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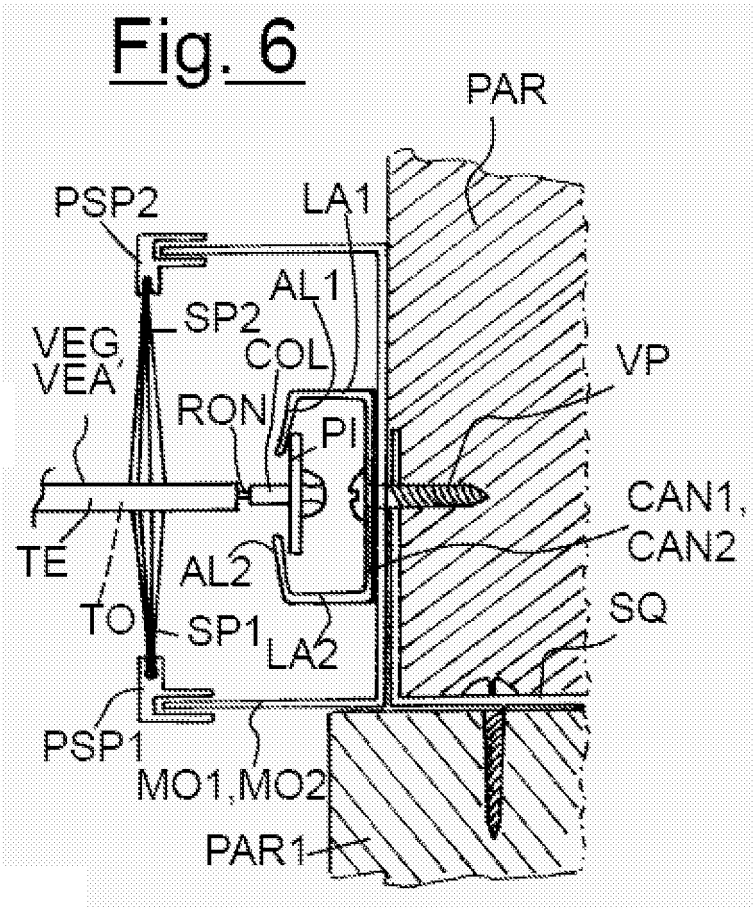
(54) **High speed door**

(57) An improved vertical-winding high speed door, comprising a construction system that allows it to be produced very quickly and provided with a self-repair system of the shutter in the case of collisions; the door does not need a safety rib either, since it has a construction that is robust, as well as, at the same time, so light as to minimise the mass that can strike a person, who is positioned beneath the door whilst it is closing.

Fig. 6



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Description

[0001] The present invention refers to an improved vertical-winding high speed door, characterised by a construction system that allows it to be made quickly, practically without swarf, provided with a self-repair system of the shutter in the case of bangs, and not needing a safety edge.

[0002] Vertical-winding high speed doors, like the one illustrated in detail in figure 1, are known.

[0003] They are usually formed from a horizontal drum TA, arranged in or outside of the opening of the door, on which a shutter made from fabric MA, normally coated in plastic material, such as PVC, is generally wound, by means of a geared motor MO,; through known commands the geared motor MO actuates the drum TA, and the shutter MA winds on it opening and closing the opening.

[0004] The shutter MA is generally built so as to withstand given pressures and/or air currents, through multiple known systems.

[0005] Such systems can be divided into two categories: according to a first embodiment, metal or plastic rods BA are used arranged horizontally in intervals, which run inside two lateral uprights MO1, MO2 of the door, whereas, according to alternative embodiments, a system for restraining the shutter MA within the two lateral uprights MO1, MO2 is exploited, without intermediate rods.

[0006] All known systems are in any case provided with a safety edge CO, i.e. a rod that keeps the bottom edge of the shutter MA taut between the uprights MO1, MO2, provided with a sensor, which, in the case of a collision against an obstacle on its way down, interrupts it and make the shutter MA go back up again.

[0007] This safety system is foreseen in the safety standards, due to the weight of the bottom rod and, therefore, the mass that can strike a person beneath the door, whilst it is closing.

[0008] Some types of door are also provided with various self-repair systems of the shutter MA, in the case in which it is struck by a vehicle passing under it.

[0009] There are various types of self-repair systems.

[0010] For example, the shutters held tight with lateral restrainers foreseen in the vertical uprights MO1, MO2 have a release system of such restrainers, according to which the sides of the shutter MA come out from the vertical uprights MO1, MO2, due to a collision and go back in again by mechanical constraint or by gravity the next time it goes down, after having been wound back onto the drum TA.

[0011] Alternatively, the systems with stiffening bars are better sealed against currents, but they have more problems in the case in which they are struck by a vehicle passing underneath, since the rigidity of the rods makes them bend, even if they are sometimes equipped with articulations near to the uprights, in order to unhook from them.

[0012] The greatest problem is however given by the bottom rod provided with a safety edge CO, given that this side is the one most stressed by the air currents and the most likely to be struck by a vehicle going underneath, as well as it being very far from the next rod.

[0013] According to the prior art, the protection of the rod generally takes place through its detachment, with respect to rod portions that remain anchored to the vertical uprights MO1, MO2, but the compromise of carrying out the detachment before the rod bends with respect to the necessary seal against air currents is very difficult: either the shutter holds back the current or the rod bends from the collision.

[0014] One of the greatest problems is indeed given by the bending of the rods from the collision of a vehicle passing underneath and the need for a manual intervention to reset them (therefore, the term self-repairing is in this case abused).

[0015] Moreover, the shutter MA is generally formed from a cloth coated with PVC that is generally heat sealed in a single piece, involving specialised processing and construction that always has to be to size, because this type of door is always built to fit the size of the space to be closed.

[0016] The result is, therefore, that the manufacturing costs are high, it is impossible to make the shutter MA with stocked material and it is necessary to rebuild the entire shutter MA in the case of a spare part being needed, with further negative consequences in terms of substantial costs, the always long time needed for replacement, given the length of the die, and high replacement costs, since such an operation requires that the entire shutter MA be disassembled, together with all of the tensioning systems.

[0017] The purpose of the present invention is, therefore, to avoid the aforementioned drawbacks and, in particular, to make an improved vertical-winding high speed door, which is more cost-effective compared to conventional solutions and that, at the same time, can be built without special equipment and using components ready in storage, near to the location of installation, thus decreasing the delivery costs and the delivery time.

[0018] Another purpose of the present invention is to make an improved vertical-winding high speed door, which has a substantial seal against air currents and which is self-repairing, in the sense that, in the case in which the pressure of the air current or else the light collision of a vehicle make it come out from the guides, it does not normally need to either be repaired or have parts replaced and that goes back in by simple gravity.

[0019] A further purpose of the invention is to make an improved vertical-winding high speed door, which is built to be strong, as well as, at the same time, so light as to minimise the mass that can strike a person positioned below the door, whilst it is closing, to the extent that no safety edge is required.

[0020] These and other purposes are accomplished by an improved vertical-winding high speed door, accord-

ing to the attached claim 1, whereas the further claims contain detailed technical characteristics of the invention.

[0021] Further characteristics and advantages of an improved vertical-winding high speed door, according to the invention, shall also become clearer from the following description, concerning a preferred, but not limiting, example embodiment, and from the attached drawings, in which:

- figure 1 shows a schematic perspective view of a vertical-winding high speed door, made according to the prior art;
- figure 2 shows a schematic perspective view of an improved vertical-winding high speed door, made according to the present invention;
- figure 3 shows a partial and schematic longitudinal section of the improved vertical-winding high speed door, according to the present invention;
- figure 4 shows a partial and schematic longitudinal section of each cloth making up the shutter of the improved vertical-winding high speed door, according to the present invention;
- figures 5-9 show a series of constructive details of the improved vertical-winding high speed door, according to the present invention.

With particular reference to figure 2, in which, for the sake of ease of description, the upright MO2 is shown detached from the assembly, the high speed door, according to the present invention, comprises a drum TA, arranged within or outside of the opening to be closed and fixed to the architrave with two flanges FL1, FL2, provided with a bearing, preferably adjustable so as to be able to adjust the distance of the drum TA from the wall and to centre the shutter MA, with respect to the vertical uprights MO1, MO2.

The drum TA is moved by a geared motor MO that, in different versions, can have a single opening and closing speed of the door or else two-speed, for example fast going up and slower going down.

The shutter MA consists of overlapping sections of strong but light cloth TE, preferably covered with PVC, and the sections of cloth, in the configuration of figure 2, four in number and indicated with TE1, TE2, TE3, TE4, are preferably all identical to each other and each of them consists, as shown enlarged in section in figure 4, of a strip of cloth TE, which carries a strip VEG of hook Velcro on one edge and a strip VEA of loop Velcro on the opposite edge, fixed so as to form two chambers CA1, CA2, situated between the Velcro VEG, VEA and the cloth TE.

The first cloth TE1, as can be seen in detail in figures 2 and 3, is fixed to the drum TA by adhesion of its strip of hook Velcro VEG on a strip of loop Velcro VEA applied to the drum TA, preferably with adhesive.

Each subsequent cloth TE2, TE3, TE4 is applied to the previous one by adhesion of the strip of hook Velcro VEG to the corresponding strip of loop Velcro VEA, whereas the bottom cloth TE4 can be a cloth absolutely identical to the others, so as to increase standardisation and minimise the diversity of the components.

Indeed, since this is the cloth that strikes the possible person situated in the opening of the door, the bottom part of the cloth TE4 is bent upwards and the band of loop Velcro VEA, arranged in the lower part of the cloth TE4, can be bent upwards, to be fixed against a further strip of hook Velcro VEG, the latter being applied a predetermined distance away (for example 15 cm.), so as to obtain a larger pocket along the entire bottom edge of the cloth TE4.

It is possible to insert, for example, a roll of padded material inside such a pocket, to increase the contact surface with the possible person and also to minimise the impact of the mass when striking something on the way down.

Since rolls of cloth TE with a strip of hook Velcro VEG and a strip of loop Velcro VEA already fixed are readily available, it is thus sufficient to cut the cloth TE to the length necessary to make the door and to join the cloths TE1, TE2, TE3, TE4 together.

The cloths TE can therefore all be of the same size, making great savings in storage, they can be simply joined together to make any size of shutter MA and, furthermore, it may not even be necessary to cut them in the height direction to obtain the total height of the opening, since the possible excess portion stays wound on the drum TA.

It goes without saying that the hook Velcro VEG can have its position exchanged with the loop Velcro VEA, that one or the other can also be applied on the opposite side of the cloth TE and that the only requirement is to start with one of the two types applied on the drum TA and continue with the type of Velcro that fastens to the first type, thus joining the cloths together down to the ground.

Inside the chambers CA1, CA2 of each sector of the cloth TE, or else in alternate sectors, in the case in which there is less need for a seal against currents, a rod TO is introduced (in the example of figure 5 the rods inserted in the chambers CA1, CA2 are respectively indicated with TO3, T04), preferably made from pre-hardened steel bar, of a suitable size to counteract the force of the air current.

As can be seen in detail in figures 5 and 6, a small plate PI, PI1, PI2, PI3, PI4, preferably round and preferably made from self-lubricating and slightly elastic plastic material, like for example Polyamide 6, is fixed to the ends of each rod TO.

Such a small plate PI is preferably kept detached from the cloth TE, for example by means of a collar COL and an abutment washer RON for the cloth TE.

The shutter MA of the door, made up of the aforementioned sectors of cloth TE1, TE2, TE3, TE4, kept under tension by the rods TO, descends vertically as it is unwound from the drum TA, and the small plates PI enter by gravity inside the vertical channels CAN1, CAN2, arranged at the sides of the door and fixed to the side jambs of the opening, with their top part a short distance, for example about 20 cm. from the drum TA.

With particular reference to figure 6, the channels CAN1, CAN2 are inserted in a preferably central position on the

inner intermediate side of the uprights MO1, M02, which are preferably fixed with through screws VP, from inside the channels CAN1, CAN2 and through the uprights MO1, MO2, directly to the wall PAR, in assemblies inside the door space, and with plates SQ, in the case of assembly outside of the door space on the wall PAR1.

The function of the channels CAN1, CAN2 is to restrain the rods TO, to vertically guide and to restrain against the pressure of the air current, whereas the function of the uprights MO1, MO2 is to contain the air current in the vertical spaces between the vertical channels CAN1, CAN2 and the edge of the cloths TE.

This seal is combined with an aesthetic component, and is preferably developed with the application of a brush SP1, SP2, for each side of the uprights MO1, MO2, inserted in suitable and respective brush-holders PSP1, PSP2, so that the brushes SP1, SP2 make contact with the cloth TE, closing the airspaces and keeping the cloth centred.

The seal against air currents is achieved with the distribution of the load over the entire surface of the shutter MA, whereas the pressure is spread over the reinforcement rods TO, (TO3, TO4 in figure 5) which bend under the pressure, as shown in fig.7 and 8, taking the small plates PI into traction against the wings AL1, AL2 of the respective channels CAN1, CAN2, thus keeping the cloth within the uprights MO1, MO2.

As illustrated in detail in figures 7 and 8, the pressure of the air current causes the rods TO to bend, with the result that the small plates PI are pushed towards the lateral edge, respectively, LA1, LA2 of the channels CAN1, CAN2, taking their opposite edge of the small plate PI to start to come out from the relative channel CAN1, CAN2.

Such an action is counteracted by the structure of the relative opposite wings AL1, AL2, following the researched inclination of the wings AL1, AL2, whose extension of the line of the surface inside the wing itself projects so as to jut out from the outer edge of the opposite wing AL1, AL2, until the increase in pressure of the air current is such as to make said opposite wing pass over the small plate PI, due to the greater bending of the rods TO, which increases the traction on the small plates PI, bending them against the wing AL1, as shown for example in fig.8.

Of course, the force of the air current can be in the opposite direction, and then what has been described shall occur in reverse.

The small plates PI preferably have a slightly smaller diameter than the distance calculated against the side LA1 and the tip of the wing AL2 and vice-versa, in reverse.

When detachment occurs, the respective rod TO generally also passes over the upright MO1, MO2, going alongside it, as shown in figure 7 (position indicated with TOE), but the rod TO and the cloth TE are in any case free to slide vertically and can be wound back up on the drum TA without problems.

When the shutter MA is wound completely up again, its bottom edge is located by gravity at the centre of the channel CAN1, CAN2 and, by simple gravity the subsequent downward movement of the door will make the rods TO enter into the channels CAN1, CAN2, restoring the seal of the shutter MA against air currents, in the brushes SP1, SP2.

It is clear that the present invention can similarly be made with reinforcement rods TO of any type, but the best operation is obtained by using elastic rods TO, which withstand bending, going back to their state of the rods being perfectly straight once the pressure of the current or of the blow has ended; for this reason, there is a preference for round rods of pre-hardened steel, or else fibreglass rods.

As stated, one of the special characteristics of the high speed door according to the invention is to be able to be made without swarf and through local assemblers, near to the intended location of use.

Indeed, the centralised production of the components allows advantageous prices that remain as such if they are not penalised by substantial transport costs which would be the case with high volume ratios.

It is clear that the processing swarf for producing the shutter MA can be minimal, since sectors of cloth TE1, TE2, TE3, TE4 can be sent from central production in rolls of substantial length, which can be cut to size necessary for the specific door only at the last minute or even at the time when it is being mounted for use, with a minimal residual swarf.

The same thing goes for the uprights M01, M02, the channels CAN1, CAN2, the brush-holders PSP1, PSP2 and the brushes SP1, SP2, which can be simply brought together lengthways in pieces of any length, therefore without any swarf.

Such a condition is not true for the drum TA, if produced with a tube, and in this case the delivery volume would be substantial.

In any case, the present invention also solves this problem, by proposing, as represented in detail in figure 9, to use a round bar or a central tube TU of reduced diameter and, therefore, of reduced volume, on which two or more flanges FL1, FL2, FL3 are fitted, which have areas parallel ZP to the central tube TU, suitable for the attachment of portions of tube PT1, PT2, PT3, which are used for the formation of the drum TA.

The aforementioned portions of tube PT1, PT2, PT3 can, for example, represent half or one third the circumference and constitute, once assembled, a complete drum TA, or else they can be simple sections, even flat and of small width, and be mounted on the flanges FL1, FL2, FL3 contiguously or detached from one another.

It is clear also in this case that there is an enormous reduction in volume that can be obtained and consequently it is easy to manoeuvre and has low delivery costs.

It is also clear that it is also possible to use pieces simply coupled lengthways, taking care simply to not place joints in positions contiguous to the other sections, thus making a further big saving in costs due to the total lack of swarf.

From the description that has been made the characteristics of the improved vertical-winding high speed door, object of the present invention, are clear, just as the advantages are also clear.

Finally, it is clear that numerous other variants can be brought to the improved high speed door in question, without for this reason departing from the novelty principles inherent to the inventive idea, just as it is clear that, in the practical embodiment of the invention, the materials, the shapes and the sizes can be whatever according to the requirements and they can be replaced with others that are technically equivalent.

Claims

1. Improved vertical-winding high speed door, comprising at least one horizontal drum (TA), arranged inside and/or outside the opening space, on which a shutter (MA) made from fabric or another material is wound, said drum (TA) being moved by actuation devices (MO), so as to wind the shutter (MA) on the drum (TA), opening or closing said opening space of the door, **characterised in that** said shutter (MA) includes at least one strip of cloth (TE), that carries, at at least one edge, at least one first fastening element (VEG), suitable for fastening to at least one matching second fastening element (VEA), positioned on an opposite edge of the strip of cloth (TE), said first (VEG) and second fastening element (VEA) being fixed so as to form respective chambers (CA1, CA2) situated between said fastening elements (VEG, VEA) and the material (TE).

2. High speed door according to claim 1, **characterised in that** said shutter (MA) includes one or more overlapping sections (TE1, TE2, TE3, TE4) of cloth (TE), preferably coated with plastic material, such as PVC, but also of the netted type that allows air to pass.

3. High speed door according to claim 2, **characterised in that** at least one first section (TE1) of cloth (TE) is fixed to the drum (TA) by adhesion of said first fastening element (VEG) onto said second fastening element (VEA).

4. High speed door according to claim 2, **characterised in that** further sections (TE2, TE3, TE4) of cloth (TE) are fixed together by adhesion of said fastening elements (VEG, VEA).

5. High speed door according to claim 2, **characterised in that** said sections (TE1, TE2, TE3, TE4) of cloth (TE) are the same size and have the same geometry, so as to increase standardisation and minimise the diversity of the components.

6. High speed door according to claim 2, **characterised in that** an end section (TE4) of cloth (TE) is folded upwards and distinct portions of said end section (TE4) of cloth (TE) are fixed together a predetermined distance apart, by means of said first (VEG) and second (VEA) fastening elements, so as to obtain a pocket of predetermined size along the bottom edge of the end section (TE4) of cloth (TE).

7. High speed door according to claim 6, **characterised in that** inside said pocket it is possible to insert one or more rolls of padded material, to minimise the impact of a possible blow from the shutter (MA) going down.

8. High speed door according to claim 1, **characterised in that** said drum (TA) is fixed to the architrave by means of flanges (FL1, FL2), preferably equipped with bearings and adjustable, so as to vary the distance of the drum (TA) from at least one wall (PAR, PAR1) and to centre the shutter (MA), with respect to the vertical uprights (MO1, MO2) of the door.

9. High speed door according to claim 1, **characterised in that** inside the chambers (CA1, CA2) of every section (TE1, TE2, TE3, TE4) of cloth (TE), or rather in alternate sections, at least one reinforcement rod (TO, TO3, TO4) is introduced, preferably made from pre-hardened steel bar, suitable for keeping the sections (TE1, TE2, TE3, TE4) of cloth (TE) under tension and being of a suitable size to counteract the force of the air current.

10. High speed door according to claim 9, **characterised in that** close to the end of each reinforcement rod (TO, TO3, TO4) at least one small plate (PI) is fixed, preferably made from self-lubricating plastic and/or elastic material.

11. High speed door according to claim 10, **characterised in that** said small plate (PI) is kept detached from the cloth (TE), through at least one shaped collar (COL), so that the shutter (MA) descends vertically as it unwinds from the drum (TA) whereas the small plates (PI) go by gravity inside vertical channels (CAN1, CAN2), arranged at the side of the door and fixed to the side jambs of the opening, which constitute restraining elements of said reinforcement rods (TO, TO1, TO2, TO3, TO4) against the pressure of the air currents.

12. High speed door according to claim 11, **characterised in that** said vertical channels (CAN1, CAN2) are positioned on an inner intermediate side of the vertical uprights (MO1, MO2) of the door, in turn fixed, from inside the channels (CAN1, CAN2), to at least one wall (PAR, PAR1), so as to contain the air current in the vertical spaces between said

uprights (MO1, MO2) and the edges of the sections (TE1, TE2, TE3, TE4) of cloth (TE).

13. High speed door according to claim 12, **characterised in that** said containment of the air current is also achieved by means of at least one brush (SP1, SP2), inserted in suitable brush-holders (PSP1, PSP2), so that the brushes (SP1, SP2) go into contact with the cloth (TE), closing the airspaces and distributing the load over the entire surface of the shutter (MA).

14. High speed door according to claim 11, **characterised in that** the pressure of the air currents is spread over said reinforcement rods (TO, TO3, TO4), which, under pressure, bend, taking said small plates (PI) into traction towards the side edges (LA1, LA2) of said channels (CAN1, CAN2) and against respective shaped wings (AL1, AL2) of said channels (CAN1, CAN2), which counteract its lateral thrusting action, through the action of the pressure of said small plates (PI) against the wings (AL1, AL2) and of the edge of the small plates (PI) against the opposite wing (AL2, AL1), so as to keep the cloth (TE) within the vertical uprights (MO1, MO2) even under a strong air current pressure.

15. High speed door according to claim 14, **characterised in that** the bending of the reinforcement rods (TO, TO3, TO4) causes the small plates (PI) to detach from the channels (CAN1, CAN2), until said vertical uprights (MO1, MO2) pass over the rods (TO), positioning themselves at their sides (TOE), said reinforcement rods (TO, TO3, TO4) and said cloth (TE) in any case being free to slide vertically, until the shutter (MA) is completely wound back up again, a condition in which the bottom edges of the shutter (MA) are, by gravity, at the centre of said channels (CAN1, CAN2), so that the next time the door is brought down they can enter, by simple gravity, inside said channels (CAN1, CAN2), in order to close the space again and seal of the air currents.

16. High speed door according to claim 9, **characterised in that** said reinforcement rods (TO, TO3, TO4) are preferably elastic, so that they withstand the bending, returning to their straight bar state once the pressure of the current or of the collision has stopped.

17. High speed door according to claim 1, **characterised in that** said drum (TA) comprises at least one central tube (TU), on which at least two flanges (FL1, FL2, FL3) are fitted, which have areas parallel (ZP) to the central tube (TU), suitable for the attachment of further surface portions (PT1, PT2, PT3) that surround the central tube (TU).

18. High speed door according to claim 17, **characterised in that** the surface portions (PT1, PT2, PT3) are mounted onto the flanges (FL1, FL2, FL3) contiguously or detached from each other forming a drum on which to wind the shutter (MA).

Fig. 1
PRIOR ART

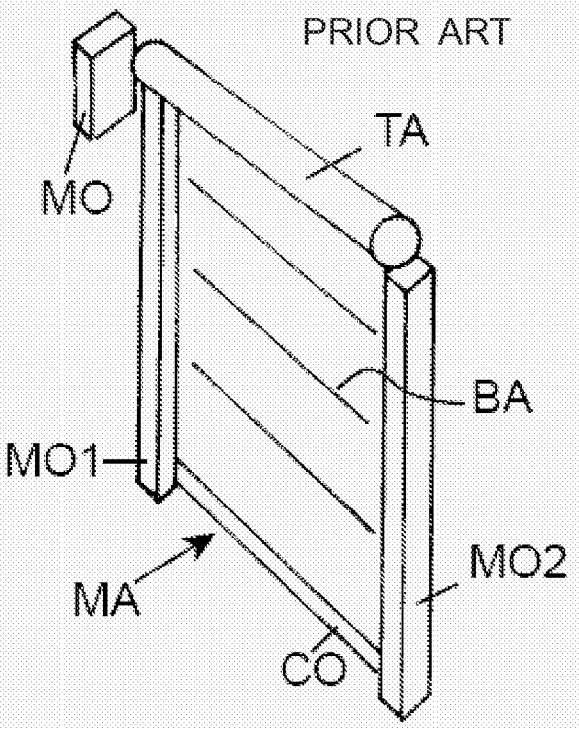


Fig. 4

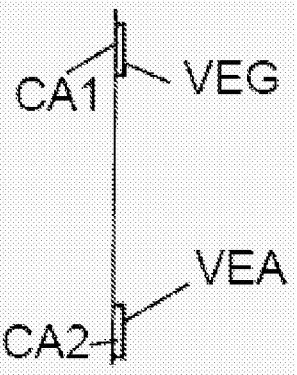


Fig. 2

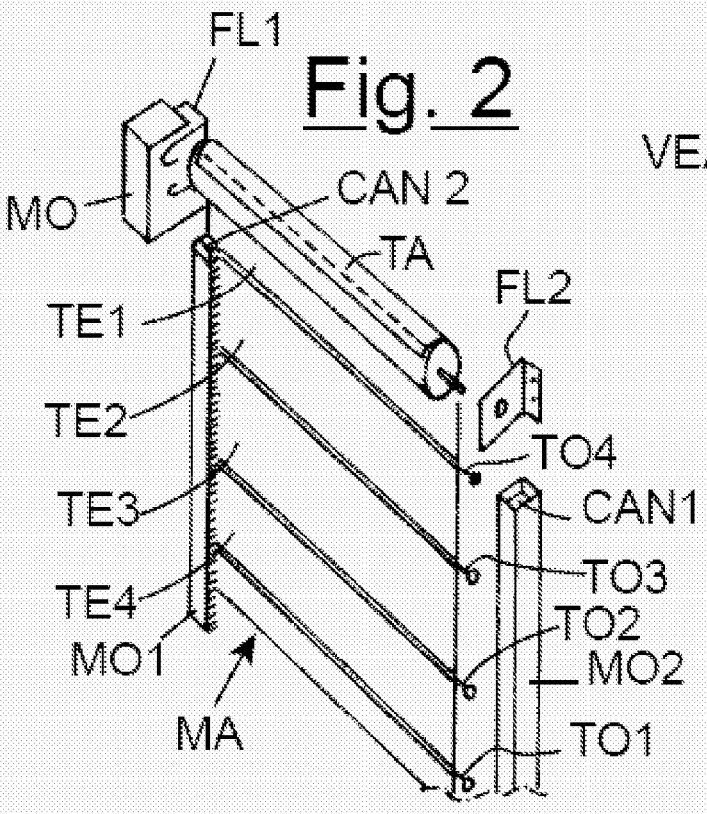


Fig. 3

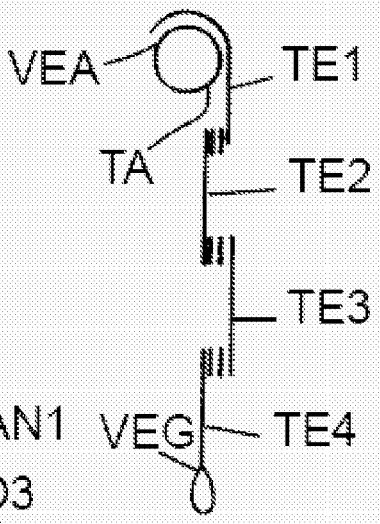


Fig. 5

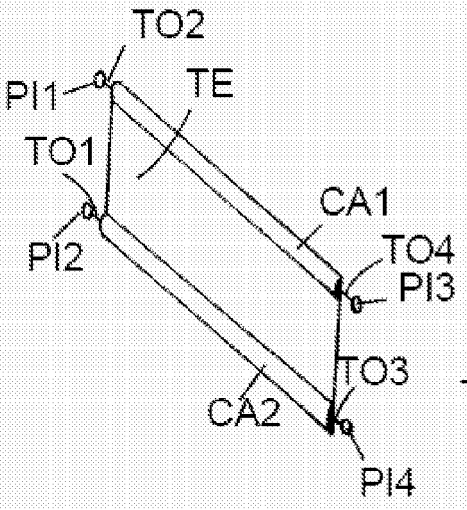


Fig. 6

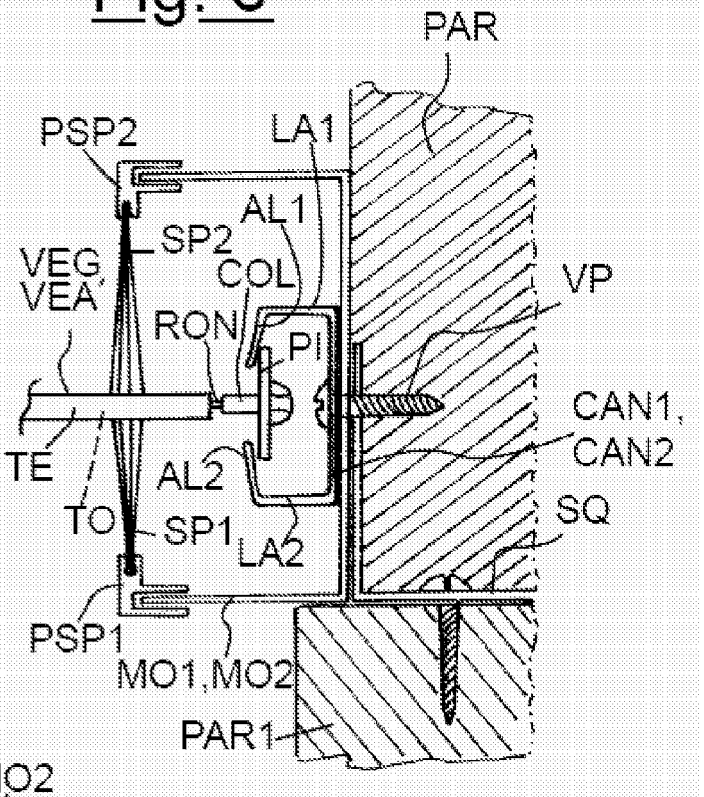
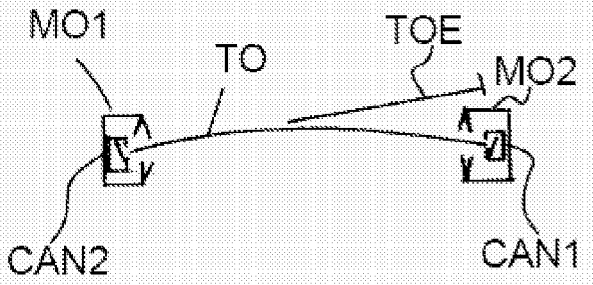


Fig. 7



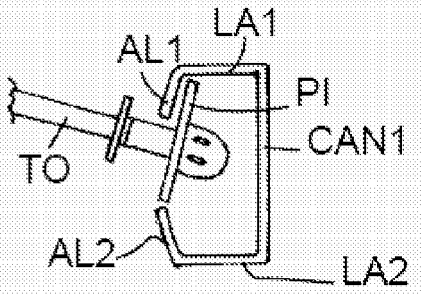


Fig. 8

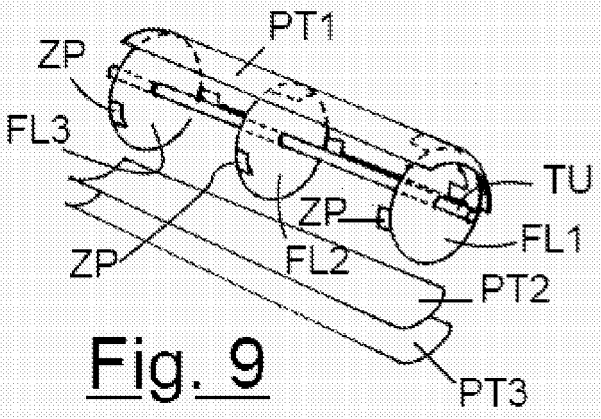


Fig. 9