Applied Mechanics and Materials
ISSN: 1662-7482, Vol. 685, pp 165-168
doi:10.4028/www.scientific.net/AMM.685.165

Submitted: 2014-09-17
Accepted: 2014-09-20
Online: 2014-10-27

Research on Shutters-Style Shielding and Protective Device for Windscreen

Jian Huang[1] Xiliang DAI[2]

[1] Department of Transportation Service，Bengbu Automobile NCO Academy, China

Yuhui District，Bengbu 233011, Anhui Province, China.

[2] Department of Basic Courses，Bengbu Automobile NCO Academy, China

Yuhui District，Bengbu 233011, Anhui Province, China.

[a] hj1971818@sina.com [b] dxiliang@yahoo.com.cn

Keywords: shutters; vehicle windscreen; shielding and protective devices

Abstract: Shutters-style shielding and protective device for windscreen is the shutters installed outside the external position of the vehicle windscreen with the function of shelter and protection. It does not only avoid the enemy reconnaissance due to the reflective glass, but also withstands the damage from all kinds of bullets and shrapnel, and it does not affect the normal running of the vehicle.

Introduction

War Practice shows that, all targets without disguise or imperfect camouflage during wartime mean to be found and destroyed, which has become an indisputable fact. As one of the important vehicles and equipment for military land transportation, it is the key destruction goal during wartime by the enemy. Therefore, Improvement for vehicle disguise or camouflage and protection has practical significance for vehicles.

1. Design of shutters-style shielding and protective device for windscreen

1.1 Background technology overview

Although the vehicle windscreen provides excellent viewing conditions for driving, and passengers, but under wartime conditions, it has negative factors in reality. On the one hand, it has many reflective symptoms of exposure for vehicles (such as light, shape, color, trace, and electrical, magnetic, and thermal factors), it is just for those symptoms of exposure that it is vulnerable to be reconnoitred and then struck by the enemy. On the other hand, due to the fact that the windscreen is not bulletproof, it make drivers and passengers who sit relatively on higher and prominent position facing serious security threats and easily killed by all kinds of bullets and shrapnel. Although there are windscreen protection measures in existing studies, such as "covered camouflage cloth", "covered steel wire net" and other methods, but they can only solve one of the problems, either they can but prevent light reflection, or can only prevent hard objects, but cannot have bullet-proof function, especially they cannot well combine the functions of preventing light reflection and bullet together. To overcome this problem, the author from the actual needs, by using simple equipment and vehicle frame, has designed the "shutters-style shielding and protective devices for windscreen".

1.2 General design ideas

The design is mainly based on the characteristics of shutters which can effectively control the incident light and the reflected light. Specific program: shutters installed outside the windscreen of vehicle, which have the functions of sheltering and protection. (Each shutter is made of super strong nylon alloys or other materials made of polyethylene), while, to improve the anti-strike capability of the shutters, transverse grooves which guide warhead (shrapnel) to slide are provided. The shutters can be rotated and adjusted through the bars set on both front sides of the windows outside when in use, and shutter's direction can also be adjusted depending on the view in driving and anti-enemy aerial reconnaissance. Therefore, excellent view in driving can be guaranteed, the windscreen can avoid the blazing of the light, so enhancing the effect of the windscreen anti-strike capability to effectively resist all kinds of bullets and shrapnel damage, therefore it improves the vehicle driving in battlefield survivability.

1.3 Shutters design

Shutters are installed under the fixed bed frame, they are composed of shutters and adjusting rod. Among them, the shutter, which is 3 to 5 centimeters in width and as long as the length of windscreen preferably, is a thin and long rectangular solid in shape, but the thickness desired is determined according to the material itself and the requirements in defensing bullets and shrapnel cutting running through it. The outer surface of the shutter has the transverse grooves guiding warheads (shrapnel) sliding. On both ends of each shutter has a cylinder-shaped transmission shaft which has the same material as the shutters (one smooth end, and one end of the concavo-convex gear on the other); the adjusting rod is rectangular solid in shape, its length is the same as that of the height of the windscreen, its width is as long as one end of concave-convex of the transmission shaft, the preferable thickness is 1 to 1.5 centimeter. Adjusting rod forms vertical angle with the shutters, one side is smooth, the other side has a certain number of bulge-teeth, and bulge-tooth always interlocks with concave-convex gear of the transmission shaft.

Table 1: Relevant data of the shutters (Unit: cm)

Parts description		Format
Shutters	Length	Same as the length of the corresponding direction of windscreen
	Width	3-5
	Height	Super strong nylon alloy:1.5; super strong polyethylene: 1
Groove of the shutters	Length	Same as the length of the shutters
	Width	0.3
	Height	0.2
Transmission shaft	Length	3
	Diameter	1.6
Adjusting rod	Length	Same as the length of the corresponding direction of windscreen
	Width	2
	Height	1-1.5

1.4 Fixed bed frame design

Fixed bed frame has two parts: the upper part and lower part. The upper part of is fixed to the top outside the cab, and it is welded by various horizontal iron plates together, while in the direction of the four corners, plagiotropous projections are welded (the purpose is to make the shutters not come in so close proximity to the windscreen glass and leave some space), on the plagiotropous projections, there are rectangular holes, in the middle of the holes, there is a cylindrical bar iron; while the lower part is composed by six iron plates (they has several circular holes on the plates), and they are connected with the cylindrical bar iron through the top hole and the plagiotropous projections of the upper part of fixed bed frame portion (the purpose is to be able to put all the shutters open to the upside, so as to facilitate drivers, and passengers coming and going out of the cab). Among them, two metal plates are located in left (right) rear side outside of the cab, four iron plates are located on the left (right) front side outside of the cab by making the two two-iron plates face to face in both directions.

Table 2: Relevant data of the shutters (Unit: cm)

<table>
<tr><td colspan="3">Parts description</td><td>Format</td></tr>
<tr><td rowspan="9">Mental plate</td><td rowspan="3">Horizontal</td><td>Length</td><td>Same as the length of top of cab outside</td></tr>
<tr><td>Width</td><td>3</td></tr>
<tr><td>Height</td><td>0.5</td></tr>
<tr><td rowspan="3">Slanting</td><td>Length</td><td>20</td></tr>
<tr><td>Width</td><td>5</td></tr>
<tr><td>Height</td><td>0.5</td></tr>
<tr><td rowspan="3">Vertical</td><td>Length</td><td>Same as the length of top of cab outside</td></tr>
<tr><td>Width</td><td>Same as the height of the corresponding windscreen</td></tr>
<tr><td>Height</td><td>0.5</td></tr>
<tr><td colspan="2">Opening of mental plate</td><td>Diameter</td><td>1.8</td></tr>
<tr><td colspan="2" rowspan="2">Cylindrical bar iron for the opening</td><td>Length</td><td>1.8</td></tr>
<tr><td>Diameter</td><td>0.3</td></tr>
</table>

2 Application of shutters-style shielding and protective device for windscreen

2.1 Installation and removal

Whether in installation or removal, it should be done under the conditions of no direct safety threat. When installed, it needs the driver and co-driver to co-operate. First install the fixed bed frame through the use of holding bolt by attaching it to the outside of the cab frame (top and side). And then install the shutters on the front, the left and the right respectively, and adjust the adjustment rod; when it is disassembled, the drivers and the assistant should stand outside the cab, first disassemble shutters from all the directions and adjustment rod, then remove the fixed bed frame. If at any time, the shutters should be installed, the fixed bed frame may not be removed, thus, the time for the overall installation is save. Whether the fixed bed frame is disassembled or not depends on your choice.

2.2 Application

When the enemy threat is small, the angle and the direction of the shutters can be adjusted by adjusting regulating rod, each shutter is in a parallel state so as to maintain the driving vision to the maximized light demand; when the enemy threat is big, adjust the rod so as to make the angle and the direction of shutters suit the needs of the situation. On this situation, it can not only provide the required driving vision, cover the light reflection of the windscreen, but also it can effectively resist all kinds of bullets and shrapnel damage, thus it satisfies the requirements of driving vision, control of reflection of windscreen glass and windscreen glass bulletproof. When drivers and passengers need to come and go out of the cab, they can open the left (right) side of the shutters, open the door and then get off.

Conclusion

In short, shutters-style shielding and protective device for windscreen has the characteristic of easy manufacturing, low cost. It can avoid the risk of being reconnoitred, discovered and struck by the enemy. At the same time, it can also solve the problem of bulletproof window glass without affecting the normal running of the vehicle, thus it greatly improving the safety factors of the vehicle, the driver and the passengers.

References:

[1]WANG Baocun, World New Military Revolution. PLA Publishing House, Apr.2003.
[2]CAI Minji, Winning With the inferior. PLA Publishing House, .Nov.2003.