Pneumatic Awning for Passenger Automobile

TECHNICAL FIELD

This invention relates to a laterally extendable and retractable rain shielding awning with pneumatic mechanism to be mounted on a passenger automobile designed for shielding passengers from rainwater during entering and exiting of the automobile.

BACKGROUND ART

Efforts to keep an individual dry on a rainy day while entering and exiting a vehicle are seen in prior arts. U.S. Pat. No. 6959715 for “Umbrella for Departing Auto Passenger”, U.S. Pat. No. 6811207 for “Motor Vehicle Door Assembly with Canopy Assembly”, U.S. Pat. No. 5,476,302 for "Rain Cover for Car Door", U.S. Pat. No. 6,044,856 for "Rain Shield Canopy for Use with An Automobile", and U.S. Pat. No. 5,150,728 for "Umbrella with Magnetic Fasteners:" to mention but a few. In these foregoing patents, passengers of small private vehicles are the main targets of protection. These inventions are compact and relatively simple for carriage. However, due to the limited height of the small vehicle and hence the canopy, the convenience of passengers is not fully attended.

There may be tens of passengers to get into or out of a bus or coach at a stop. There may be passengers carrying baby or other things. There may be a queue of passengers to get into or get out of a bus. It is expensive to build a big kiosk at each bus stop. Still there is always gap between a bus and the roof of a kiosk. It is more worth for a bus to be equipped with an awning.

U.S. Pat. No. 6,044,856 disclosed a rain shielding canopy for use with an automobile that extends and retracts from roller housing assembly as the door of the vehicle is opened and closed. It is compact as a roller is used. However, its application is limited to vehicles with doors opening outwards and its covering area is limited.

U.S. Pat. No. 6,260,908 for “Awning Extension And Retraction Mechanism with Pneumatic Actuator” disclosed a retractable awning assembly includes a spring-biased roller assembly, a pair of arm assemblies supporting opposite ends of the roller

assembly and operable to move the roller assembly between a stored position adjacent the wall and a sheltered position spaced from the wall. Each arm assembly has an extendable support arm, a pneumatic cylinder operably connected to the support arm for extending and retracting the support arm, and an extendable rafter arm including a pair of parallel pneumatic cylinders for extending and retracting the rafter arm. The support arm has a pair of laterally spaced apart wheels which are rotatable about a generally horizontal axis, an upper end operably connected to the roller assembly and a lower end pivotably securable to the wall. The rafter arm has an upper end pivotably securable to the wall and a lower end pivotally connected to the support arm. The awning assembly also includes a pair of laterally spaced apart ramps for each support arm and a pneumatic control system for selectively supplying and exhausting pressurized fluid to and from the pneumatic cylinders of the support arms and the pairs of pneumatic cylinders of the rafter arms to move the roller assembly between the stored position and the sheltered position. The ramps are securable to the wall and have engagement surfaces adapted to cooperate with the wheels of the support arms to pivot the support arms about their lower ends when the support arms are extended while in the stored position. However, the awning in this invention with complicated arm structure needing a flat support wall is not suitable for vehicle application.

"Awning System for A Recreational Vehicle" disclosed in WO/2004/074040 is an automatic lateral arm awning system for recreational vehicle having a pair of spring loaded arms urging the awning to stretch out, and having an electric motor disposed in the roller capable of extending and retracting the awning by turning in different directions. However, there are only two positions of fully extended and stored controlled by the electric motor that when the head of the awning is prevented from further stretching out, the awning will not in tension. Furthermore when incase there is a failure in the motor or power supply, the awning may remain in the extended position. For a bus that may need to extend and retract the awning frequently, these may become its disadvantages.

SUMMARY OF DISCLOSURE

It is an objective of the invention to provide a rain shielding awning that can deflect rainwater while passengers get into or out of a bus, and provide a covered corridor

between the bus and a bus stop kiosk, or provide a shield area where passengers can open or close an umbrella before entering or after departing a bus.

It is an another objective of the invention to provide an awning that is compact when in stored position and to be mounted on limited space of a bus above an entrance and an exit, and provide a supporting means that does not hamper passengers when the awning is extended.

It is yet another objective of this invention to provide a reliable and safe mechanism for extending and retracting an awning mounted on a vehicle that is able to extend and retract quickly and automatically, stops extending when its front hits an object and retracts to its stored position in case there is a failure in power (compressed air) supply.

The invention is an extendable and retractable awning comprising a roller housing assembly, an retractable tarpaulin sheet extending between the roller and a front bar, a laterally stretching and supporting arm assembly with its upper arm joined to the roller housing or vehicle body and its forearm joined to the front bar, and a pneumatic cylinder providing stretching force to the stretching arms to extend and support the awning.

The preferred embodiment of the roller assembly in this invention comprises a housing cover (3), a roller (1) rotatably mounted within the housing, wind-up spring wound on the end of roller (1) to bias the roller to roll the tarpaulin (2) onto it, a tarpaulin sheet (2) with its inner edge attached to the roller (1) in the roller housing and with its outer edge attached to a front bar (6), and two belts (9) with their one ends rolled on the ends of said roller (1) and with the other ends tied to the side ends of said front bar (6) through two turning pulleys (10). Preferably said front bar (6) has a front view as shown in Fig 3 which has a risen central part and leans towards both side edges. Preferably, said tarpaulin (2) is such attached to said front bar (6) that it fits the roller housing well in stored position as shown in Fig 3, which means that it is not in fully tension towards both side edges when the awning is extended. Preferably, said two belts (9) are rolled on said roller (1) synchronously to said tarpaulin (2) and are in full tension the same as the central part of said tarpaulin (2).

The preferred embodiment of the laterally stretching and supporting arm assembly comprises joined upper arm (4) and forearm (5), a pneumatic cylinder (8), vertical axes (7) and corresponding bearings and mounting (17), and a hook (11) to lock the folded said arm assembly. The stretching arm assembly thus structured is only able to stretch and retract horizontally or perpendicularly to said axes (7). Said front bar (6) joined to

said forearm (5) through said axis (7) is rotatable and only rotatable around said vertical axis (7). Preferably said upper arm (4) joined to the roller housing body or bus body through said mounting (17), and said forearm (5) joined to the front bar (6) with vertical axes (7) are strong enough to withstand the weight and possible maximum force and torque which the awning may subject to during strong wind and heavy rain. Preferably said upper arm (4) and said forearm (5) is stopped from stretching to a straight line, and the arm-of-force of said pneumatic cylinder (8) acting on said forearm (5) is greater than zero when fully folded.

Preferably, said tarpaulin (2) is made of thin and light but strong and weathering-resistant material, and is non-stretchable in all directions. Preferably, the wind-up spring of the roller provides enough tension across said tarpaulin (2) that it can withstand strong wind and heavy rain when it is extended, and can fully retract the tarpaulin reasonably fast when the pressurized air in said pneumatic cylinder (8) is releasing through properly sized gas releasing hole. Preferably said pneumatic cylinder (8) is multiple bore type that is capable of providing greater pushing force in the beginning to produce enough moment to unfold the arms to stretch quickly from the folded position, and providing reduced stretching force when the arms stretches out further towards the end of full extension of the awning.

The number of said arm assembly depends on the width of the awning. For vehicles whose front door and rear door are far apart, independent awnings may be installed. A single stretching arm assembly may be used. For buses like some double-deckers whose front and rear doors are not too far apart, a single wide awning covering both doors with two stretching arm assemblies each installed along the central line of the doors is preferred.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood with reference to the accompanying drawings or figures, and the detailed description that follows hereinafter specific embodiments are described as non-limiting examples or illustrations, in which:

Fig 1 is the schematic lateral view of the awning of this invention;

Fig 2 is the schematic vertical view of the pneumatic stretching arm assembly and the hook of this invention;

Fig 3 is the schematic front view of the awning of this invention;

Fig 4 is the schematic lateral view of the hook.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

In the rest status when pneumatic cylinder (8) and pneumatic actuator (15) are under atmospheric pressure, tarpaulin (2) is rolled and held on the roller (1) under the bias force of the wind-up spring and the awning is in stored position. Hook (11) locks the arms (4) and (5) to the folding position. Said tarpaulin (2) fits the roller assembly and front bar (6) well as the correct extra length is given to the tarpaulin towards both side edges though the side ends of said front bar (6) is at a lower level than the roller (1) as illustrated in Fig 3.

When an unfolding button (or the like) is pressed, compressed air from air compressor of a vehicle is introduced to said pneumatic actuator (15) and said pneumatic cylinder (8) through an adequately sized tube or valve. Said hook (11) actuated by pressurized air will unlock the stretching arm assembly. The stretching arm assembly together with the front bar (6) and the whole awning will stretch out under the stretching force from said pneumatic cylinder (8) at an proper rate to the maximum or until said front bar (6) touches a stationary object like the roof of a kiosk to balance the stretching force of the awning. It is preferably such configured that the compressed air is prevented from feeding to said pneumatic actuator (15) and cylinder (8) unless the bus is in full stop, and the pressurized air in said pneumatic actuator (15) and cylinder (8) starts to be released automatically when the vehicle is driven.

When the awning is extended, said non-stretchable tarpaulin (2) is only in full tension across the triangle area defined by central part of said front bar (6) and the two ends of said roller (1), and hangs down towards front side edges due to extra length of tarpaulin towards side edges. The tension across the triangle area of the tarpaulin (2) stabilizes the stretching arms and therefore the awning from swing towards either side in wind. Said two belts (9) extended along two side edges between said roller (1) and said front bar (6) are in full tension, which keeps said front bar (6) from rotating around said axis (7) and to be parallel to said roller (1), and keeps said tarpaulin on both sides being symmetric. Rainwater drains from both sides of the awning. Rainwater that flows into the roller drains from both ends of the bottom trough (18) of the roller assembly.

When a folding button (or the like) is pressed, the pressurized air in said pneumatic actuator (15) and said pneumatic cylinders (8) is disconnected from the air compressor of the vehicle and is released through a discharging valve or hole. The awning is

retracted under the bias force from the wind-up spring and the stretching arms (4) and (5) are folded at a reasonable speed adjustable through the discharging valve. When said stretching arm assembly is folded to the end, said hook (11) will automatically lock said arm assembly to its folding position and trigger the button (16) to signal the driver.

It is important that the vehicle body where said stretching arm assembly being mounted is strong enough or other wise be reinforced.

While the embodiments disclosed in present invention is initially designed for big passenger vehicles, it will be apparent to those skilled in the field that the laterally extendable and retractable awning disclosed herein may be modified or installed in a safe angle to suit other type of vehicles or an industrial building structure where compressed air is available.

Although a single multiple bore pneumatic cylinder for stretching said arm assembly is disclosed in this invention, it will be apparent to those skilled in the art that more and different type pneumatic cylinders can be used to drive the upper arm and forearm separately. Such variation and alternative embodiments should not to be considered as departures from the present invention but shall be considered as falling within the letter and scope of the following claims.

CLAIMS

1. A pneumatic awning system comprising:
   - A retractable awning roller assembly bias the roller to roll the tarpaulin (2) onto the roller (1);
   - A laterally stretching arm assembly with its upper arm (4) joinable to a bus body or the like and its forearm (5) joined to the front bar (6) of an awning roller assembly;
   - Two belts (9) with their one ends rolled on the roller (1) synchronously to said tarpaulin (2) and their other ends tied to the two edges of said front bar (6) of the awning roller assembly;
   - A hook (11) for locking folded stretching arm assembly.
2. A pneumatic awning system according to Claim 1 wherein said winding bias of said roller assembly is from a wind-up spring wound on the roll which provides

sufficient tension to withstand strong wind and heavy rain when the awning is fully extended.

3. A pneumatic awning system according to Claim 1 wherein said tarpaulin (2) in said roller assembly is thin and light yet strong and weathering-resistant, and non-stretchable in all directions.

4. A pneumatic awning system according to Claim 1 wherein all parts of said roller assembly and stretching arm assembly are resistant to acidic rainwater.

5. A pneumatic awning system according to Claim 1 wherein said stretching arm assembly comprises a joined upper arm (4) and forearm (5), a pneumatic cylinder (8) providing stretching force to said joined upper arm and forearm, a mounting (17), vertical axes (7) and corresponding bearings joining said upper (4) arm and forearm (5), and joining joined arms to said mounting (17) and said front bar (6).

6. A pneumatic awning system according to Claim 5 wherein said stretching arm assembly stretches out perpendicularly to said axes (7) under the resultant force of stretching force from said pneumatic cylinder (8) and pulling force acting upon said front bar (6) by said wind-up spring through tension across said tarpaulin (2).

7. A pneumatic awning system according to Claim 6 wherein said stretching arm assembly when fully stretched is strong enough to withstand resultant vertical force and torque from the weight of system, rainwater and wind load.

8. A pneumatic awning system according to Claim 1 wherein said two belts (9) with their one ends rolled on the two ends of said roller (1) are tied to the two side ends of said front bar (6) at the same level through two turning pulleys (10), capable of keeping said front bar (6) to be parallel to said roller (1) all the time.

9. A pneumatic awning system according to Claim 1 wherein the resultant strength of said awning from said stretching force of said stretching arm assembly and the tensions across said non-stretchable tarpaulin (2) and said two belts (9) is enough to prevent the fully extended awning from swing left and right in strong wind.

10. A pneumatic awning system according to Claim 1 wherein said tarpaulin (2) fits said roller (1) and said front bar (6) well along the full width of said tarpaulin (2) when the awning is in its stored position, and said tarpaulin (2) hangs down along its side edges when the awning is extended due to extra length left to the part of tarpaulin towards side edges, allowing rainwater to drain to the sides of the awning.

11. A pneumatic awning system according to Claim 5 wherein said pneumatic cylinder (8) is multiple bore type which provides greater extending force at its initial stage of extending to compensate the shorter arm-of-force when said stretching arm assembly is folded, and provides less stretching force after said stretching arm assembly is further extended.

12. A pneumatic awning system according to Claim 1 wherein said pneumatic hook (11) unlocks folded said stretching arm assembly when and only when pressurized air is introduced into said pneumatic actuator (15) by turning the hook arm (12) upward, and returns to locking position with the help of spring (14) whenever pressurized air in said pneumatic actuator (15) is released.