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(54) **DRIVE ASSEMBLIES**

ANTRIEBSVORRICHTUNGEN

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Description

[0001] The present invention relates to drive assemblies and is especially, but not exclusively, concerned with drive assemblies for use with gaming machines, sometimes referred to as fruit machines or amusement machines.

[0002] It is well known in Britain for gaming machines to include a number of adjacent reels marked around their circumferential surfaces with symbols such as fruit. In operation, the reels are caused to spin about a common axis by pulling on a handle or pressing a button. When the reels come to a standstill, the positions of the symbols on the different reels in relation to one or more predetermined lines decide whether or not a player has won.

[0003] Each of the reels is typically formed from a strip presenting the symbols and a drum-like support carrying the strip.

[0004] Current regulations in Spain, however, forbid the use of gaming machines in which symbol-presenting strips are carried by drum-like supports of a diameter exceeding 39mm - the conventional answer to the problem of "small drum diameter" has been to provide a magnifying system whereby the necessarily small symbols on special strips carried by the drum-like supports can be viewed more comfortably by a player.

[0005] An object of the present invention is to provide an alternative answer to the above-noted problem.

[0006] However, it is known from US-A-5108349 for a drive assembly to include a pair of pulleys and a sprocket wheel around which is wrapped an endless belt. A stepper motor drives the sprocket wheel which in turn drives the endless belt. Position detecting means straddles the endless belt for detecting the passing of a notch in the endless belt.

[0007] Moreover, it is known from ES-A-0505262 for a drive assembly to include a plurality of parallel and rotatable supports, a strip formed of a translucent plastics material and wrapped around the plurality of parallel and rotatable supports as a continuous loop, illumination means located within the continuous loop for back illumination of the translucent strip, and drive means for causing the translucent strip to be moved.

[0008] The present invention is characterised in that optical sensing means is also located within the continuous loop for sensing the passing of a tab which is stuck to or otherwise fixed to the inner surface of the strip and is thus moved as the strip is moved.

[0009] Preferably, there are three of the rotatable supports, none of which has a diameter exceeding 39mm, and the illumination means includes a plurality of illumination units.

[0010] In one arrangement, one or more or all of the rotatable supports is or are formed with at least one series of circumferentially spaced studs, which locate sequentially in at least one corresponding row of longitudinally spaced apertures formed in the strip.

[0011] In another arrangement, all of the rotatable supports are wrapped around by at least one endless belt, which is or are secured to only a corresponding edge portion of the strip.

[0012] Preferably, there are two of the endless belts each of which is flexible and is secured to a respective one of the edge portions of the strip in a manner allowing a central portion of the strip to remain unobstructed. The or at least one of the belts may be moulded of a plastics material and may present a groove for receiving the adjacent edge portion of the strip. One or more lugs may be provided in the groove(s) for locating with one or more complementary notches provided in the adjacent edge(s) of the strip. The or at least one of the belts may be capable of providing a friction drive or may present a series of ribs or recesses for non-slip engagement with complementary recesses or ribs presented by at least one of the rotatable supports. The ribs and recesses may be rounded or serrated and may be located immediately adjacent to one another or separated from one another. The tab may be formed on the inner surface of the or one of the belts as part of an optical device for providing information to electronic circuitry.

[0013] Preferably, a pair of parallel and non-rotatable supports are provided to which the rotatable supports are rotatably secured.

[0014] Preferably, the non-rotatable supports are formed as plates of generally triangular outline with the rotatable supports extending therebetween and being located at or near the corners thereof, but plates of other shapes would be possible.

[0015] In use of the preferred drive assembly, an electrical stepper motor (or other drive means) rotates only one of the rotatable supports, which thus positively moves the strip wrapped therearound whilst the other rotatable supports merely idle, in order to bring symbols presented by the strip into successive view through one or more windows (or other inspection means).

[0016] Two drive assemblies, in accordance with the present invention, will now be described in greater detail, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a schematic perspective view of a first drive assembly;

Figure 2 is a front view of one of the endless belts shown in Figure 1;

Figures 3 and 4 are enlarged cross-sectional views taken respectively along the lines III-III and IV-IV shown in Figure 2;

Figure 5 is a schematic perspective view of a second drive assembly viewed from the front; and

Figure 6 is a schematic perspective view of the second drive assembly viewed from the back.

[0017] The accompanying Figures 1 to 4 show a drive assembly 10 including: a strip 12 arranged in a continuous loop (part omitted for clarity); two symmetri-

cal endless belts 14 each secured to only a respective edge portion of the strip 12; and three parallel supports 16 formed as rotatable skeletal drums around which the belts 14, and thus the strip 12, are wrapped.

[0018] One of the supports 16 is driven by an electrical stepper motor 18 whose drive shaft 20 is connected by a belt 22 to a flanged disk 24. The shaft 20, belt 22 and disk 24 may all be toothed as in a conventional timing belt drive. The disk 24 is carried centrally of a driven shaft 26 whose ends carry half-flanged disks 28 rotatably mounted to respective adjacent side plates 30.

[0019] For convenience, both of the other supports 16 may be of the same construction and each of the three supports 16 may be integrally moulded of a plastics material.

[0020] All of the half-flanged disks 28 are similar, each including a drum-like peripheral surface 32 which itself includes a plurality of circumferentially-spaced three-sided grooves 34. In alternatives, as previously mentioned, the grooves 34 could be of different outline and spacing so that the peripheral surfaces 32 could have the appearance of, for example, toothed wheels or gear wheels.

[0021] The purpose of the grooves 34 is to enable a non-slip engagement with complementary longitudinally-spaced three-sided ribs 36 formed on the endless belts 14 (these are not clearly shown in the schematic perspective view in which rounded surfaces have been indicated by flat surfaces as in typical computer generated drawings).

[0022] Each of the endless belts 14 may be integrally moulded of a plastics material such as polyurethane. There may be an upper (outer) band 38 joined to a lower (inner) band 40 of greater width by a series of webs 42 to define a groove 44. There may be a lug 46 in the groove 44 for location with a complementary notch (not shown) provided in the adjacent edge of the strip 12. There may also be a tab 48 for use as part of a generally conventional optical device for providing information to electronics circuitry for driving the electrical stepper motor 18.

[0023] It will be appreciated that the strip 12, which may be a translucent plastics strip of generally conventional construction having symbols 50 printed or formed thereon, is a push fit within the grooves 44 of the endless belts 14 which are themselves located by engagement with and between the half-flanged disks 28.

[0024] The drive assembly 10 may be associated with one or more illumination units, located in lamp housing 52, and may be mounted in a gaming machine in whatever orientation is appropriate, by use of fixings 54.

[0025] The accompanying Figures 5 and 6 show a drive assembly 100 including: a strip 112 arranged in a continuous loop; a plurality of parallel and rotatable supports 116 around which the strip 112 is wrapped; and a pair of parallel and non-rotatable supports 130 to which

the rotatable supports 116 are rotatably secured.

[0026] The strip 112 may be a translucent plastics strip of generally conventional construction having symbols 160 printed or otherwise formed thereon. A row of apertures 162 may be formed near an edge of the strip 112 such that the apertures 162 are spaced apart along the length of the strip. A second row of similar apertures may be formed near the other edge of the strip.

[0027] For convenience, each of the rotatable supports 116 may be integrally moulded of a plastics material to the same shape, even though only one of the supports 116 is here to be driven.

[0028] A conventional toothed timing belt 122 may connect drive means such as an electrical stepper motor to a toothed disc 124 carried centrally of a driven shaft 126, which is in turn to drive the strip 112 wrapped therearound whilst the other rotatable supports 116 merely idle.

[0029] More particularly, the ends of each of the rotatable supports 116 are formed with respective discs 128. If the strip 112 is to have one row of the apertures 162, only one of the two driven discs 128 on the driven shaft 126 needs to be formed with a series of circumferentially spaced studs 164. If the strip has two rows of the apertures 162, both of the two driven discs are formed with a respective series of the studs 164. Alternatively, as appropriate, additional or all of the discs 128 may be provided with corresponding series of circumferentially spaced studs 164. It will be appreciated that, in use, the studs 164 sequentially engage with the apertures 162 to locate the strip correctly as the strip is driven.

[0030] The non-rotatable supports 130 may be of a rigid metal construction capable of being secured to a pair of end brackets 166 which are themselves capable of being secured through holes 167 to the body of a gaming machine.

[0031] Each of the non-rotatable supports 130 may be a plate of identical shape to the other, for convenience, even though not all of the mountings and other features are then utilised. Thus, each of the plates 130 may have an elongate cutout 168 and a pair of slotted offset tongues 170. However, a plastics lamp housing 152 may be a snap fit with just one of the cutouts 168 and a stepper motor may be adjustably secured to just one pair of the tongues 170. Preferably, the lamp housing is fixed to one of the plates 130, whereas the stepper motor is fixed to the other of the plates 130. Similarly, each of the plates 130 may have a hole 172 to which an optic unit 174 can be secured, although only one of holes 172 is utilised.

[0032] The lamp housing 152 may incorporate a plurality of individual lamp sections 176, the stepper motor may be associated with a pair of sprung loaded belt tensioners 179 (only one shown) for tensioning the belt 122, and the optic unit 174 may have a pair of arms 180 between which can pass an optic tab stuck or otherwise fixed to the inner surface of the strip 112. The

driven shaft 126 is mounted at opposed bearings 182 whereas the other two rotatable supports 116 are sprung mounted in bearings 184 - the springs keep the correct tension in the strip 112, but can be compressed to disengage the studs 164 from the apertures 162 and thus facilitate fitting/removal of the strip 112.

[0033] Finally, three struts 186 extend between opposed pair of holes 188 to provide rigidity and the correct spacing between the plates 130.

[0034] It will be appreciated that the components and functional features of the above-described two examples may be interchanged as appropriate.

Claims

1. A drive assembly (10; 100) comprising:

a plurality of parallel and rotatable supports (16; 116); a strip (12; 112) formed of a translucent plastics material and wrapped around the plurality of parallel and rotatable supports (16; 116) as a continuous loop; illumination means (52; 152) located within the continuous loop for back illumination of the translucent strip (12; 112); and drive means (18) for causing the translucent strip (12; 112) to be moved; characterised in that optical sensing means (174) is also located within the continuous loop for sensing the passing of a tab (48) which is stuck to or otherwise fixed to the inner surface of the strip and is thus moved as the strip is moved.

2. A drive assembly according to claim 1, characterised in that the illumination means includes a plurality of illumination units (176).

3. A drive assembly according to claim 1 or claim 2, characterised in that one or more or all of the rotatable supports (116) is or are formed with at least one series of circumferentially spaced studs (164) which locate sequentially in at least one corresponding row of longitudinally spaced apertures (162) in the strip (112).

4. A drive assembly according to claim 1 or claim 2, characterised in that all of the rotatable supports (16) are wrapped around by at least one endless belt (14) which is or are secured to only a corresponding edge portion of the strip (12).

5. A drive assembly according to claim 4, characterised in that there are two of the endless belts (14), each of which presents a groove (44) for receiving the corresponding edge portion of the strip (12).

6. A drive assembly according to claim 4 or claim 5, characterised in that the or at least one of the end-

less belts (14) presents a series of ribs (36) or recesses for non-slip engagement with complementary recesses (34) or ribs presented by at least one of the rotatable supports (16).

7. A drive assembly according to claim 6, characterised in that the tab (48) is formed on the inner surface of the or one of the belts (14).

8. A drive assembly according to any preceding claim, characterised in that a pair of parallel and non-rotatable supports (30; 130) are provided to which three of the parallel and rotatable supports (16; 116) are rotatably secured, with the non-rotatable supports (30; 130) being formed as plates of generally triangular outline and the three rotatable supports (16; 116) extending therebetween and being located at or near the corners thereof.

9. A drive assembly according to claim 8, characterised in that one of the rotatable supports (16; 116) is driven whereas the other two of the rotatable supports (16; 116) are sprung mounted in bearings (184).

Patentansprüche

1. Antriebsvorrichtung (10; 100) folgendes aufweisend:

mehrere parallele und drehbare Träger (16; 116), einem Streifen (12; 112), der aus einem transparenten Kunststoffmaterial geformt und als eine durchgängige Schleife um die mehreren parallelen und drehbaren Träger (16; 116) geführt ist, Beleuchtungseinrichtungen (52, 152) die in der durchgehenden Schleife zur Hintergrundbeleuchtung des transparenten Streifens (12; 112) angeordnet sind, und Antriebseinrichtungen (18), um den transparenten Streifen (12; 112) zu bewegen, dadurch gekennzeichnet, daß eine optische Meßeinrichtung (174) ebenfalls innerhalb der durchgehenden Schleife angeordnet ist, um das Passieren eines Vorsprung (48) zu messen, der an die Innenseite des Streifens geklemmt oder in sonstiger Weise an dieser befestigt ist und der folglich mit dem Streifen bewegt wird.

2. Antriebsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Beleuchtungseinrichtung mehrere Beleuchtungseinheiten (176) aufweist.

3. Antriebsvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß einer oder alle drehbaren Träger (116) mit mindestens einer Reihe von entlang dem Umfang beabstandet angeordneten

Stummeln (164) geformt ist, die nacheinander in mindestens eine entsprechende Reihe von in Längsrichtung beabstandeten Öffnungen (162) in dem Streifen (112) eingreifen.

4. Antriebsvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß alle drehbaren Träger (16) durch mindestens ein Endlosband (14) geführt werden, das nur an einem Randbereich des Streifens (12) befestigt ist.

5. Antriebsvorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß zwei von den Endlosbändern (14) vorgesehen sind, von denen jedes eine Ausnehmung (44) zur Aufnahme des entsprechenden Randbereichs des Streifens (12) aufweist.

6. Antriebsvorrichtung nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß das oder mindestens eines der Endlosbänder (14) eine Reihe von Rippen (36) oder Vertiefungen für einen nicht-rutschenden Eingriff mit entsprechenden Ausnehmungen (34) oder Rippen, die an mindestens einem der drehbaren Träger (16) vorgesehen sind, aufweist.

7. Antriebsvorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß der Vorsprung (48) an der Innenseite des oder eines der Bänder (14) geformt ist.

8. Antriebsvorrichtung nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß ein Paar von parallelen und nicht-drehbaren Trägern (30; 130) vorgesehen ist, an welchen drei parallele und drehbare Träger (16; 116) drehbar befestigt sind, wobei die nicht-drehbaren Träger (30; 130) als Platten mit einem im wesentlichen dreieckigen Umriß geformt sind und die drei drehbaren Träger (16; 116) zwischen diesen verlaufen und in oder nahe deren Ecken angeordnet sind.

9. Antriebsvorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß einer der drehbaren Träger (16; 116) angetrieben wird, während die anderen beiden drehbaren Träger (16; 116) in Lagern (184) federnd montiert sind.

Revendications

1. Ensemble d'entraînement (10 ; 100) comportant :

une pluralité de supports parallèles et rotatifs (16 ; 116) ; une bande (12 ; 112) formée d'une matière plastique translucide et enroulée autour de la pluralité de supports parallèles et rotatifs (16 ; 116) sous la forme d'une boucle continue ; des moyens d'éclairage (52 ; 152)

placés à l'intérieur de la boucle continue pour éclairer par l'arrière la bande translucide (12 ; 112) ; et des moyens d'entraînement (18) pour provoquer un déplacement de la bande translucide (12 ; 112) ;

caractérisé en ce qu'un moyen de détection optique (174) est également placé à l'intérieur de la boucle continue pour détecter le passage d'une patte (48) qui est collée ou autrement fixée à la surface intérieure de la bande et est ainsi déplacée en même temps que la bande.

2. Ensemble d'entraînement selon la revendication 1, caractérisé en ce que le moyen d'éclairage comprend plusieurs unités d'éclairage (176).

3. Ensemble d'entraînement selon la revendication 1 ou la revendication 2, caractérisé en ce qu'un ou plusieurs ou la totalité des supports rotatifs (116) est ou sont formés d'au moins une série d'ergots (164) espacés circonférentiellement qui se positionnent séquentiellement dans au moins une rangée correspondante d'ouvertures (162) espacées longitudinalement dans la bande (112).

4. Ensemble d'entraînement selon la revendication 1 ou la revendication 2, caractérisé en ce qu'au moins une courroie sans fin (14), qui est fixée à seulement une partie de bord correspondante de la bande (12), passe autour de la totalité des supports rotatifs (16).

5. Ensemble d'entraînement selon la revendication 4, caractérisé en ce qu'il y a deux courroies sans fin (14), présentant chacune une gorge (44) destinée à recevoir la partie de bord correspondante de la bande (12).

6. Ensemble d'entraînement selon la revendication 4 ou la revendication 5, caractérisé en ce que la courroie sans fin (14) présente une série de nervures (36) ou d'évidements destinés à réaliser une prise sans glissement avec des évidements (34) ou des nervures complémentaires présentés par au moins l'un des supports rotatifs (16).

7. Ensemble d'entraînement selon la revendication 6, caractérisé en ce que la patte (48) est formée sur la surface intérieure de la courroie (14) ou de l'une des courroies (14).

8. Ensemble d'entraînement selon l'une quelconque des revendications précédentes, caractérisé en ce que deux supports parallèles et non rotatifs (30 ; 130) sont prévus auxquels trois des supports parallèles et rotatifs (16 ; 116) sont reliés de façon à pouvoir tourner, les supports non rotatifs (30 ; 130)

étant réalisés sous la forme de plaques de contour globalement triangulaire et les trois supports rotatifs (16 ; 116) s'étendant entre eux et étant placés à leurs angles ou à proximité de leurs angles.

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9. Ensemble d'entraînement selon la revendication 8, caractérisé en ce que l'un des supports rotatifs (16 ; 116) est entraîné alors que les deux autres des supports rotatifs (16 ; 116) sont montés au moyen de ressorts dans des paliers (184).

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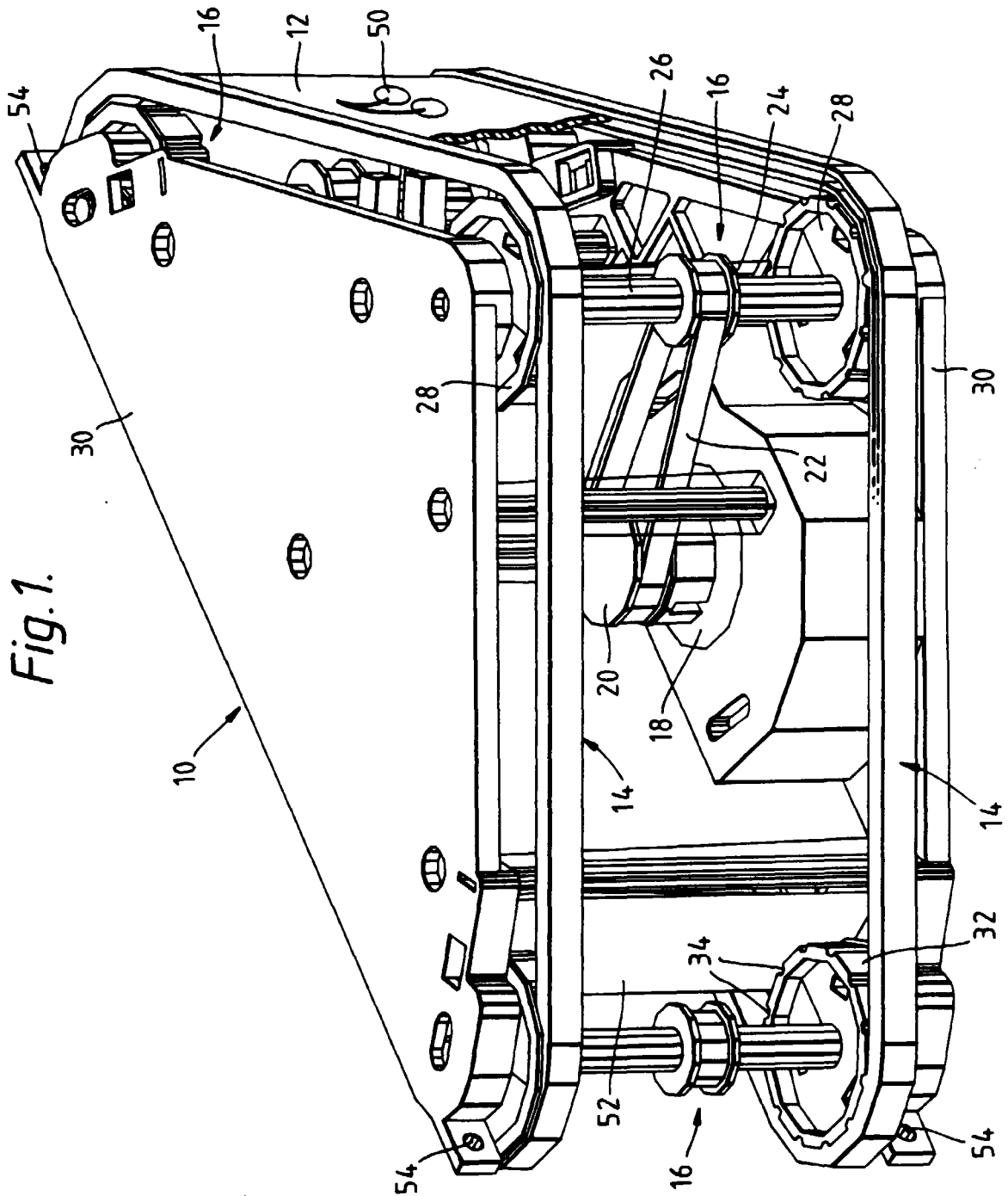


Fig.2.

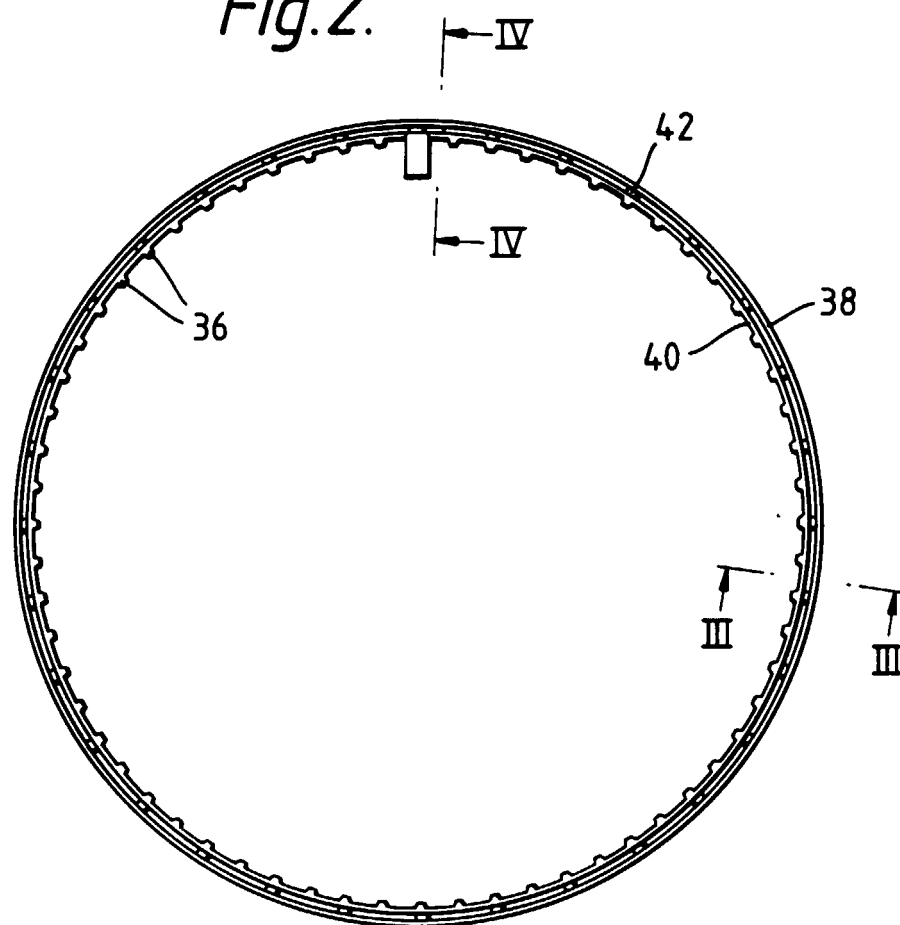


Fig.3.

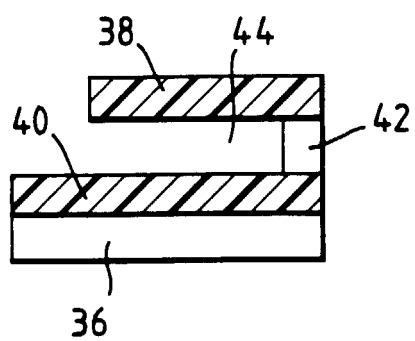


Fig.4.

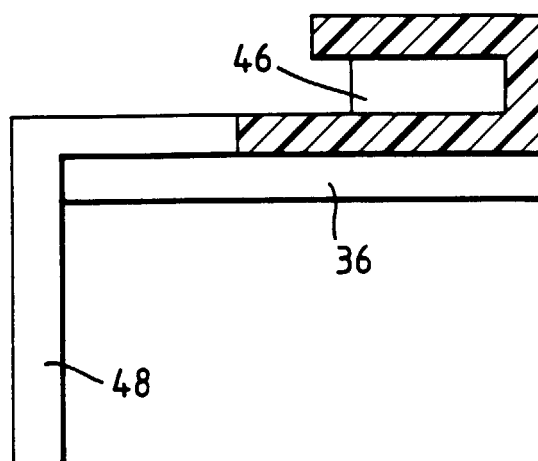


Fig. 5.

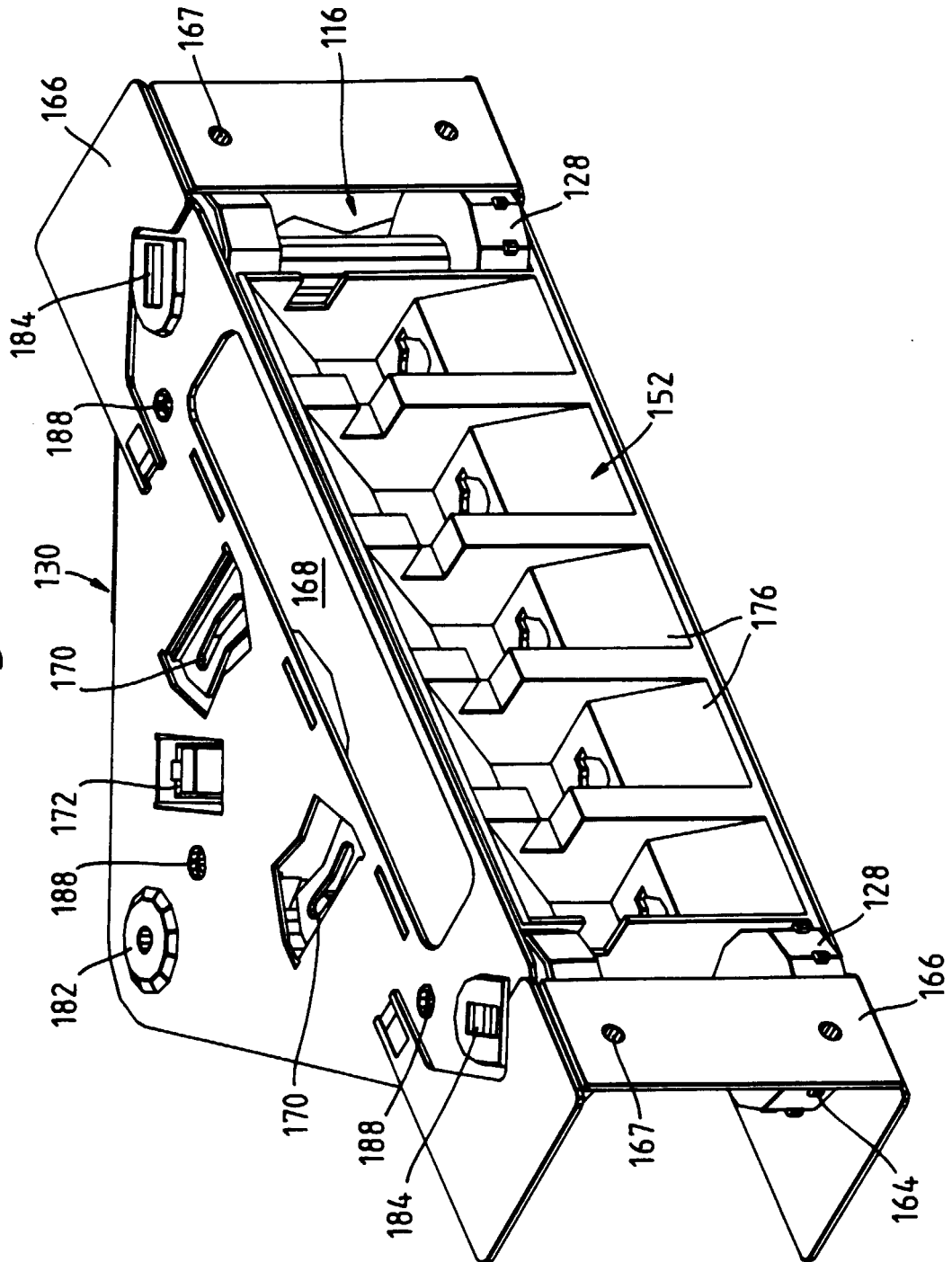


Fig.6.

