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(54) **Plastic glazing foil and method and apparatus for manufacture thereof**

(57) Plastic foil for arranging behind a glazing which can be rolled up on a roller shaft for reducing the amount of sunlight incident through said glazing, provided with folds extending mutually parallel at a regular mutual distance over the width of said foil, wherein an inward bulge is formed in each case around a fold seam in a surface

of the foil and an outward bulge is formed in the opposite surface, wherein all inward bulges are formed in the surface on the same side of the foil, preferably in the surface on the side of the foil to be directed toward the incident sunlight, in addition to method and apparatus for manufacturing this foil.

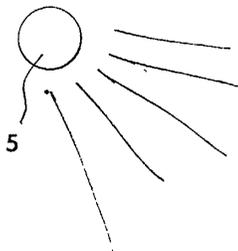
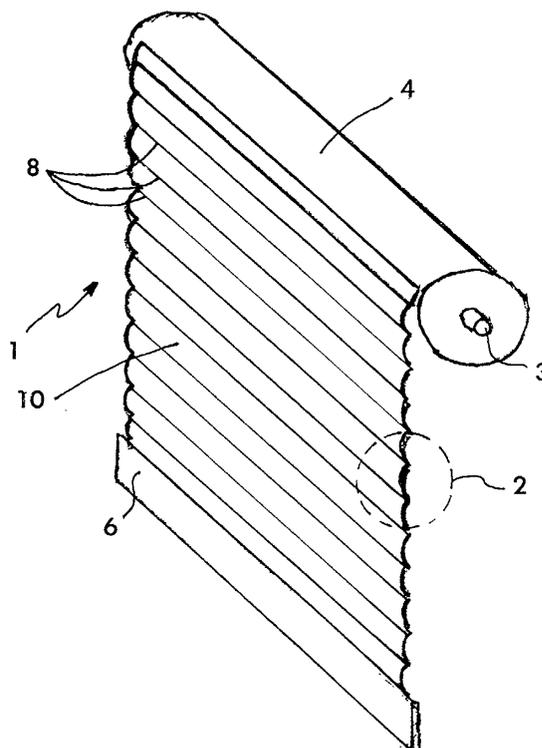


Fig. 1



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## Description

**[0001]** The invention relates to a plastic foil for arranging behind a glazing which can be rolled up on a roller shaft for reducing the amount of sunlight incident through said glazing, provided with folds extending mutually parallel at a regular mutual distance over the width of said foil, wherein an inward bulge is formed in each case around a fold seam in a surface of the foil and an outward bulge is formed in the opposite surface.

**[0002]** Such a foil is known under the designation of protective foil from the European patent application EP-A-0711901.

**[0003]** The folds in the known foil serve as reinforcements which are formed by pleating the foil. In a situation where it is unwound from a roller shaft, the known foil displays in side view a zigzag profile as a result of the alternately occurring inward and outward bulges of the foil.

**[0004]** The reinforcing folds are arranged to impart a better mechanical stability to the protective foil so that a foil arranged behind a glazing will depend in substantially planar manner and free of twists in the hung situation so as to prevent irritating reflections of sunlight incident on this foil.

**[0005]** A foil depending in substantially planar manner is only partially achieved with the known pleated foil. Under the influence of its own weight the zigzag profile is noticeably less clearly present on the upper side of a foil unrolled behind a glazing than on the lower side of the foil, as a result of which the foil tends to twist on an axis in vertical direction. Another drawback of the known protective foil with reinforcing profile is that, as a result of the pleating, this foil is difficult to place round a roller shaft in a housing. The foil acts more or less as a volute spring which, when rolled up on a roller shaft, is pressed automatically against the outside wall of a housing, which makes rolling up and subsequent unrolling more difficult.

**[0006]** It is an object of the invention to provide a plastic protective foil which remains substantially planar when suspended behind a glazing and also retains its planar structure after a long period of time. It is a further object to provide a foil which can be rolled up in simple manner on a roller shaft in a housing without it herein jamming or otherwise being impeded by this housing during winding up or unwinding.

**[0007]** These objects are achieved with a foil of the type specified in the preamble, wherein according to the invention all inward bulges are formed in the surface on the same side of the foil. In a situation where it is unwound from a roller shaft the foil according to the invention displays in side view a profile of successive inward or outward bulges instead of the zigzag profile of the known protective foil.

**[0008]** In a foil according to the invention all inward bulges are preferably formed in the surface on the side of the foil to be directed toward the incident sunlight. In

this embodiment strips with a convex profile in longitudinal direction extend in said surface in each case between the recessed folds over the width of the foil, which strips reflect the incident sunlight as convex cylindrical mirrors.

**[0009]** In one embodiment the mutual distance between the folds lies within the range of about 10 mm to about 30 mm.

**[0010]** The mutual distance preferably amounts to about 23 mm.

**[0011]** In yet another embodiment the foil has in cross-section a structure with peaks and valleys, wherein the distance between peaks and valleys is smaller than about 200  $\mu\text{m}$ , and preferably amounts to about 100  $\mu\text{m}$ .

**[0012]** The foil is for instance assembled from a carrier layer and at least one layer applied thereto.

**[0013]** This carrier layer is for instance a polyester layer, the applied layer substantially comprises for instance aluminium.

**[0014]** The invention further relates to a method for manufacturing the foil according to the above described invention.

**[0015]** According to the invention this method comprises the steps of (i) providing a fold-free plastic foil on a supply roll, (ii) providing a wind-up roller for the foil co-acting with the supply roll, (iii) providing a horizontal guide surface for guiding foil for unwinding from the supply roll and for winding onto the wind-up roller, which guide surface is provided in width direction of the foil with a groove filled with a compressible material, (iv) providing a stamp above the groove which just reaches into this groove in an up and downward movement, and (v) guiding the foil over the guide surface from the supply roll onto the wind-up roller in a continuous movement and, using the stamp in an up and downward movement, arranging at regular mutual distance in this foil folds directed to one side and extending over the width of the foil.

**[0016]** The invention further comprises an apparatus for manufacturing a foil according to the above described invention.

**[0017]** According to the invention this apparatus comprises (i) a supply roll for a plastic foil, (ii) a wind-up roller for the foil co-acting with the supply roll, (iii) a horizontal guide surface for guiding foil for unwinding from the supply roll and winding onto the wind-up roller, which guide surface is provided with a groove filled with an elastically compressible material in width direction of the foil, (iv) a stamp above the groove just reaching into this groove in an up and downward movement, and (v) drive means for the supply roll, the wind-up roller and the stamp for the purpose of guiding a foil over the guide surface from the supply roll onto the wind-up roller in a continuous movement and, using the stamp in an up and downward movement, arranging at regular mutual distance in this foil folds directed to one side and extending over the width of the foil.

**[0018]** The invention will be elucidated in the following on the basis of embodiments and with reference to the drawings.

**[0019]** In the drawings

Fig. 1 shows in perspective view an embodiment of a protective foil according to the invention, in a situation where this foil is partly unwound from a roller shaft out of a housing,

Fig. 2 shows in perspective view a detail of the foil shown in fig. 1, and

Fig. 3 shows a schematic representation of an embodiment of an apparatus for manufacturing a foil according to the invention.

**[0020]** Fig. 1 shows a plastic foil 1 which is partially unwound from a roller shaft 3 out of housing 4 which is suspended on the top side of a window (not shown). The foil serves as reflecting daylight filter which reduces the amount of sunlight, indicated symbolically by sun 5, incident through the glazing (in the figure from the left). Under the weight of an end slat 6 the foil 1 hangs downward in substantially planar manner. Foil 1 is provided with folds 8 extending mutually parallel at a regular mutual distance over the width of this foil 1.

**[0021]** Fig. 2 shows in detail the part 2 circled in fig. 1, wherein can be seen how an inward bulge 9 is formed in each case around a fold seam 8 in surface 10 of foil 1 on the side directed toward the incident sunlight 5, which inward bulge will of course form an outward bulge in the opposite surface. The mutual distance  $d$  between fold seams 8 amounts in the described embodiment to 23 mm. On the side 10 directed toward the incident sunlight 5 the folds 8 form the boundaries of convexly formed foil strips extending over the width and acting as convexly cylindrical mirrors reflecting the incident sunlight.

**[0022]** Fig. 3 shows schematically an apparatus 11 for manufacturing a foil according to the invention, with a supply roll 12 for a fold-free plastic foil 13, a wind-up roller 14, a horizontal guide surface 15 which is provided with a groove 17 filled with rubber 16 in the width direction of the foil, a stamp 18 which just reaches into groove 17 in an up and downward movement. Not shown are the drive means for supply roll 12, wind-up roller 14 and stamp 18. During operation unfolded foil 13 is transported by supply roll 12 at continuous speed to stamp 18 which presses the foil 13 into the rubber 16 in groove 17 in a regular up and downward movement, wherein folds 8 are formed in foil 13. The foil 1 thus provided with folds 8 is wound at a continuous speed onto wind-up roller 14 driven via a slip coupling.

## Claims

1. Plastic foil (1) for arranging behind a glazing which can be rolled up on a roller shaft (3) for reducing the

amount of sunlight incident through said glazing, provided with folds (8) extending mutually parallel at a regular mutual distance ( $d$ ) over the width of said foil (1), wherein an inward bulge (9) is formed in each case around a fold seam (8) in a surface (10) of the foil (1) and an outward bulge is formed in the opposite surface, **characterized in that** all inward bulges (9) are formed in the surface (10) on the same side of the foil (1).

2. Foil (1) as claimed in claim 1, **characterized in that** all inward bulges (9) are formed in the surface (10) on the side of the foil (1) to be directed toward the incident sunlight.

3. Foil (1) as claimed in claims 1-2, **characterized in that** the mutual distance ( $d$ ) lies within the range of about 10 mm to about 30 mm.

4. Foil (1) as claimed in claim 3, **characterized in that** the mutual distance ( $d$ ) amounts to about 23 mm.

5. Foil (1) as claimed in any of the claims 1-4, **characterized in that** it has in cross-section a structure with peaks and valleys, wherein the distance between peaks and valleys is smaller than about 200  $\mu\text{m}$ .

6. Foil (1) as claimed in claim 5, **characterized in that** the distance between peaks and valleys amounts to about 100  $\mu\text{m}$ .

7. Foil (1) as claimed in any of the claims 1-6, **characterized in that** it is assembled from a carrier layer and at least one layer applied thereto.

8. Foil (1) as claimed in claim 7, **characterized in that** the carrier layer is a polyester layer.

9. Foil (1) as claimed in either of the claims 7-8, **characterized in that** the applied layer substantially comprises aluminium.

10. Method for manufacturing a foil (1) as claimed in any of the claims 1-9, comprising the steps of

(i) providing a fold-free plastic foil (13) on a supply roll (12),

(ii) providing a wind-up roller (14) for the manufactured foil (1) co-acting with the supply roll (12),

(iii) providing a horizontal guide surface (15) for guiding foil (1) for unwinding from the supply roll (12) and for winding onto the wind-up roller, which guide surface (15) is provided in width direction of the foil (13, 1) with a groove (17) filled with an elastically compressible material (16),

(iv) providing a stamp (18) above the groove (17) which just reaches into this groove (17) in an up and downward movement, and  
(v) guiding the foil (13) over the guide surface (15) from the supply roll (12) onto the wind-up roller (14) in a continuous movement and, using the stamp (18) in an up and downward movement, arranging at regular mutual distance in this foil (13, 1) folds (8) directed to one side and extending over the width of said foil (13, 1).

**11. Apparatus (11) for manufacturing a foil (1) as claimed in any of the claims 1-9, comprising**

(i) a supply role (12) for a fold-free plastic foil (13),  
(ii) a wind-up roller (14) for the manufactured foil (1) co-acting with the supply roll (12),  
(iii) a horizontal guide surface (15) for guiding foil (13, 1) for unwinding from the supply roll (12) and winding onto the wind-up roller (14), which guide surface (15) is provided with a groove (17) filled with an elastically compressible material (16) in width direction of the foil (13, 1),  
(iv) a stamp (18) above the groove (17) just reaching into the groove (17) in an up and downward movement, and  
(v) drive means for the supply roll (12), the wind-up roller (14) and the stamp (18) for the purpose of guiding a foil (13) over the guide surface (15) from the supply roll (12) onto the wind-up roller (14) in a continuous movement and, using the stamp (18) in an up and downward movement, arranging at regular mutual distance (d) in said foil folds (8) directed to one side and extending over the width of said foil (13, 1).

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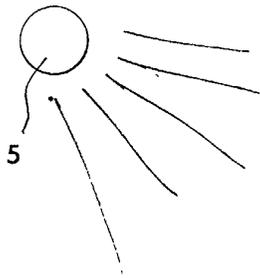


Fig. 1

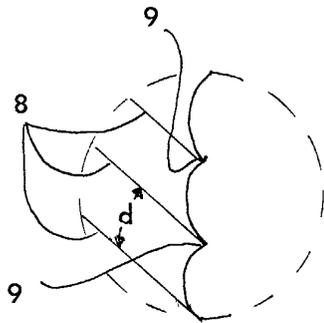
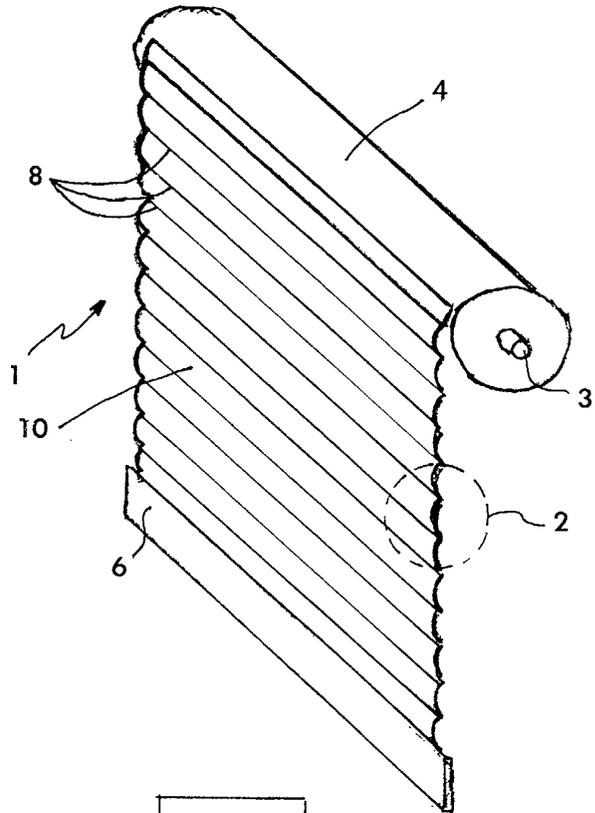


Fig. 2

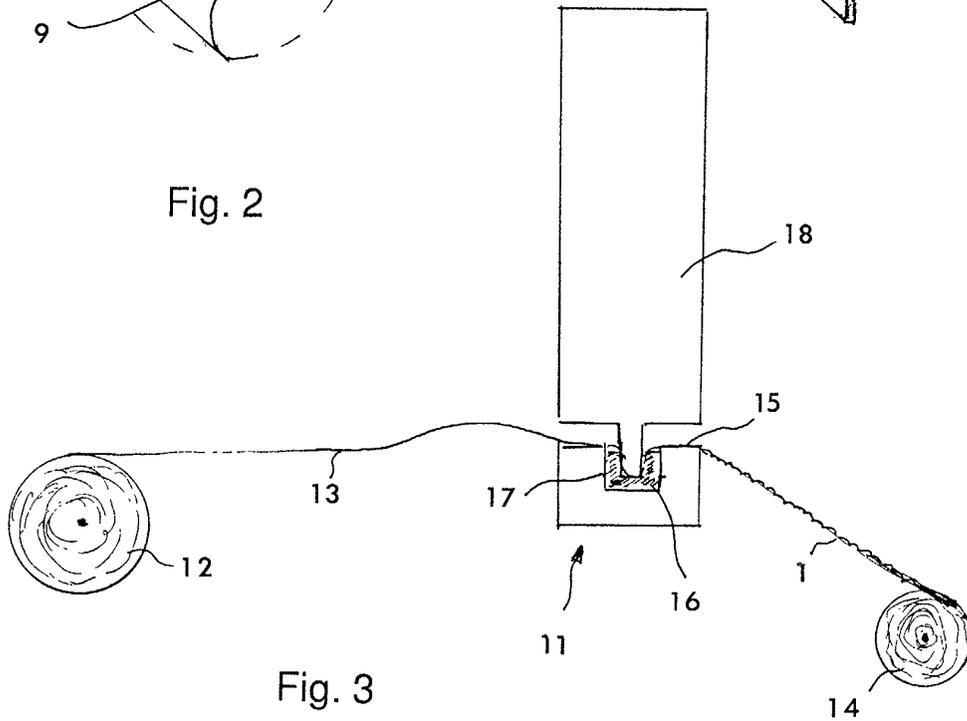


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number  
EP 02 07 6309

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 737 795 A (SCHMIDT MANFRED DIPL PHYS) 16 October 1996 (1996-10-16) * column 1, line 3 - line 6 * * column 3, line 17 * * figures 2,3 *	1,2	E06B9/40
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		22 July 2002	Geivaerts, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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