blister web 20 with supply chute 32 terminating adjacent to blister web 20. Supply chute 32 includes mechanism adapted to deposit pills individually into respective cavities 22. In practice, multiple chutes 32 will be mounted to simultaneously deposit a pill in each of multiple cavities. A first pill 16 and a second pill 16' are shown as being improperly nested in respective cavities 22, pills 16 and 16' being oriented perpendicular to and parallel to the plane of the drawing. The pills placed in the balance of cavities 22 downstream of feed chute 32 are properly nested and do not protrude above the surface of blister web 20. A frame 46 is fixedly mounted a distance above the path of blister web 20. A drive device 42, for example a variable speed motor, is mounted to frame 46 with a drive shaft 44 extending therethrough. Drive shaft 44 is connected to a first pulley 48 that in turn drives a second pulley 48' by means of a belt 50 to rotate cyclically and synchronously. Other means of driving first pulley 48 synchronously with second pulley 48' are considered within the scope of the invention. In the preferred embodiment of the invention, three pulleys 48 are used, as will be shown below. Pulleys 48 and 48' are preferably timing pulleys and belt 50 is preferably a timing belt to maintain radial alignment between pulleys 48 and 48'. Pulleys 48 and 48' are mounted

to frame 46 by bearing means (not shown). Each of pulley 48 and 48' is fitted with a crank shaft 52 and 52' rotatably mounted off center thereof and connected to a tray 60. Thus, drive device 42 causes tray 60 to move cyclically over blister web 20. Tray 60 may be formed as a flat plate or as a box having sides according to the intent of the designer. A series of flexible members 62 are mounted to, and depend downwardly from, tray 60 to terminate slightly above the upper surface of blister web 20 at a height to contact pills 16 and 16' that protrude out of cavities 22. Depending on the parameters of the pills, blister cavities and the stiffness of the bristles, flexible members 62 are typically positioned between 0.1 - 1.0 mm (0.004 - 0.039 inch) above blister web 20. Alternatively, flexible members 62 may be positioned at the level of blister web 20 or lower to effectively cause all pills 16 and 16' to nest properly. Flexible members 62 are positioned a pitch distance P from one another, distance P being substantially equal to the pitch between adjacent cavities 22. In a further embodiment of the invention, the distance P between flexible members 62 is related to, but not equal to, the distance between cavities in blister web 20. Flexible members 62 may be oriented either perpendicular, parallel, or at an intermediate angle to the travel direction A of blister web 20 (as illustrated). In the preferred embodiment of the invention, flexible members 62 are elongate brushes formed of nylon resin bristles approximately 0.15 mm (0.006 inch) diameter and 2.5 cm (1.0 inch) long. As such, the bristles of flexible members 62 are substantially flexible in all directions perpendicular to their length and effectively not compressible lengthwise. In the preferred embodiment, flexible member 62 is a brush of approximately 2.0 mm (0.78 inch) thickness T and sufficient length to engage improperly oriented pills 16 and 16' across blister web 20. A level adjustment 56 is provided to ensure that flexible members 62 terminate in a plane parallel to blister web 20.

[0010] Referring now to Figure 4, a top plan view of tray 60 is shown with flexible members 62 depicted in dashed lines as being mounted to the bottom surface thereof. Rotary couplings 54 are shown rotatably mounted to the upper surface of tray 60. As rotary couplings 54 are rotated by drive device 42 (see Figure 3), tray 60 travels a substantially circular cyclical path, characterized by arrow B. According to the preferred embodiment, tray 60 moves through a cycle related to pitch distance P between flexible members 62, a particular example being approximately 15 mm (0.60 inch) diameter, thus passing over all cavities in blister web 20 to knock down pills not properly nested in respective cavities. Tray 60 is driven continuously through cycle B so that protruding pills are contacted while blister web 20 (see Figure 3) is moving into position and when it is still in position beneath tray 60. Depending on the product being packed, tray 60 may be rotated from approximately 30 - 200 cycles per minute. In an exemplary application of the present Invention, tray 60 is cycled approximately 50 rotations per minute and blister web 20 is indexed 50 cycles per

minute.

[0011] Referring now to Figure 5, assembled tray 60 is shown inverted in perspective view with flexible members 62 facing upward for visibility. Each flexible member 62 is held in a slot 64 formed in tray 60. Flexible members 62 may be assembled in individual channels (not shown) for ease of handling and secure insertion in slots 64, especially when in the form of brushes. As noted above, flexible members 62 and therefore slots 64 are spaced from one another a distance P as described above. Whereas the invention is intended primarily for packaging pharmaceuticals, tray 60 is mounted in a manner to allow quick removal and replacement at the start of a new production run of a different compound to avoid cross-contamination. Additionally, all materials forming the disclosed apparatus are food or pharmaceutical grade, such as anodized aluminum or stainless steel components and nylon "6" grade brush bristles.

[0012] Now referring to Figure 6 an embodiment is shown, which is particular suited for applications, where the direct interaction of brushes with the pills 16 should be avoided. Therefore the terminal ends 68 of the flexible members 62 are interconnected with a plate 66, wherein the plate 66 is a spring-mounted plate with the flexible members 62 acting as springs, which prevent crushing of the pills 16 due to the influence of the cyclically moving plate. The plate 66 itself is secured to the flexible members 62, which engage a groove 70 shaped in the plate 66.

[0013] While the description above discloses preferred embodiments of the present invention, it is contemplated that numerous variations and modifications of the invention are possible and are considered to be within the scope of the claims that follow.

List of references

[0014]

10 blister web portion
12 cavities
16 first pill
16' second pill
16" third pill
20 blister web
22 cavities
26 supply
30 pill hopper
32 supply chute
42 drive device
44 drive shaft
46 frame
48 first pulley
48' second pulley
50 belt
52 crank shaft
52' crank shaft
54 rotary couplings

56 level adjustment
60 tray
62 flexible members
64 slot
5 66 plate
68 terminal end
70 groove
A arrow
B cycle
10 P distance

Claims

1. In a machine for packing pills in blister cavities wherein a blister web is moved along a path beneath a mechanism for placing a pill in each blister cavity and wherein random pills are not properly nested within their respective cavities, the blister web is then moved to a position beneath an apparatus for knocking down improperly oriented pills, the apparatus comprising:
 - a. a tray moveably mounted in a plane substantially parallel to and spaced apart from the blister web;
 - b. a plurality of flexible members depending downwardly from the tray in an orientation substantially perpendicular to the blister web and positioned to contact pills that are not properly nested in cavities thereof; and
 - c. means to move the tray and flexible members cyclically in a plane substantially parallel to the blister web.
2. The apparatus described in claim 1, wherein the flexible members comprise brushes.
3. The apparatus described in claim 1, wherein the flexible members are affixed to the tray in spaced apart parallel relation.
4. The apparatus described in claim 3, wherein the flexible members are separated from one another by a distance related to a pitch between adjacent rows of cavities in the blister web portion.
5. The apparatus described in claim 1, wherein the flexible members are oriented substantially perpendicular to the path of the blister web.
6. The apparatus described in claim 1, wherein the flexible members are oriented substantially parallel to the path of the blister web.
7. The apparatus described in claim 1, wherein the flexible members are oriented at an acute angle to the path of the blister web.

8. The apparatus described in Claim 1, wherein the means to move the tray and flexible members cyclically is adjustable in speed.
9. The apparatus described in claim 1, further comprising means to adjust the level of the tray to be parallel to the blister web. 5
10. A method for packaging pills in a blister web having a plurality of cavities, comprising: 10
 - a. moving a blister web in a selected direction beneath a mechanism for placing a pill in each cavity;
 - b. depositing a pill from the mechanism in each of the plurality of cavities; 15
 - c. moving the blister web to beneath an apparatus comprising a plurality of parallel, spaced apart, downwardly directed flexible members that terminate adjacent to the blister web to contact pills that are not properly nested; 20
 - d. moving the plurality of flexible members cyclically in a plane parallel to the blister web and in contact with pills not properly nested in cavities; and 25
 - f. moving the blister web downstream from the apparatus comprising a plurality of flexible members,
11. The method described in claim 10, wherein the cyclical movement describes a substantially circular path. 30
12. The method described in claim 10, wherein the speed of cyclical movement of the flexible members is equal to or greater than the speed of movement of the blister web. 35
13. The method described in claim 10, wherein the blister web is moved incrementally and the speed of cyclical movement of the flexible members is equal to or greater than the incremental speed of movement of the blister web. 40
14. The apparatus described in claim 1, wherein the terminal ends of the flexible members are interconnected with a plate. 45
15. The apparatus described in claim 14, wherein the plate is a spring-mounted plate with the flexible members acting as springs. 50
16. The apparatus described in claim 14, wherein the plate is secured to the flexible members. 55
17. The apparatus described in claim 16, wherein the flexible members engage a groove shaped in the plate.

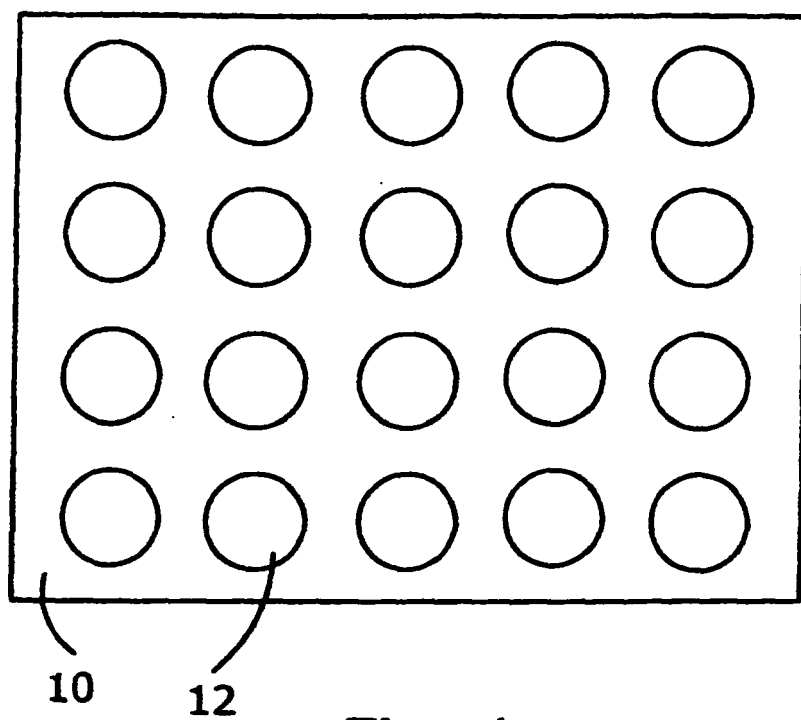


Fig. 1

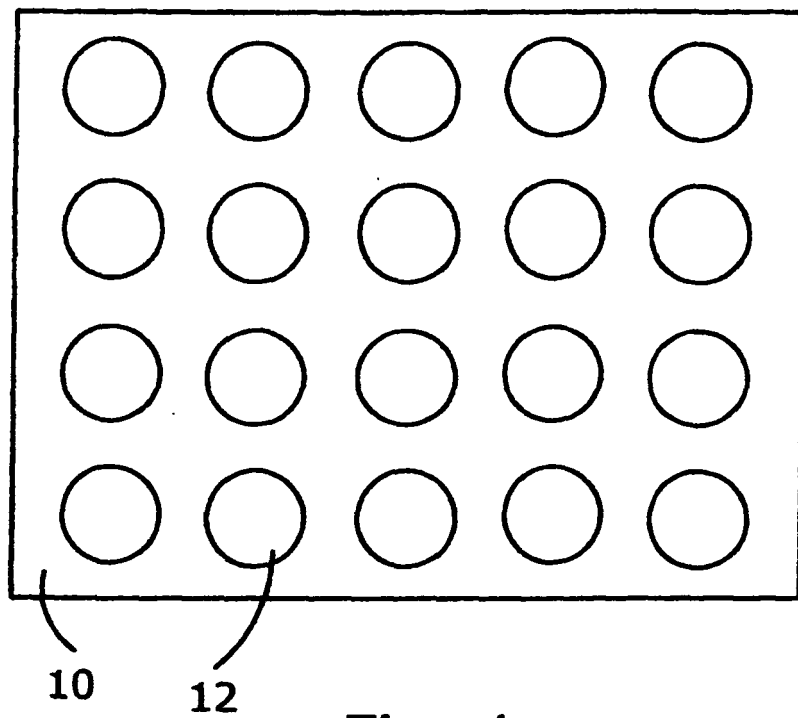


Fig. 1

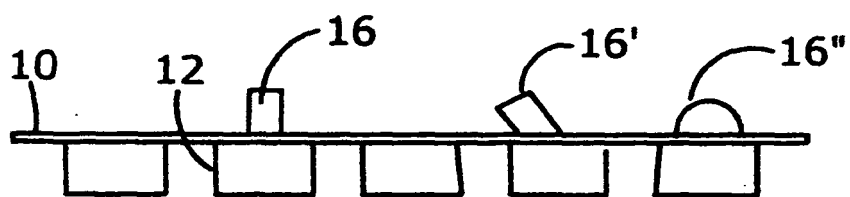


Fig. 2

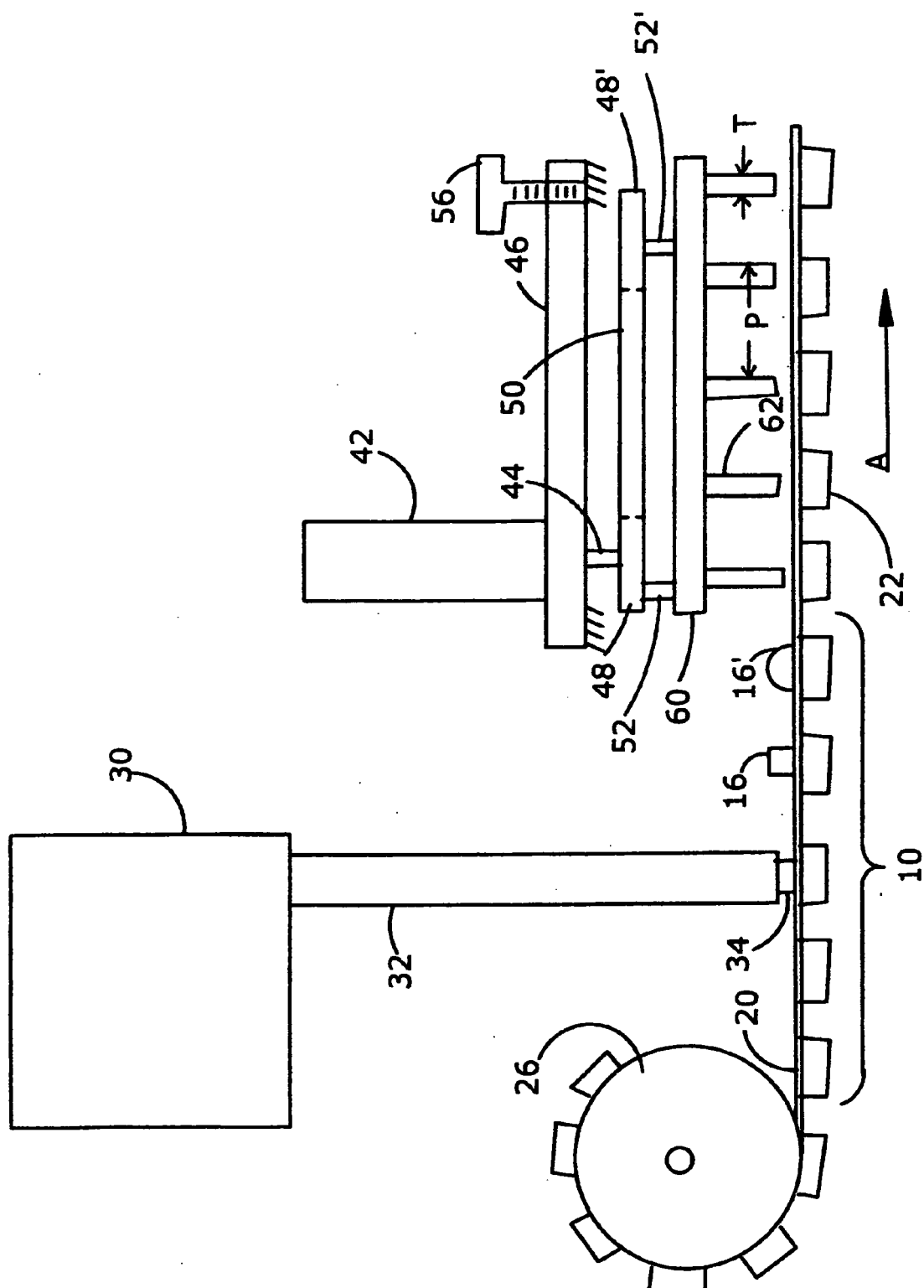


Fig. 3

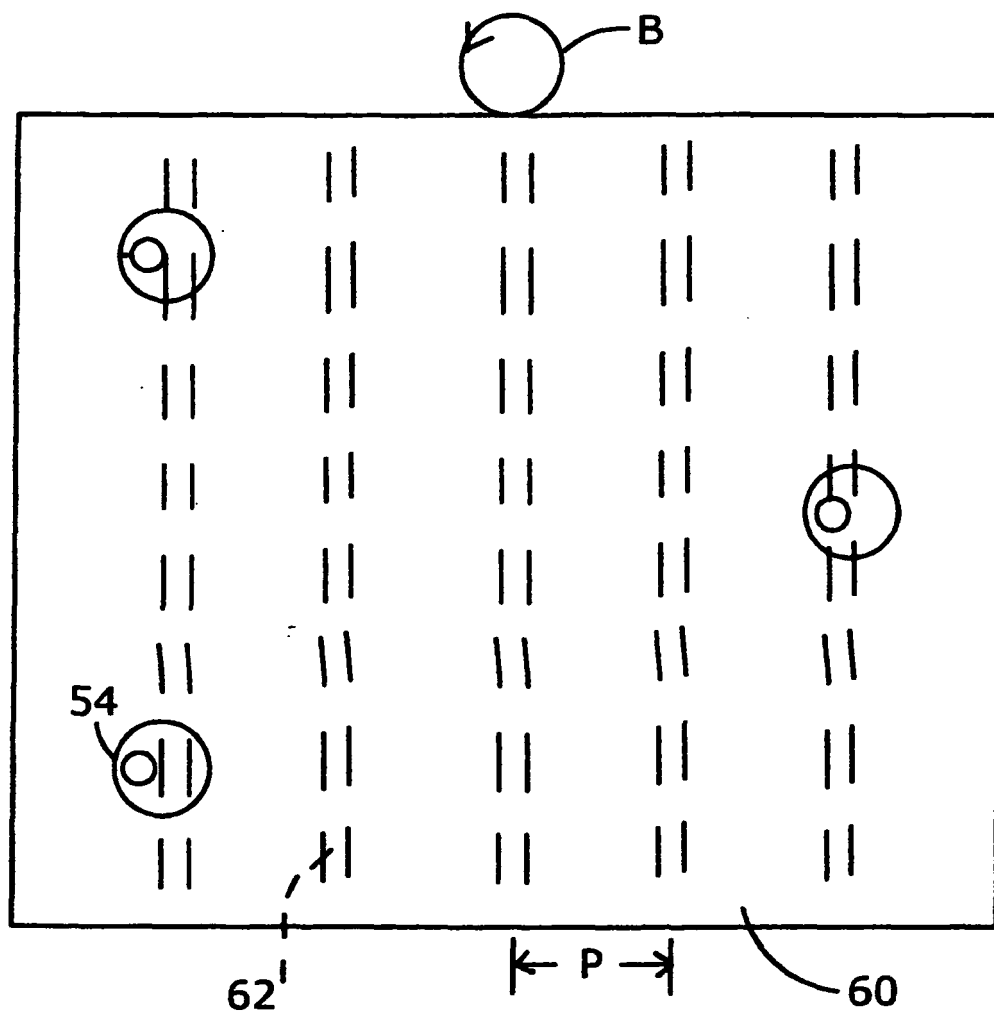


Fig. 4

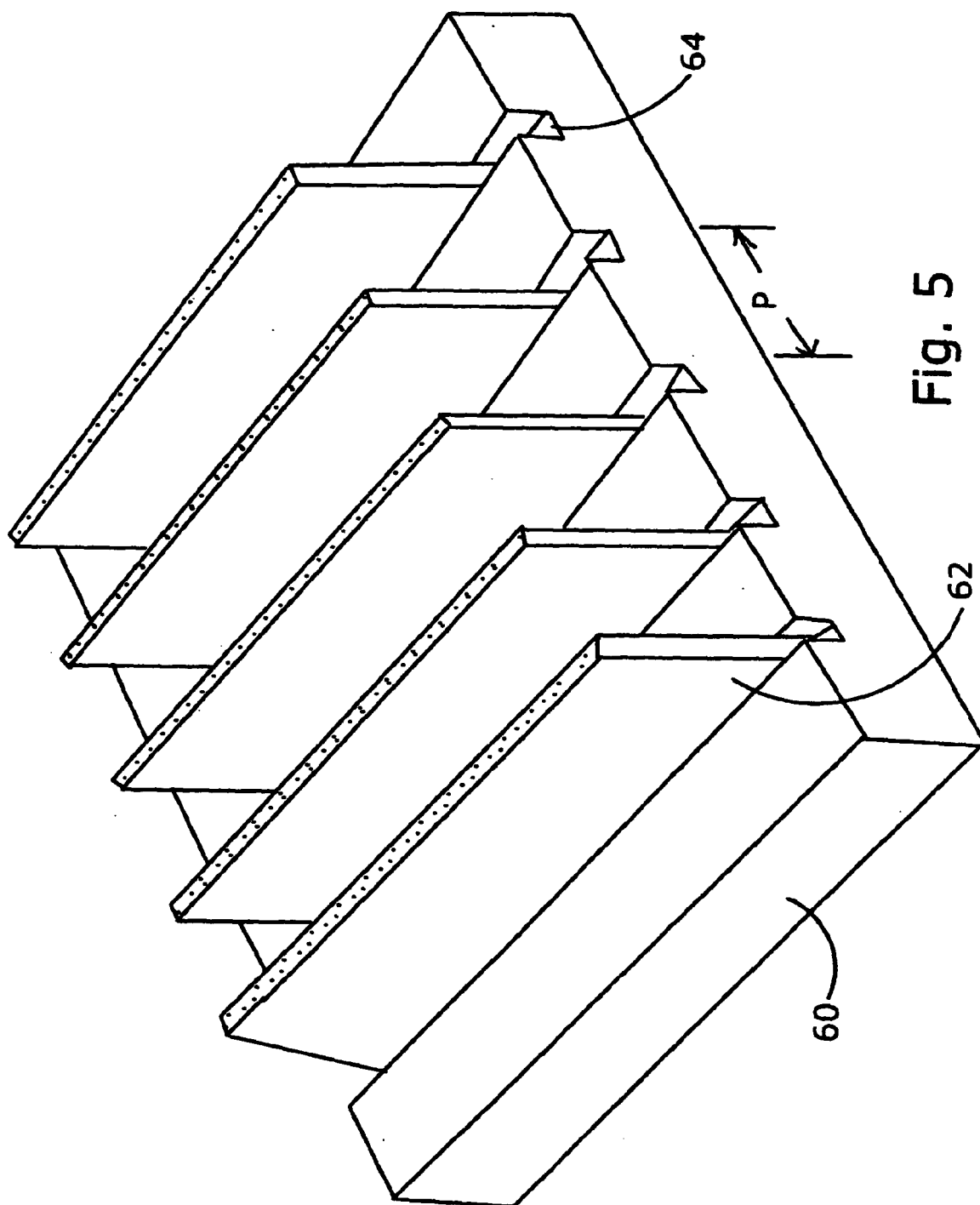


Fig. 5

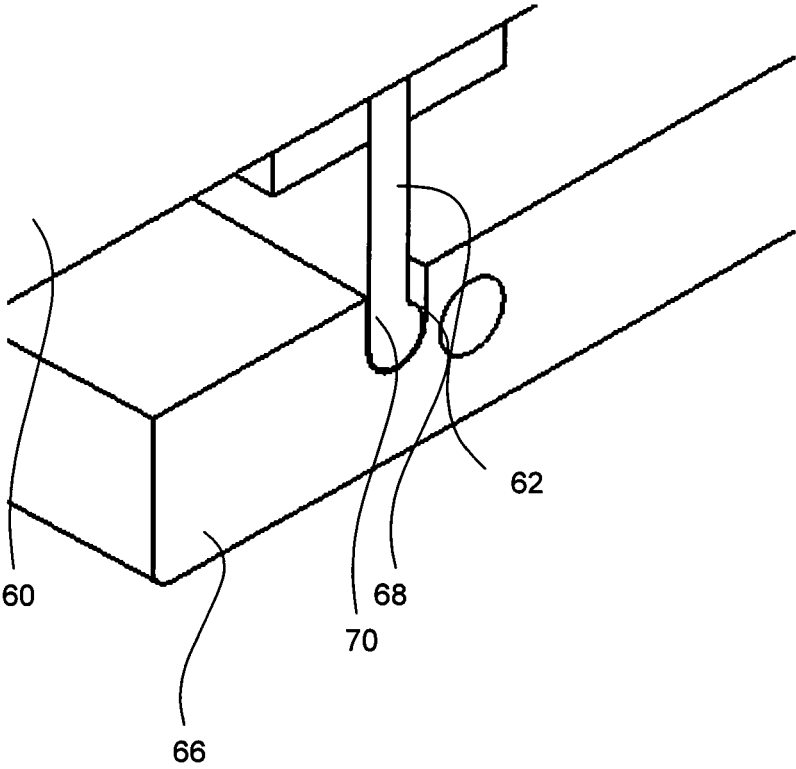


Fig. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 02 2096

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	----- JP 60 023107 A (CKD CORP) 5 February 1985 (1985-02-05) * figures 1-6 *	1,10	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 March 2008	Examiner Grentzius, Wim
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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