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- (73) Patenthaver: **Seuster KG, Tietmecker Weg 1, 58513 Lüdenscheid, Tyskland**
- (72) Opfinder: **Fischer, Jörg, Hofeswiese 54, 44269 Dortmund, Tyskland**
- (74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**
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The invention relates to a door according to the preamble to Claim 1.

These types of door in the form of roll-up doors or spiral doors are used to close room openings and thoroughfares. With simple roll-up doors the door leaf can be realised in the form of a sheet-like hanging that is wound up onto a winding shaft in the course of the opening movement. In view of the thermal insulation properties that are sought in some cases, for example when using corresponding doors in the area of cold-storage and deep-freezing rooms, but also in the area of heating chambers, for example for the vulcanisation of car tyres, it is a requirement for the door leaf to have thermally insulating properties. For this purpose a sheet-like hanging can be equipped with appropriate insulating elements. Corresponding doors are described, for example, in DE 20 2013 005 164.

In GB 1313208 a door is described in which a guide roller is fastened with the aid of a threaded bolt to a hinge that connects successive panels to one another flexibly. The position of the guide roller can be set here with the aid of a lever that extends perpendicularly to the bolt axis of the threaded bolt.

If a reliable aperture closure is also desired in addition to thermal separation, for example to guarantee sufficient security against break-ins, doors are used with which the door leaf is made up of rigid slats which are connected to one another flexibly relative to articulation axes running perpendicularly to the path of movement. The flexible connection can be realised in the form of so-called insertion profiles. In addition, or alternatively, hinge-like connections between the slats can also be provided. Doors of this type are described in DE 20 2006 017 619. In view of reducing noise pollution during an opening or closing movement of corresponding doors, it is generally desirable for a distance to be observed between successive windings of the multi-layer winding in the open position which enables contact-free unwinding of the multi-layer winding or contact-free winding up to form a multi-layer winding. An appropriate distance in the region of the open position can be ensured if the slats are equipped with guide elements on their lateral edges which, in the course of the opening movement, run into guide rails which can

be arranged in planes running approximately perpendicularly to the longitudinal axes of the slats and advantageously run helically. By adapting the dimensions of the guide elements to the guide rails, almost play-free guidance can be guaranteed, it being possible to ensure by means of the dimensions and by the course of the guide rails that contact-free winding up or
5 unwinding of the door leaf takes place.

Corresponding doors may have desired thermal properties or insulating properties if the slats are made at least partially of thermally insulating material, such as for example plastic, in particular in the form of a foam,
10 particularly preferably in the form of a PU foam. The thermally insulating material can be incorporated into stabilising sheets of material, such as for example shells made of a metallic material.

15 In addition to the thermal properties of the slats, the sealing with respect to the main structure also plays an important role in the thermal insulation. It has proven to be particularly problematic here to block the gap that occurs in the lintel area, i.e. at the upper edge of the door leaf in the closed position. Contact-type sealing in the form of a brush or loop made of
20 flexible material leads to drag marks on the slats if the slats drag along the seal in the course of the closing or opening movement. Contactless sealing on the main structure prevents damage to the slat, but in the closed position of the door leaf there remains a gap which assists the passage of heat. It has also already been proposed to provide sealing in the lintel area with the aid of
25 sealing arrangements attached to the slat which is the leading slat in an opening movement, i.e. the uppermost slat in the closed position. However, it has proven to be a problem here that corresponding sealing arrangements strike against slats of an adjacent winding layer when the door is wound up to form the multi-layer winding, and lead to undesirable development of noise
30 and possibly also to drag marks.

In view of these problems in the prior art, the object underlying the invention is to provide a door with which sealed closure can be ensured in the

lintel area without the slats being damaged and/or undesirable noises developing.

According to the invention, this object is achieved by the further
5 development of the known doors specified in the characterising part of Claim 1.

Since the guide element is received in the guide rails with a small
amount of play, the leading slat can be pivoted relative to the guide element
10 such that any sealing arrangement attached to the latter, with reliable
guidance of the opening movement at the same time, is displaced such that it
no longer comes into contact with the slats of an adjacent winding layer. On
the other hand, the slat can be pivoted relative to the guide element upon
reaching the closed position so that reliable sealing occurs. Overall, a sealed
15 opening closure can thus be realised in the lintel area, avoiding any damage
to individual slats and any undesired development of noise.

Within the context of a low-noise door leaf movement, it has proven to
be advantageous if at least one guide element has a guide roller attached to
20 the pivot lever that can turn relative to a roller axis running parallel to the pivot
axis.

If the seal arrangement on the slat which is the leading slat during the
opening movement protrudes into the outside space in the closed position of
25 the door leaf, a contact-free opening movement can be realised when the
guide element is displaced radially outwards relative to the leading slat in the
course of the opening movement by pivoting the pivot lever about the pivot
axis relative to the helical axis or the winding axis so that a leading edge of
the leading slat is displaced radially inwards relative to the helical axis. The
30 outwardly protruding sealing arrangement is then displaced with the leading
slat so that the sealing arrangement on the leading slat, which forms the start
of the innermost winding layer in the open state, can be a radial distance
away from the subsequent winding layer.

A reliable sealing closure is achieved with doors according to the invention because a sealing arrangement disposed on the leading slat and disposed between successive winding layers in its rest position in the open position can be displaced upon reaching the closed position by pivoting the
5 leading slat relative to guide elements guided in the guide rail on the leading slat about the pivot axis from the rest position into a sealing position in which it preferably rests against a fixed sealing device.

In order to ensure contact-free movement is has proven to be
10 advantageous if a pre-tensioning device urging the leading slat in a pre-specified direction relative to the pivot lever, in particular into the rest position of the seal arrangement, is provided. By the effect of the pre-tensioning device the positioning of the sealing arrangement in the rest position during the opening movement is ensured. In order to displace the sealing
15 arrangement into the sealing position a positioning device can be provided with which the leading slat can be displaced from the rest position into the sealing position against the pre-tensioning force of the pre-tensioning device upon reaching the closed position.

20 A corresponding positioning device can be realised particularly easily if it has a first positioning element attached to the leading slat, such as for example a ramp-shaped contact surface or a positioning roller, and a second positioning element, such as for example a positioning roller or a ramp-shaped contact surface, that comes into contact, fixed, with the first
25 positioning element upon reaching the closed position. By moving the positioning element fastened to the leading slat relative to the second positioning element, the desired displacement of the leading slat, and so also of the sealing arrangement, into the sealing position, can be realised. In order to guarantee the desired operational reliability of a door according to the
30 invention it may be advantageous if a stop arrangement that is fixed relative to the leading slat is provided to limit the pivoting movement of the pivot lever.

With doors according to the invention, as with conventional doors, provision is generally made such that at least two successive slats in the

direction of movement are connected flexibly to one another relative to articulation axes running parallel to their longitudinal axes. Here guide elements co-operating with the guide arrangement, in particular guide rollers, can be attached to the lateral edges of two, three or more, in particular of all of the successive slats, in order to move the door leaf.

By means of the pivoting movement of the leading slat relative to the pivot lever the leading slat can pass into the region of the guide rail. In order to guarantee disruption-free operation it can therefore be advantageous to make the leading slat shorter in its longitudinal direction than the following slats so that an axial distance is formed between the two lateral edges of the leading slat and the corresponding lateral edges of the subsequent slat. The leading slat is then disposed symmetrically relative to the following slat and may optionally be plunged between the guide rails disposed in the planes running perpendicularly to the longitudinal axes.

Finally, it is also advantageous with doors according to the invention if a drive device, such as for example a geared motor, preferably coupled to the shaft which is trailing during an opening movement, is provided to move the door leaf.

In the following the invention will be explained with reference to the drawings to which explicit reference will be made with regard to all details that are essential to the invention and that are not highlighted in any more detail in the description. The drawings show as follows:

- Fig. 1 a diagrammatic illustration of a door according to the invention in which the door leaf has almost reached the closed position;
- Fig. 2 a diagrammatic illustration according to Fig. 1 with the door leaf in the closed position;
- Fig. 3 a partial illustration of the door according to Figs. 1 and 2, and
- Fig. 4 a comparison of doors according to the prior art and doors according to the invention.

The door shown in the drawing consists essentially of a guide arrangement identified as a whole by 10 and a door leaf identified as a whole by 20. The guide arrangement 10 comprises a section 12 running in an approximately straight line and which extends approximately parallel to the lateral edges of the door leaf in the direction of gravity in the closed position of the door leaf and a helical section that adjoins the upper end of the section 12 running in a straight line, the section 12 running in a straight line 12 passing tangentially into the end of the helical section 14. The helical section 14 runs in a plane extending perpendicularly to the longitudinal axis of the slats 30, 40 of the door leaf. The door leaf 20 comprises a number of door leaf slats 30, 40 arranged one behind the other in a direction running perpendicularly to their longitudinal axes to which guide rollers 32 or 42 are respectively assigned with which a movement of the door leaf is guided between a closed position, in which the door leaf is received between the sections 12 running in a straight line of the guide rails disposed on either side of the door leaf, and an open position in which the door leaf is wound up in the helical section 14 of the guide rail to form a multi-layer winding. The slats 30, 40 are connected to one another pivotably with the aid of a hinge-like connection relative to pivot axes running parallel to the longitudinal axes of the slats.

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The guide roller 42 disposed on the leading slat 40 of the door leaf during an opening movement is fastened pivotably to the leading slat 40 relative to a pivot axis running parallel to the longitudinal axis of the slat 40 by a pivot lever 50. Furthermore, an outwardly protruding sealing strip 60 is attached to the leading edge of the leading slat 40 during an opening movement.

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As can be seen particularly clearly in Fig. 2, upon reaching the closed position the sealing strip 60 comes into contact with a hollow chamber seal 70 attached in the region of the lintel of the opening that is to be closed. The hollow chamber seal 70 is made as a short loop from an elastomer material. For this purpose, upon reaching the closed position the slat 40 is urged with the aid of a positioning device from the intermediate position shown in Fig. 1 into the sealing position shown in Fig. 2 against the pre-tensioning force of a

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pre-tensioning spring 62. The positioning device has a contact surface 80 attached to the inner boundary surface of the slat 40 which rises from the inside of the slat towards the edge of the slat 40 that is the leading edge during an opening movement and is designed to be wedge-shaped, and a
5 positioning roller 82 that is attached to the vertically running section 12 of the guide rail arrangement 10.

Upon reaching the closed position shown in Fig. 2 the contact surface 80 runs over the positioning roller 82 and urges the slat 40 that is the leading
10 slat during an opening movement outwards relative to the guide roller 42, at the same time the sealing strip 60 coming into contact with the hollow chamber seal 70. The pivoting movement of the slat 40 is made possible by the flexible coupling of the guide roller 42 by means of the pivot lever 50, a movement of the slat which is the leading slat during the opening movement
15 which has very little play being achieved by the guide roller 42 being accommodated in the guide rail 10.

Upon leaving the closed position shown in Fig. 2 the slat 40 which is the leading slat during an opening movement is urged with the aid of the pre-
20 tensioning spring 62 together with the sealing strip 60 relative to the guide roller 42 inwards towards the helical axis of the helical section 14 of the guide rail. It passes from the sealing position shown in Fig. 2c) via the intermediate position shown in Fig. 1c) into the rest position shown in Fig. 4b) into which it passes between successive windings of the door leaf wound up to form a
25 multi-layer winding, without touching slats of the adjacent windings of the door lead, as is observed in the known doors illustrated in Fig. 4a).

Despite the guide rollers 32 and 42 being guided within the helical guide rail section 14 with little play, the pivoting of the leading slat 40 relative
30 to the pivot lever 50 enables pivoting of the leading slat 40 relative to the subsequent slat 30 by an angle that is greater than the angle about which the slat 30 can be pivoted relative to the subsequent slat.

Overall, with a door according to the invention an opening or closing movement into the helical section 14 or out of the helical section 14 is made possible without it striking or coming into abrasive contact with the sealing strip 60 of the slats of an adjacent winding layer.

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As can be seen particularly clearly in Fig. 3, the slat 40 that is the leading slat during an opening movement has a smaller axial length than the subsequent slat 30. It can be pivoted by a pivoting movement about the pivot axis between the guide rail section disposed on the lateral edges of the slat.

- 10 In order to bridge the distance between the axial ends of the slats 30 and 40 a spacer 54 allowing the fitting of a hinge connection between these successive slats is provided. Moreover, by shortening the slat which is the leading slat during an opening movement, free space is provided for the pivot lever 50 for pivotable coupling of the guide roller 42 to the slat 40 that is the leading slat
- 15 during an opening movement. The pivoting movement of the pivot lever 50 is limited by a stop 64 that is attached to the slat 40. The slat 40 is thus prevented from pivoting too far inwards upon running into the helical section 14 of the guide rail 10. With a similar stop arrangement the slat can be prevented from pivoting too far outwards upon reaching the closed position.
- 20 Since the movement of the slat into the sealing position can not, however, be supported by a pre-tensioning device, one can refrain from providing a second stop arrangement. The second stop arrangement can be advantageous in order to limit the pivoting range mechanically if a spring breaks and to prevent collisions. Furthermore, the possibility is thus created of fixing the profile in
- 25 the pivoted state if a spring breaks in order to maintain the door function on an interim basis.

- In all of the embodiments of the invention a drive device can be provided that preferably acts on the slat which is trailing during an opening
- 30 movement and supports movement of the door leaf between the open position and the closed position.

The invention is not restricted to the embodiment illustrated by the drawings. It is also conceivable, for example, to provide an oval guide rail

with a number of guide rail windings instead of a helical guide rail. Needless to say it is also possible to attach the positioning roller to the slat 40 while the contact surface is disposed on the guide rail. Also conceivable are embodiments in which only individual slats are equipped with guide rollers.

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LIST OF REFERENCE NUMBERS

	10	guide arrangement
	12	section running in a straight line
5	14	helical section
	20	door leaf
	30	slat
	32	guide roller
	40	leading slat
10	42	guide roller of the leading slat
	50	pivot lever
	54	spacer
	60	sealing strip
	62	pre-tensioning spring
15	64	stop
	70	hollow chamber seal
	80	contact surface
	82	positioning element

Patentkrav

1. Port med et portblad (20), som med udgangspunkt i en lukkestilling i løbet af en åbningsbevægelse kan vikles op til en flerlaget vikling, og som har en
5 flerhed af lameller (30), som strækker sig med deres langsgående akser omtrent vinkelret på åbningsbevægelsens retning, sædvanligvis horisontalt, og en føringsindretning (10) til føring af åbningsbevægelsen med føringsskinner, som er rundtgående fortrinsvis på en spiralformet måde i området ved lamellernes (30) sidekanter, og som er anbragt i planer, som forløber omtrent vinkelret på lamellernes langsgående akser, i hvis radialt yderste vindinger der
10 kan indføres føringselementer (42), der er anbragt på sidekanter af den førende lamel (40) ved åbningsbevægelsen, hvor føringselementerne (42) på sidekanterne af den førende lamel (40) er fastgjort på den førende lamel (40) via svingarme (50) og er anbragt på lamellen (40), så de kan svinge i forhold til svingakser, der er parallelle med lamellens (40) langsgående akse, hvor
15 en tætningsanordning (60), som er anbragt på den førende lamel (40) og i åbningsstillingen befinder sig i en hvileposition mellem på hinanden følgende vikinagslag, og som ved opnåelse af lukkestillingen kan forskydes fra hvilepositionen til en tætningsposition ved at svinge den førende lamel (40) omkring
20 svingaksen i forhold til det i føringsskinnen (10) førte føringselement (42), i hvilken tætningsposition den fortrinsvis ligger an mod en stationær tætningsindretning (70).
2. Port ifølge krav 1, **kendetegnet ved, at** mindst et føringselement har en
25 føringsrulle (42), der er anbragt på svingarmen (50), så den kan rotere i forhold til en rulleakse, der forløber parallelt med svingaksen.
3. Port ifølge krav 1 eller 2, **kendetegnet ved, at** føringselementet (42) i løbet af åbningsbevægelsen forskydes radialt udad i forhold til den førende
30 lamel (40) ved at svinge svingarmen (50) omkring svingaksen i forhold til spiralaksen.
4. Port ifølge et af de foregående krav, **kendetegnet ved** en forspændingsindretning (62), som tvinger den førende lamel (40) ind i en forudbestemt retning i forhold til svingarmen (50), især ind i tætningsanordningens (60) hvile-
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position.

5. Port ifølge krav 4, **kendetegnet ved** en positioneringsindretning, med hvilken den førende lamel (40) kan forskydes fra hvilepositionen til tætningspositionen mod forspændingskraften fra forspændingsindretningen, når lukkestillingen er nået.
6. Port ifølge krav 5, **kendetegnet ved, at** positioneringsindretningen (80, 82) har et første positioneringselement (82), som er anbragt på den førende lamel (40), såsom en rampeformet anlægsflade (82) eller en positioneringsrulle (82), og et andet positioneringselement (82), som kommer i anlæg mod det første positioneringselement (80), når lukkestillingen er nået, såsom en positioneringsrulle (82) eller en rampeformet anlægsflade.
7. Port ifølge et af de foregående krav, **kendetegnet ved** en stopanordning (64), der er stationær i forhold til den førende lamel, til begrænsning af svingarmens (50) svingbevægelse.
8. Port ifølge et af de foregående krav, **kendetegnet ved, at** mindst to lameller (30, 40), der følger efter hinanden i bevægelsesretningen i forhold til ledakser, der forløber parallelt med deres langsgående akser, er ledmæssigt forbundet med hinanden.
9. Port ifølge et af de foregående krav, **kendetegnet ved, at** der på sidekanterne af to, tre eller flere på hinanden følgende lameller (30, 40) er anbragt føringselementer, der samvirker med føringsindretningen (10), især føringsruller (32, 42), til føring af portbladbevægelsen.
10. Port ifølge et af de foregående krav, **kendetegnet ved, at** den førende lamel er udført kortere i den langsgående retning end de følgende lameller, og der mellem de to kanter af den førende lamel og de tilsvarende sidekanter af de efterfølgende lameller er dannet en aksial afstand.

11. Port ifølge et af de foregående krav, **kendetegnet ved** en drivindretning til bevægelse af portbladet, hvilken drivindretning fortrinsvis er koblet til den efterfølgende lamel ved en åbningsbevægelse.

Fig. 1a

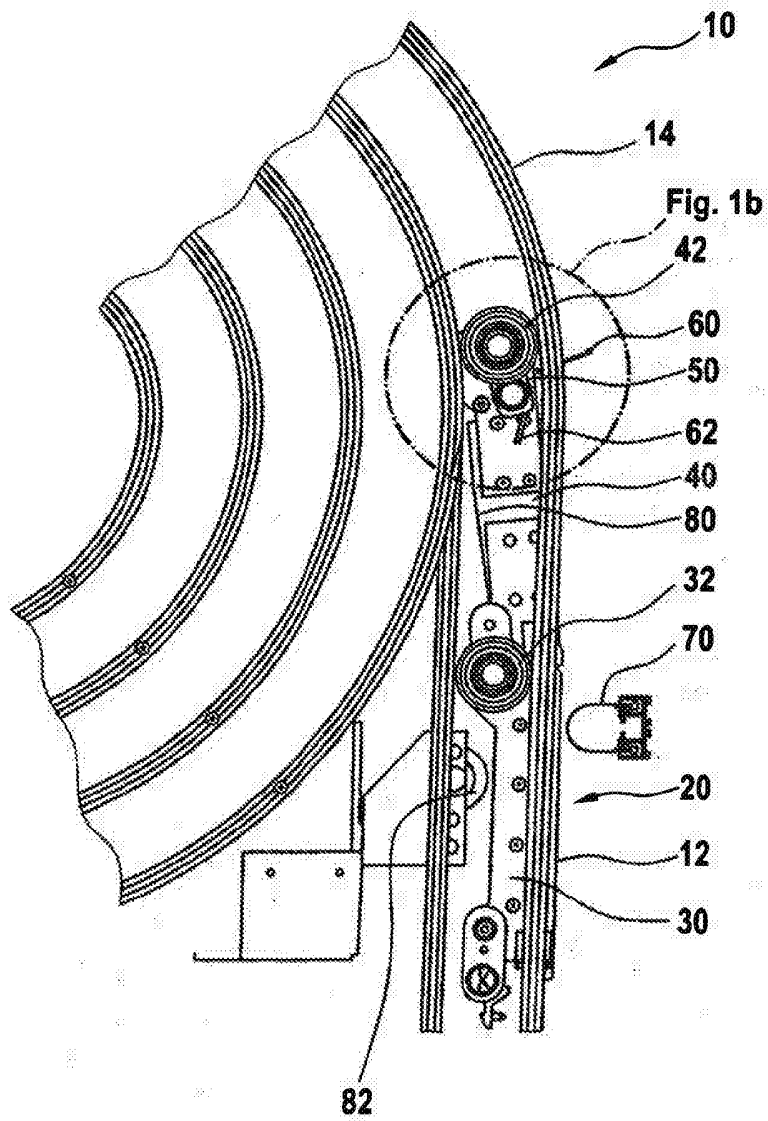


Fig. 1b

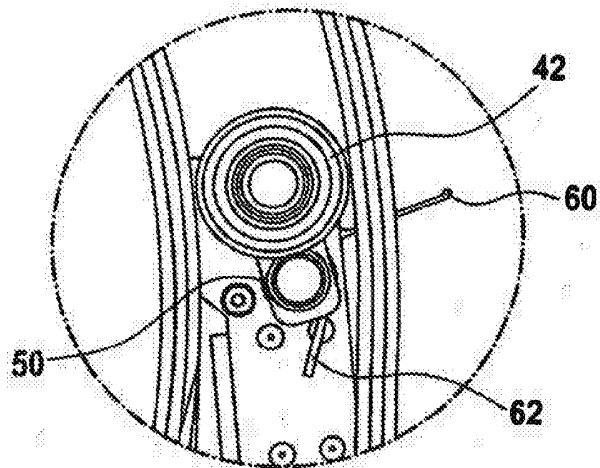


Fig. 1c

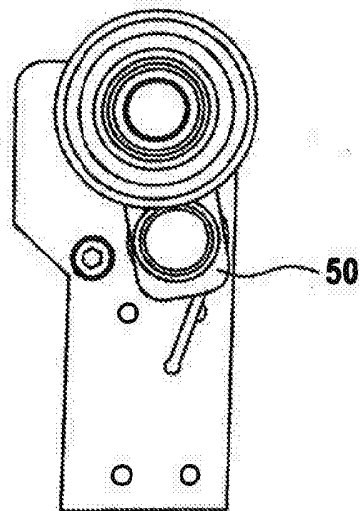


Fig. 2a

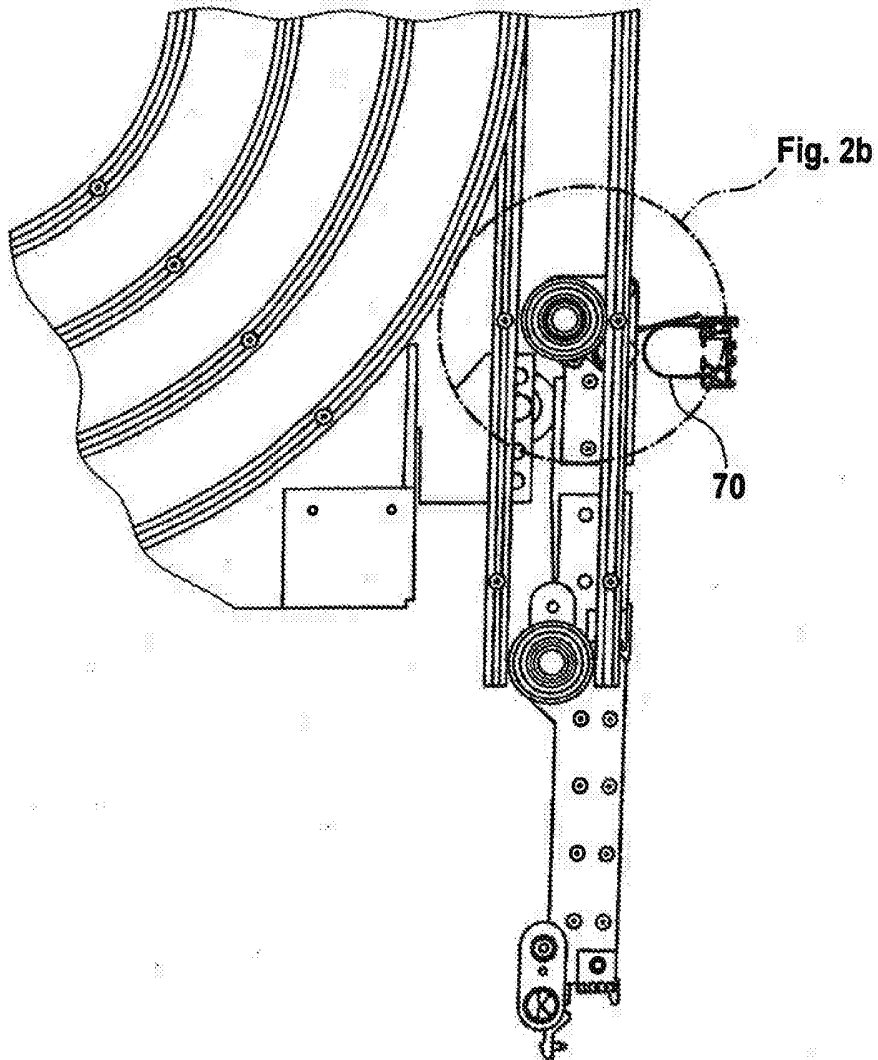


Fig. 2b

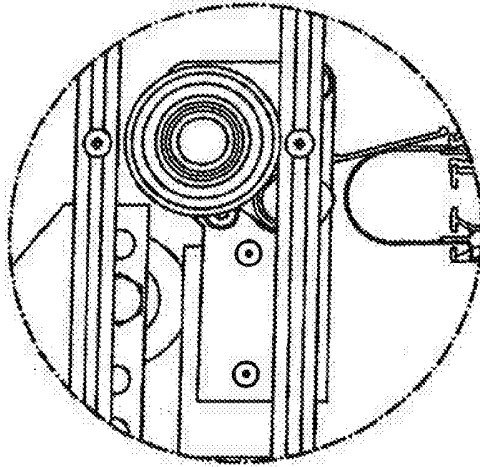


Fig. 2c

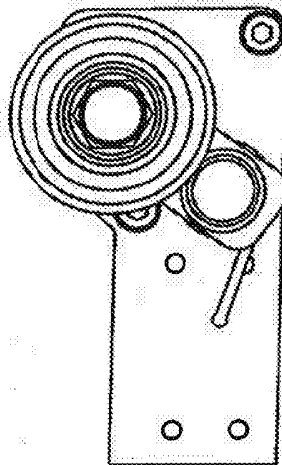


Fig. 3

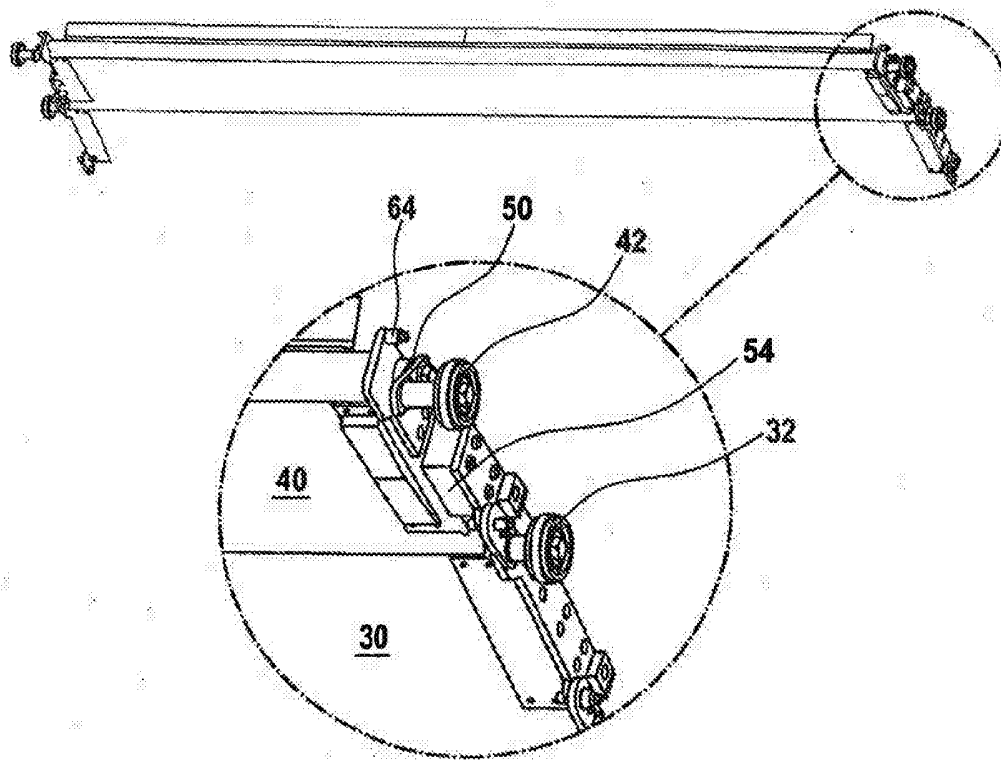


Fig. 4a
OLD

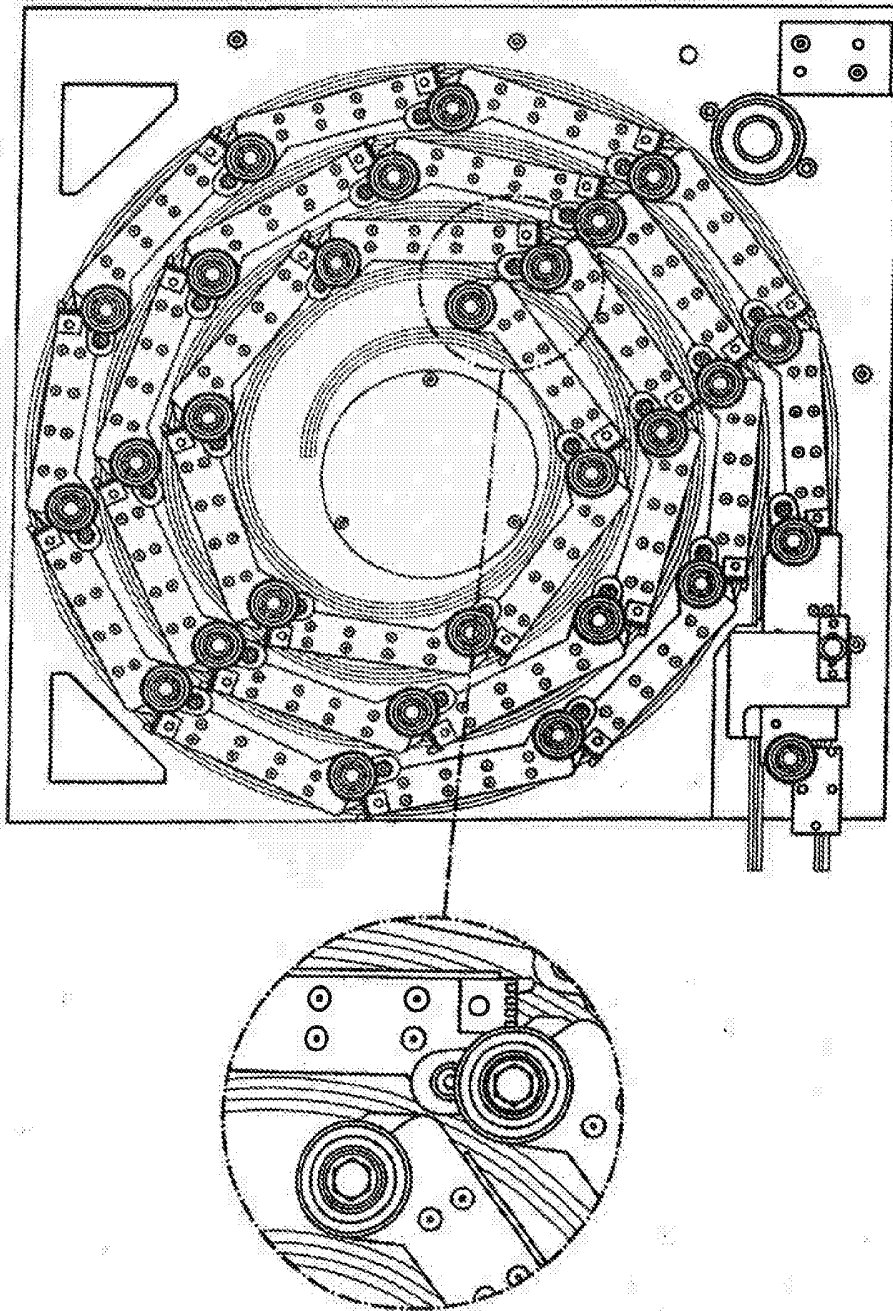


Fig. 4b
NEW

