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(54) **A ROLLER SHUTTER**

ROLLADEN

VOLET A ROULEAUX

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Description

[0001] The present invention relates to a roller shutter for screening an opening, in particular the light-admitting area of a sash for a window mounted in an inclined roof surface, which opening is limited by a first pair of mutually parallel members and a second pair of mutually parallel members which are perpendicular to said first pair, comprising a length of a plurality of slats running parallel to the first pair of members, said slats being mutually articulated at their interspaces by means of hinge joints, a rotatable spring-loaded roller embedded in one member of the first pair for accommodating the slats in a rolled-up condition of the roller shut, a guide rail mounted at each second pair member for guiding the slat ends during rolling up and down the slat length, and a drive mechanism for movement of the slat length in the unrolling direction and comprising a drive shaft disposed parallel to the roller for operating a slat driving member positioned at each guide rail, said slat driving member being provided with carriers for driving engagement with the slat length at the interspaces between the slats.

[0002] The rolling down of vertically situated roller shutters is normally effected in that the slat length moves by means of the gravity in the direction of the bottom of the opening during simultaneous successive unrolling of the slats from the roller. The unrolling may, however, entail some problems, especially in the beginning of the rolling down operation where only few slats are rolled out from the roller and thus form part of the unrolling force. This also applies to roof windows where the friction between the guide rails and the slat ends can be so large that it surpasses the gravity component in the rolling down direction.

[0003] As a solution to this problem conventional roller shutters of the above-mentioned kind, comprising a drive mechanism arranged close to the roller with the object of so to speak pushing the slat length in the unrolling direction, are known from EP 0 145 628, EP 0 317 461 and DE 40 00 908.

[0004] This solution requires, however, that demands are made to the design of the slats and/or that modifications of the very slats have to be made which, besides an increase in the costs of production, implies that existing roller shutters cannot, or only after considerable adjustments, be provided with such a drive mechanism.

[0005] A further drawback of this unrolling method is that a good driving engagement is dependant on the positioning of the drive mechanism.

[0006] US-A-4 760 873 discloses a roller shutter disposed in a frame and comprising a driving mechanism for the slats constituted by a drive shaft and a cam wheel. The teeth of the cam wheel engage mechanical devices (dogs) attached to the slats and suitable for gripping said teeth.

[0007] Therefore, it is the object of the invention to procure a roller shutter of the initially stated kind where the slats may remain intact and where a safe engage-

ment is still obtained between the drive mechanism and the slat length.

[0008] This object is achieved by a roller shutter as defined in the independent claim.

[0009] Roller shutters whose slats are mutually articulated by means of hinge joints in the form of flexible bands are known per se from EP 0 410 364, GB 2 246 805 and GB 2 113 749. Such a design of the hinge joints provides a relatively noiseless operation of the roller shutter and no supplementary sealing at the hinge joints is required as may be the case by roller shutters with conventional hinge joints. The drive mechanism which contributes to the unrolling movement has in these design further the function that it keeps the slat length extended and in the latter document, comprises e.g. an operating device in the form of a handle by which the slat length is drawn out by surmounting the force from the spring-loaded roller. The unrolling of the roller shutter by drawing the slat length in this way is thus well-known and has the advantage that the hinge joints are kept stretched thus preventing that the slats are placed edgewise and the movement is blocked.

[0010] However, such a solution requires a rather extensive cord arrangement which may be a considerable drawback as regards limited place on the site of incorporation which is the case with e.g. roller shutters used in connection with roof windows and/or a positioning of the drive mechanism or its operating device which is not compatible with the need for a compact design of the roller shutter.

[0011] By the present invention, the use of the interspaces between the slats in the way defined and combined with the design of the hinge joints as flexible bands, the desirable safe engagement between the carriers of the driving device and the slat length is obtained without using any price-raising reinforcement or insert elements and at the same time a larger freedom of choice with respect to positioning of the drive mechanism and an essentially blockage-free movement of the drive mechanism are obtained.

[0012] In an embodiment of the invention, the projections are formed by teeth of a gearwheel with a circular pitch corresponding to the distance between adjacent slat interspaces, the gearwheel having between the teeth a surface form substantially complementary to the surface form of the slat sides facing the gearwheel.

[0013] Thereby, it is possible to secure the engagement between the drive mechanism and the slat length, irrespective of the form of the slats.

[0014] In an alternative embodiment, the drive member comprises a flexible band in engagement with at least two shafts parallel to the slats, one of said shafts being the driving shaft of the driving mechanism, and the projections are formed by pins projecting from the band.

[0015] In order to increase the flexibility when building in the roller shutter, the drive mechanism can be arranged either on the side of the slats turned away from

or on the one facing the light-admitting area.

[0016] With a view to further improving the engagement between the drive device and the slat length, the side of the slats placed opposite in relation to the drive mechanism can preferably be provided with an abutment which cooperates with the carriers of the driving device and retains the engagement of the slats with the driving device.

[0017] In an advantageous embodiment an inner end slat of the length of slats is connected with the roller by a hinge joint having an extended width with respect to the width of the hinge joints between the remaining slats, said latter width being substantially uniform. As a result of the extended width of the hinge joint closest to the roller rolling-up of an unrolled shutter by manual force becomes essentially more difficult, whereby an improved safety against burglary and other forms of unauthorized access through a roller shutter is obtained.

[0018] The invention will in the following be explained in more detail by means of an example of an embodiment and with reference to the schematic drawings, where

Fig. 1 shows a perspective view of a roller shutter according to the invention mounted on a roof window,

Fig. 2 is also a perspective view of a section of the left top corner of the roller shutter in Fig. 1,

Fig. 3 is a sectional view along the line III-III in Fig. 1,

Fig. 4 is a view corresponding to Fig. 2, however, of the right top corner of the roller shutter and with another placing of the drive mechanism for the roller shutter according to the invention, and

Fig. 5 is a sectional view of an alternative embodiment for the roller shutter according to the invention.

[0019] Fig. 1 shows a roof window of a per se conventional design with a window frame 1 comprising a top member, a bottom member 1a and two side members 1b. A window sash 2 carrying a glass pane 3 in a top and a bottom member forming the members in a first pair, and two side members 2b forming the members in a second pair which together define a light-admitting area to be screened, is articulated with the window frame 1 either at the top member of the window frame and thus of the sash or at a centre line for the sash.

[0020] A roller shutter 4 according to the invention is mounted above the window. In the Figure, the roller shutter 4 is shown in partly rolled out condition where a number of slats 5 screen a part of the light-admitting area of the sash 2. The slats 5 extend parallel with the top and bottom members and are connected with each other at their mutual interspaces 6 at the longitudinal side edges. At the ends, the slats 5 are guided in guide rails 7 extending along the side members 1b, 2b of the frame and the sash.

[0021] A case 8 for the roller shutter with side delimitations in the form of end plates 9 is positioned above

in the window. In Fig. 2, the upper part of the case 8 is removed. As shown in Fig. 3, the case contains a spring-loaded roller 10 for keeping the slats 5 in their rolled up condition, and a drive mechanism 11 effecting the movement of the slats 5 in the unrolling direction. In this Figure, only the outer slats 5 on the roller 10 are shown, and the non-shown remaining slats 5 are positioned in spiral and the inner slat is fastened to the roller 10 either directly or by means of an extra-wide hinge joint. From these figures further appears that at their interspaces 6, the slats 5 are connected with each other by means of hinge joints, here constituted of flexible bands 12 with a cross-sectional form of a dumbbell where the bands 12 at each of their side edges are inserted in longitudinal and in cross-section cylindrical grooves 5a in the slats 5. The hinge joints can, however, also be designed in other ways, e.g. as a piano hinge. The slats 5 are constructed as thin metal shells of e.g. aluminium with a foam-filled cavity.

[0022] The drive mechanism 11 comprises a drive shaft 13 which in each end is embedded for rotation on the end plates 9 of the roller shutter case 8 and can be driven either manually or by an electric motor. The drive mechanism 11 further comprises a driving device which in the shown embodiment is a gearwheel 14 mounted in a rotationally locked manner on the drive shaft 13 and has a number of carriers in the form of teeth 15 positioned with mutual distances corresponding to the distance between adjacent slat interspaces 6. As is most obvious from Fig. 3, the gearwheel 14 between the teeth 15 has an essentially concave form in order to fit the convex top side of the slats 5. On the side of the slats 5 opposite in relation to the drive mechanism 11 in the roller shutter case 8, there is designed an abutment in the form of a ramp 16 which contributes to retaining the teeth 15 in engagement with the slat interspaces 6 when the slats 5 are unrolled from the roller 10.

[0023] As shown in Fig. 4, the drive mechanism 21 can be positioned on the opposite side of the slats 5, i. e. on the side facing the light-admitting area. The gearwheel 24 has in this design a convex, essentially partly cylindrical form between the teeth 25 and thus fits the concave underside of the slats. The abutment has here the form of a separate block 26 which can be fastened to the top part of the case 8 or on the guide rail. Otherwise, the function is the same as described in connection with the above described embodiment, however, only the exterior slats are shown and the remaining slats are symbolized by the cylinder face 27.

[0024] An alternative design of the drive mechanism 31 is shown in Fig. 5 where the driving device is constituted of a flexible band 34 entwining two rotationally embedded shafts 33 and 37 one of which is the drive shaft 33 of the drive mechanism. In distances corresponding to the slat interspaces 6, the band 34 has outwardly projecting pins 35 which, in the same way as the gearwheels in the above described embodiments, engage the slat length at its interspaces 6, the engagement be-

tween the pins 35 and the slat interspaces 6 being secured by the guide rails 7. The band 34 and the shafts 33 and 37 can of course with minor modifications be placed on the other side of the slat length and in that case, an abutment can be provided on the opposite side of the slat length in order to secure the engagement between the pins and the slat interspaces.

[0025] In cases with wide and long roller shutters, it can be necessary to strengthen the side edges of the slats opposite the engagement of the driving device with the slats by removing the hinge joints at this place and insert hard cylindrical inserts in the grooves 5a.

Claims

1. A roller shutter (4) for screening an opening, in particular the light-admitting area of a sash (2) for a window mounted in an inclined roof surface, which opening is limited by a first pair of mutually parallel members and a second pair of mutually parallel members which are perpendicular to said first pair, comprising
 - a length of a plurality of slats (5) running parallel to the first pair of members, said slats being mutually articulated at their interspaces (6) by means of hinge joints (12),
 - a rotatable spring-loaded roller (10) embedded in one member of the first pair for accommodating the slats (5) in a rolled-up condition of the roller shutter (4),
 - a guide rail (7) mounted at each second pair member for guiding the slat ends (5) during rolling up and down the slat length, and
 - a drive mechanism (11, 21, 31) for movement of the slat length in the unrolling direction and comprising a drive shaft (13, 33) disposed parallel to the roller (10) for operating a slat driving member (14, 24, 34) positioned at each guide rail (7), said slat driving member being provided with carriers (15, 25, 35) for driving engagement with the slat length at the interspaces (6) between the slats (5), the hinge joints between the slats (5) being formed by flexible bands (12), the carriers (15, 25, 35) being constituted by projections from said driving member (14, 24, 34), said projections engaging said flexible bands (12) in each interspace between successive slats (5).
2. A roller shutter according to claim 1, **characterized in that** said projections are formed by teeth (15, 25) of a gearwheel (14, 24) with a circular pitch corresponding to the distance between adjacent slat interspaces (6), the gearwheel (14, 24) 35 having between the teeth (15, 25) a surface form substantially complementary to the surface form of the slat sides (5) facing the gearwheel (14, 24).
3. A roller shutter according to claim 1, **characterized in that** said drive member comprises a flexible belt member (34) in engagement with at least two shafts (33, 37) parallel to the slats, one of said shafts being the driving shaft (33) of the driving mechanism, and that said projections are formed by pins (35) projecting from the belt member.
4. A roller shutter according to claim 1, 2, or 3, **characterized in that** the drive mechanism (11) is situated on the side of the slats (5) intended to face away from the light-admitting area.
5. A roller shutter according to claim 1, 2 or 3, **characterized in that** the drive mechanism (21, 31) is situated on the side of the slats intended to face the light-admitting aperture.
6. A roller shutter according to claims 2 and 4, **characterized in that** said surface form of the gearwheel (14) is substantially concave to match a substantially convex surface form of said slat sides.
7. A roller shutter according to claims 2 and 5, **characterized in that** said surface form of the gearwheel (24) is substantially convex to match a substantially concave surface form of said slat sides.
8. A roller shutter according to any of the preceding claims, **characterized in that** an abutment (16, 26) is arranged on the side of the slats (5) placed opposite in relation to the driving mechanism (11, 21, 31) and cooperating with the carriers (15, 25, 35) of the driving member to ensure the engagement of the slats (5) with the driving member.
9. A roller shutter according to any of the preceding claims, **characterized in that** an inner end slat of said length of a plurality of slats (5) is connected with said roller (10) by a hinge joint having an extended width with respect to the width of the hinge joints between the remaining slats, said latter width being substantially uniform.

Patentansprüche

1. Rolladen (4) zum Abschirmen einer Öffnung, insbesondere der Lichtfläche eines Flügelrahmens (2) für ein in eine schräge Dachfläche eingebautes Fenster, welche Öffnung von einem ersten Paar untereinander paralleler Elemente und einem zu erwähnten ersten Paar rechtwinkelig verlaufenden zweiten Paar untereinander paralleler Elemente abgegrenzt ist, umfassend
 - eine Bahn einer Mehrzahl zum ersten Paar von Elementen parallel verlaufender Lamellen (5), die an ihren Zwischenräumen (6) mittels Scharnier-

verbindungen (12) gegenseitig angelenkt sind,

eine in einem Element des ersten Paares von Elementen eingebettete rotierbare federbelastete Rolle (10) zur Aufnahme der Lamellen (5) in einer aufgerollten Stellung des Rolladens (4),

eine an jedem Element des zweiten Paares montierte Führungsschiene (7) zum Leiten der Lamellenenden (5) während des Auf- und Abrollens der Lamellenbahn, und

einen Antriebsmechanismus (11, 21, 31) zum Bewegen der Lamellenbahn in der Abrollrichtung und umfassend eine parallel zur Rolle (10) angeordnete Antriebswelle (13, 33) zum Aktivieren eines an jeder Führungsschiene (7) vorhandenen Lamellen-Antriebelements (14, 24, 34), welches Lamellen-Antriebselement mit Mitnehmern (15, 25, 35) zum antreibenden Eingriff mit der Lamellenbahn bei den Zwischenräumen (6) zwischen den Lamellen (5) vorgesehen ist, wobei die Scharnierverbindungen zwischen den Lamellen (5) durch flexible Bänder (12) gebildet werden, und die Mitnehmer (15, 25, 35) aus Vorsprüngen aus dem Antriebselement (14, 24, 34) bestehen, welche Vorsprünge in erwähnte flexible Bänder (12) in jeden Zwischenraum zwischen aufeinanderfolgenden Lamellen (5) eingreifen.

2. Rolladen nach Anspruch 1, **dadurch gekennzeichnet, dass** erwähnte Vorsprünge durch Zähne (15, 25) eines Zahnrades (14, 24) mit einem kreisförmigen Abstand entsprechend dem Abstand zwischen angrenzenden Lamellen-Zwischenräumen (6) gebildet werden, und dass das Zahnrad (14, 24) zwischen den Zähnen (15, 25) eine Form aufweist, die im wesentlichen der dem Zahnrad (14, 24) zugewandten Seite der Lamellen (5) entspricht.

3. Rolladen nach Anspruch 1, **dadurch gekennzeichnet, dass** das Antriebselement einen flexiblen Riemen (34) umfasst, der mit zumindest zwei parallel zu den Lamellen verlaufenden Wellen (33, 37) in Verbindung steht, wobei die eine Welle die Antriebswelle (33) des Antriebsmechanismus ist, und dass erwähnte Vorsprünge durch aus dem Riemen hervorstehende Zapfen (35) gebildet werden.

4. Rolladen nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** der Antriebsmechanismus (11) auf der von der Lichtfläche abgewandten Seite der Lamellen (5) angeordnet ist.

5. Rolladen nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** der Antriebsmechanismus (21, 31) auf der von der Lichtöffnung zugewandten Seite der Lamellen angeordnet ist.

6. Rolladen nach Anspruch 2 und 4, **dadurch gekennzeichnet, dass** die Oberflächenform des

Zahnrads (14) im wesentlichen konkav ist zwecks Anpassen an eine im wesentliche konvexe Oberflächenform der Lamellenseiten.

5 7. Rolladen nach Anspruch 2 und 5, **dadurch gekennzeichnet, dass** die Oberflächenform des Zahnrads (24) im wesentlichen konvex ist zwecks Anpassen an eine im wesentlichen konkave Oberflächenform der Lamellenseiten.

10 8. Rolladen nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** auf der im Verhältnis zum Antriebsmechanismus (11, 21, 31) entgegengesetzten Seite der Lamellen (5) ein Anschlag (16, 26) vorgesehen ist, der mit den Mitnehmern (15, 25, 35) des Antriebselements in bezug auf den Eingriff der Lamellen (5) mit dem Antriebsorgan zusammenarbeitet.

20 9. Rolladen nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** von erwähnter Bahn einer Mehrzahl von Lamellen (5) eine innere Endlamelle über eine Scharnierverbindung mit der Rolle (10) verbunden ist, welche Scharnierverbindung gegenüber der im wesentlichen gleichen Breite der Scharnierverbindungen zwischen den übrigen Lamellen eine erweiterte Breite aufweist.

30 Revendications

1. Volet à rouleaux (4) pour munir une embrasure d'un écran, en particulier la largeur du clair de vitre de l'ouvrant (2) d'une fenêtre installée dans une surface de toit incliné, ladite embrasure étant limitée par une première paire de membres mutuellement parallèles et une deuxième paire de membres mutuellement parallèles qui sont perpendiculaires à ladite première paire, comprenant

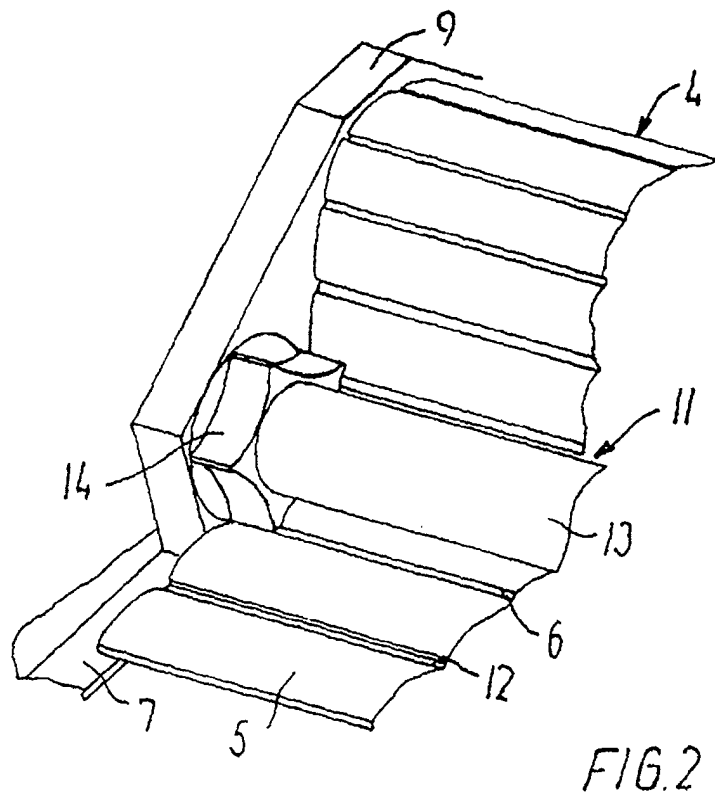
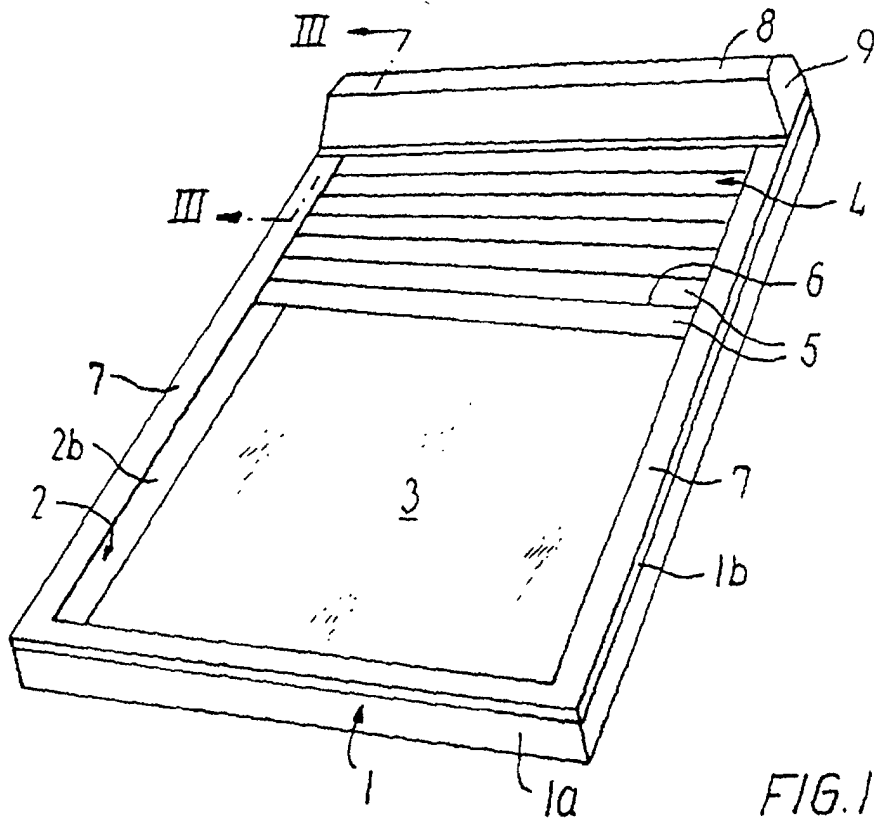
un tablier d'une pluralité de lames (5) qui sont parallèles à la première paire de membres, lesdites lames étant mutuellement articulées à leurs espaces (6) par le moyen de charnières (12),

un enrouleur rotatif (10) à charge par ressort enchâssé dans un membre de la première paire en vue de contenir les lames (5) dans une position enroulée du volet à rouleaux (4),

une glissière de guidage (7) installée sur chaque membre de la deuxième paire ayant pour rôle de guider les extrémités des lames (5) lors de l'enroulement et du déroulement du tablier de lames, et

un dispositif de commande (11, 21, 31) pour mouvement du tablier de lames dans la direction de déroulement et comprenant un arbre de transmission (13, 33) placé parallèlement à l'enrouleur (10) destiné à l'opération d'un membre de commande (14, 24, 34) de lames posé près de chaque glissière de guidage (7), ledit membre de commande de la-

- mes étant muni d'organes d'entraînement (15, 25, 35) pour permettre l'engrenage motrice avec le tablier de lames aux espaces (6) entre les lames (5), les charnières entre les lames (5) étant formées par des bandes flexibles (12), les organes d'entraînement (15, 25, 35) étant constitués d'avances dudit membre de commande (14, 24, 34), lesdites avances engrenant avec lesdites bandes flexibles (12) dans chaque espace entre les lamés successives (5).
2. Volet à rouleaux selon la revendication 1, **caractérisé en ce que** lesdites avances sont constituées par les dents (15, 25) d'une roue dentée (14, 24) ayant un pas circulaire correspondant à la distance entre les espaces (6) des lames adjacentes, et **en ce que** la roue dentée (14, 24) a une forme de surface entre les dents (15, 25) essentiellement complémentaire à la forme de surface des côtés de lames face à la roue dentée (14, 24).
3. Volet à rouleaux selon la revendication 1, **caractérisé en ce que** dudit membre de commande comprend un élément flexible à chenilles (34) en engrenement avec au moins deux arbres (33, 37) parallèles aux lames, un desdits arbres étant l'arbre de commande (33) du mécanisme de commande, et que lesdites avances sont formées par des éminences (35) saillant de l'élément à chenilles.
4. Volet à rouleaux selon l'une des revendications 1, 2 ou 3 **caractérisé en ce que** le dispositif de commande (11) est situé du côté des lames destiné à tourner la face contre la largeur du clair de vitre.
5. Volet à rouleaux selon l'une des revendications 1, 2 ou 3 **caractérisé en ce que** le dispositif de commande (21, 31) est situé du côté des lames destiné à tourner la face vers la largeur du clair de vitre.
6. Volet à rouleaux selon les revendications 2 et 4, **caractérisé en ce que** ladite forme de surface de la roue dentée (14) est principalement concave afin de pouvoir aller bien à la forme de surface principalement convexe desdits côtés des lames.
7. Volet à rouleaux selon les revendications 2 et 5, **caractérisé en ce que** ladite forme de surface de la roue dentée (24) est principalement convexe afin de pouvoir aller bien à la forme de surface principalement concave desdits côtés des lames.
8. Volet à rouleaux selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une butée (16, 26) est posée sur le côté des lames (5) en face relatif au dispositif de commande (11, 21, 31) et qui coopère avec les organes d'entraînement (15, 25, 35) du membre de commande pour assurer l'engrenage des lames (5) avec le membre de commande.
9. Volet à rouleaux selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une lame du côté intérieur dudit tablier d'une pluralité de lames (5) est attachée audit enrouleur (10) par le moyen d'une charnière ayant une largeur d'extension en ce qui concerne la largeur des charnières situées entre les lames restantes, ladite dernière largeur étant principalement uniforme.



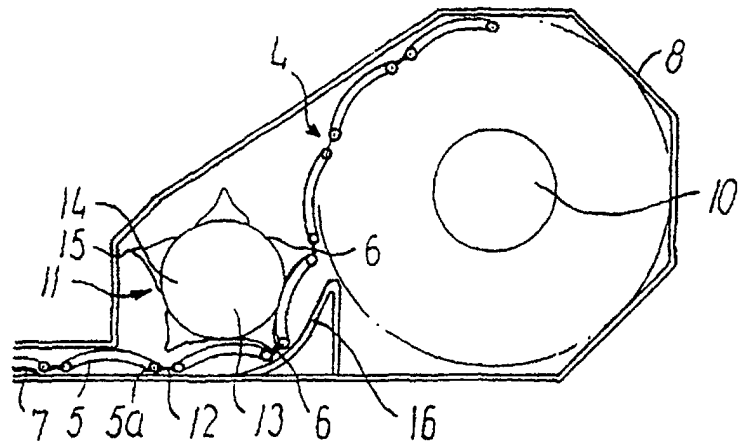


FIG. 3

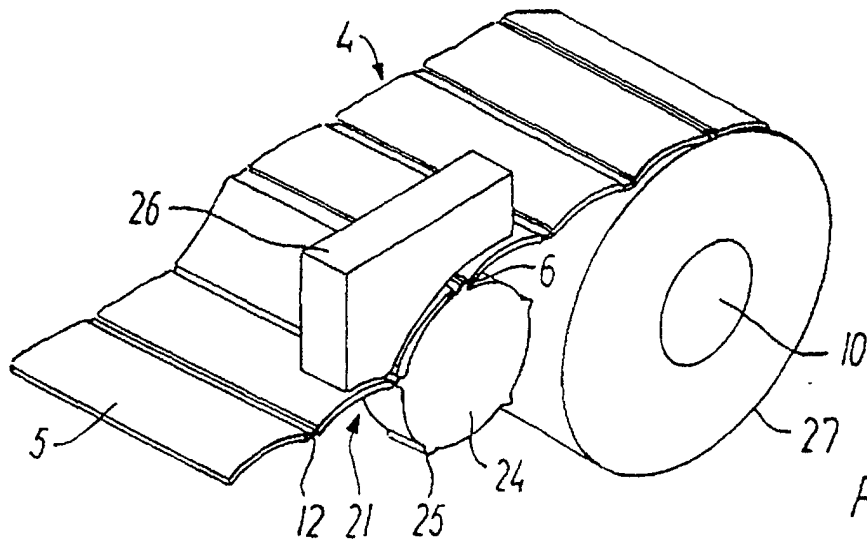


FIG. 4

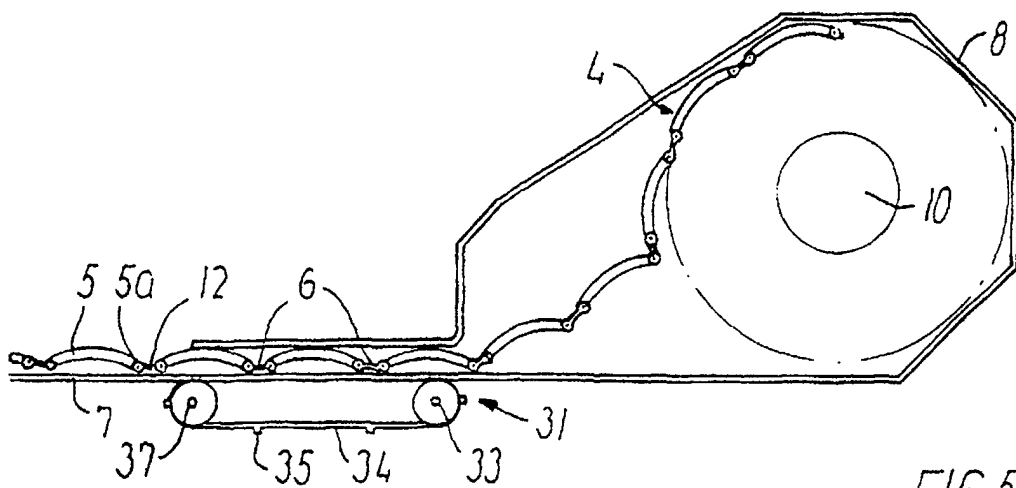


FIG. 5