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### (54) Overhead door structure

(57) An overhead door structure including a fixed frame (1) to be secured in a door opening, two lateral vertical guides (3) formed in the fixed frame (1), an overhead door (5) slidingly constrained to the lateral guides (3) at a lower portion thereof and provided with articulation means to the fixed frame (1) at an upper portion thereof, and drive means arranged to actuate the overhead door (5) between a closed position in which the overhead door (5) fully close the door opening and an opening position in which the overhead door (5) clears the door opening and is positioned at an upper portion of, and transversely to, the fixed frame (1). The articulation means comprises at least one flexible connecting member (11) having one end thereof (12) secured to the fixed frame (1) and its other end (13) secured to an upper portion of the overhead door (5), whereby said overhead door (5) yieldingly abuts against a possible obstacle (O) to be found in the path of the overhead door (5) while being closed.

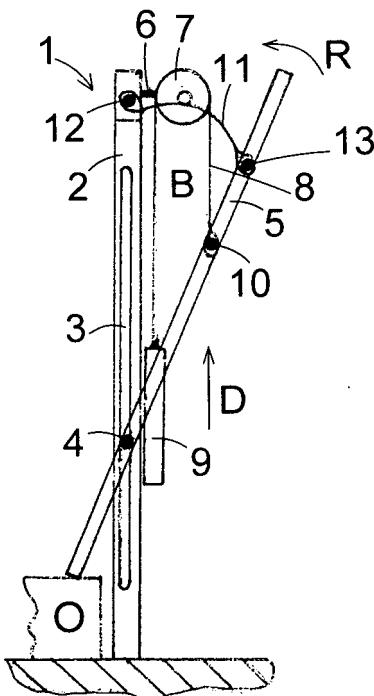


Fig. 3

## Description

**[0001]** The present invention relates an overhead door structure.

**[0002]** The use of both manually handled and motorized overhead door, e.g. garage overhead doors, is well known in the art. These overhead doors are laterally guided along vertical guides and are counterweighed by means of lateral cables loaded with a weight or by a spring and turning around a respective pulley. The lifting and lowering (opening and closing) of such doors occurs by means of rigid rotation rods having one end linked to one side of the door and the other end pivoted to a fixed bracket projecting from the lintel of the opening in which the overhead door is mounted, such a bracket also bearing a pulley around which one of the cables turns.

**[0003]** In particular, motorized overhead doors have been known to present a danger to people and/or things. There are at least two dangerous situations which occur during a downwards or closing travel of a motorized overhead door in the event there is an obstacle in the path of the door being closed. A first dangerous situation occurs when a person accidentally laterally insert its arm or hand between the rotation rod and the door being closed, because the rotation rod, being rigid, act as a scissors, eventually shearing the arm or hand. A second dangerous situation occurs when people and/or things, especially young children, are in the vicinity of the door while it is being closed because they may be subject to possible injury by the impact of the weight of the door in its downwards travel.

**[0004]** One type of commercially available safety device provides a sensor, which trigger or interrupt the circuitry which power the door to remove the power and therefore arrest the door in its downwards travel in the event an obstacle, such as people and/or things, is in the path of the door while it is closing. The above mentioned solution is not completely satisfactory, a drawback thereof being the delay time between the sensing of the obstacle in the path of the closing door and the cutting off of the power to the drive member, e.g. a motor. Also, it has been found that due to inertia and weight of the door, even if the powering mechanism is de-energized, the door will continue its downwards travel for a short distance. Moreover, in the worst case of a malfunction of the sensor, it can happen that the overhead door does not arrest its downwards travel with consequent heavy impact and damages to people and/or things.

**[0005]** The main object of the present invention is to provide an overhead door structure provided with a safety device such that the overhead door yieldingly abut against a possible obstacle to be found in the path of the door while being closed.

**[0006]** Another object of the present invention is to provide an overhead door structure that is easy and reliable in operation and can be manufactured at competitive production cost.

**[0007]** These and other objects which will better ap-

pear below are achieved by an overhead door structure including a fixed frame to be secured in a door opening, two lateral vertical guides formed in fixed frame, an overhead door slidably constrained to lateral guides at a lower portion thereof and provided with articulation means to fixed frame at an upper portion thereof, and drive means arranged to actuate the overhead door between a closed position in which said overhead door fully close said door opening and an opening position in which the overhead door clears said door opening and is positioned at an upper portion of, and transversely to, said fixed frame, characterized in that articulation means comprises at least one flexible connecting member having one end thereof secured to said frame and its other end secured to an upper portion of said overhead, whereby said overhead door yieldingly abuts against a possible obstacle to be found in the path of said overhead door while being closed.

**[0008]** Further features and advantages of the overhead door according to the present invention will better appear from the following description of preferred embodiments thereof, given by way of non-limiting example of carrying out the invention, with references to the accompanying drawings, in which:

Figure 1 shows a side view of an embodiment of an overhead door structure according to the prior art; Figure 2 illustrates a diagrammatic side view of an overhead door structure according to the present invention during a downwards travel of the door, with a flexible connecting member in its working tight position; and

Figure 3 illustrates a diagrammatic side view of an overhead door according to the present invention during a downwards travel of the door, with a flexible connecting member in its flexed position.

**[0009]** In the accompanying drawings the same or similar parts or components are indicated with the same reference numerals. The following description is made with reference to one side only of the door, but it should be understood that the same applies to the other side of the door.

**[0010]** With reference to Figure 1, a prior art overhead door structure comprises a fixed frame 10 including two vertical uprights 20 formed with respective fixed vertical guides 30 along which a respective pin or roller 40 secured to a lower portion of an overhead door 50 can slide. At its top each vertical upright 20 carries a bracket 60 bearing a rotatable pulley 70 around which a respective cable 80 carrying a respective counterweight 90 can turn. The other end of the cable 80 is anchored to an intermediate portion of a respective side of the overhead door 50. Moreover, an articulation rod 110 is provided, having one end thereof pivoted to a pin 120 projecting from an upper portion of the fixed frame 10 and its other end articulated to a pin 130 at an upper portion of the overhead door 50. Thus, the overhead door 50 at its upper portion

is laterally constrained by the articulation rod 110, whereas at its lower portion by means of pin or roller 40 it is slidably movable along fixed vertical guides 30. The overhead door 50 can thus be raised to its open overhead position and lowered to its closed position either by an operator acting manually onto the overhead door or by an actuation or drive means, e.g. a reversible electric motor, for the pulleys 70, i.e. for each cable 80 acting at an intermediate side portion of the overhead door 50.

**[0011]** With an overhead door structure according to the prior art, should an obstacle, such as a person, accidentally be located in the vicinity of the threshold of the overhead door opening (see zone A) while the overhead door is being closed, i.e. lowered to its closed position, it is liable to be injured by the impact of the overhead door 50 abutting against it. Moreover, if a person accidentally laterally inserts his/her arm or hand into the space between the articulation rod 110 and the overhead door 50 while being closed (see zone B), the rigid articulation rod 110 will act as a shearing blade with undesirable consequences.

**[0012]** An overhead door structure 1 according to the present invention as shown in Figures 2 and 3 comprises two vertical uprights 2 having a respective vertical guide 3 along which a pin or roller 4 projecting from a lower portion of an overhead door 5 can slide. Each vertical upright 2 carries at the top thereof a bracket 6 on which a pulley 7 is mounted for rotation. A cable 8 turns around each pulley 7, one end of each cable carrying a respective weight 9, whereas its other end is secured to an intermediate side portion, e.g. a projecting pin 10, of overhead door 5. A flexible connecting member 11, e.g. one or two cables, preferably metal cables, one or two chains, or a linkage system, has one end thereof anchored to an upper portion, e.g. a pin 12, of the fixed frame 1 and its other end fixed, e.g. by means of a respective lateral pin 13, to an upper portion of the overhead door 5. Thus, the overhead door 5 is constrained by the flexible connecting member 11 at its upper portion, by means of a pin or roller 4 sliding along a respective vertical guide 3 at its lower portion, and by one end of a cable 8 carrying the counterweight 9 at its intermediate portion.

**[0013]** Figures 2 and 3 show the closing or lowering movement of a motorized overhead door structure according to the invention and the event in which an obstacle O (see Fig. 3) is found in the path of the overhead door 5.

**[0014]** Upon abutting against obstacle O the overhead door 5 can yield backwards and upwards while damping the impact between obstacle O and overhead door 5 by carrying out a composite rotational and displacement movement as illustrated by arrows R and D in Fig. 3, backwards rotational movement (arrow R) being allowed by flexible connecting member 11, whereas upwards displacement movement (arrow D) is carried out by pins or rollers 4 sliding along their respective vertical guides 3.

**[0015]** As shown in the Figures, the zones B are no longer dangerous, since, in the event an obstacle, e.g.

an arm or an hand, is present in zone B, when the overhead door, during its lowering movement, abuts against such an obstacle, the flexible connecting member 11 yields backwards, thereby preventing any shearing effect.

**[0016]** Advantageously, sensor means, e.g. a micro or proximity switch, is provided which is arranged to detect such an upwards movement of the overhead door and stop or preferably invert the rotation of the motor.

**[0017]** The invention as described above is susceptible to numerous modifications and variations within the scope as defined by the claims.

15 **Claims**

1. An overhead door structure including a fixed frame (1) to be secured in a door opening, two lateral vertical guides (3) formed in said fixed frame (1), an overhead door (5) slidably constrained to said lateral guides (3) at a lower portion thereof and provided with articulation means to said fixed frame (1) at an upper portion thereof, and drive means arranged to actuate said overhead door (5) between a closed position in which said overhead door (5) fully close said door opening and an opening position in which said overhead door (5) clears said door opening and is positioned at an upper portion of, and transversely to, said fixed frame (1),  
**characterized in that** said articulation means comprises at least one flexible connecting member (11) having one end (12) thereof secured to said frame (1) and its other end (13) secured to an upper portion of said overhead door (5), whereby said overhead door (5) yieldingly abuts against a possible obstacle (O) to be found in the path of said overhead door (5) while being closed.
2. An overhead door structure as claimed in claim 1,  
**characterized in that** said at least one flexible connecting member (11) comprises at least one metal cable.
3. An overhead door structure as claimed in claim 1,  
**characterized in that** said at least one flexible connecting member (11) comprises at least one chain.
4. An overhead door structure as claimed in claim 1,  
**characterized in that** said flexible connecting member (11) comprises at least one linkage system.
5. An overhead door structure as claimed in any previous claim, further comprising actuating means for said sensor means arranged to detect any upwards movement of said overhead door (5) and to control said drive means.

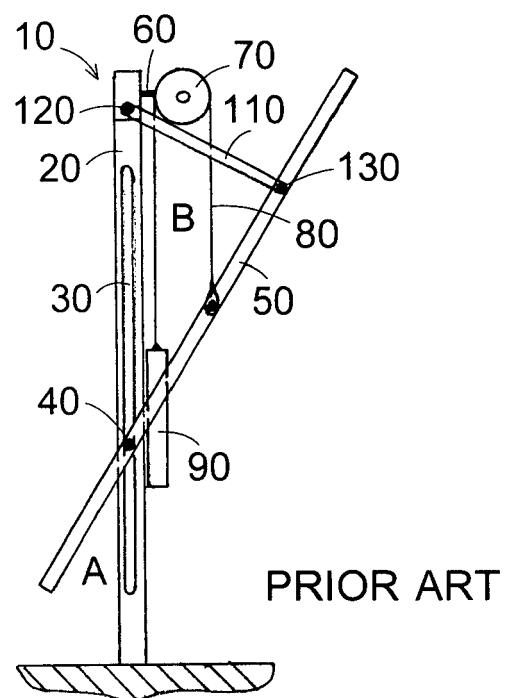


Fig. 1

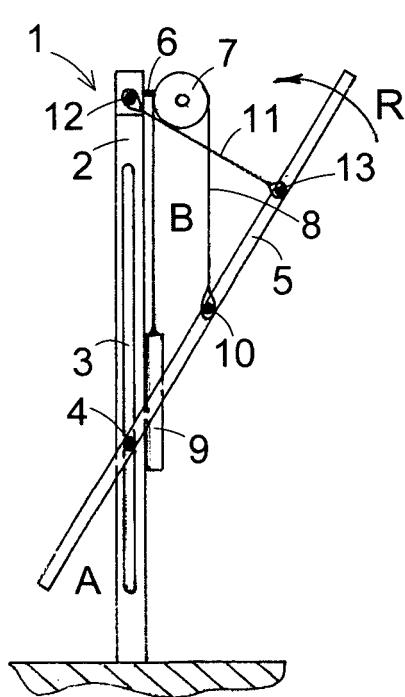


Fig. 2

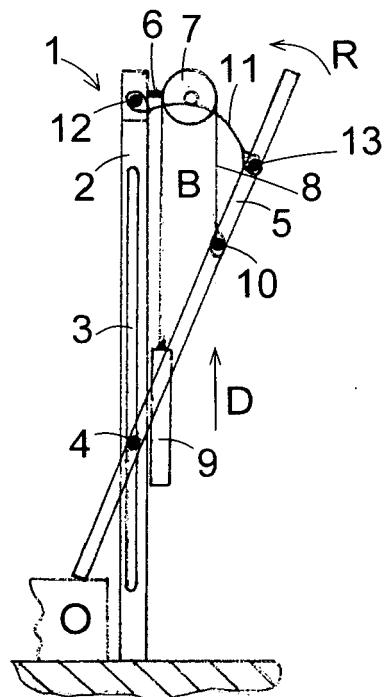


Fig. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US 2 929 623 A (MARMONT GEORGE H ET AL) 22 March 1960 (1960-03-22) * column 2, lines 59-69; figure 1 * -----	1-5	E05F15/00 E05D15/44 E05D13/00 E05F15/16
X	FR 733 460 A (COULOMB A, GIESSNER F) 6 October 1932 (1932-10-06) * page 1, paragraph 2 * * page 2, paragraph 2-6; figures * -----	1,4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E05F E05D
<p>1 The present search report has been drawn up for all claims</p>			
Place of search		Date of completion of the search	Examiner
The Hague		20 June 2005	Witasse-Moreau, C
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 00 1914

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-06-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2929623	A	22-03-1960	NONE	
FR 733460	A	06-10-1932	NONE	

EP0 FORM P0459  
For more details about this annex : see Official Journal of the European Patent Office, No. 12/82