

TRUCK AIR HORN SYSTEM WITH ADJUSTABLE SOUND VOLUME

TECHNICAL FIELD

5 **[0001]** The present invention belongs to the field of auto parts, and particularly relates to a truck air horn system with an adjustable sound volume.

BACKGROUND

10 **[0002]** The common honking system of a truck is an air horn honking system. During the driving of the truck, a honking warning is given to possible driving dangers to ensure driving safety.

15 **[0003]** The sound volume of existing truck air horn honking systems is generally large, and the sound volume cannot be adjusted according to the surrounding environment. When the vehicle is driven in an urban area, the pedestrians around the vehicle are dense, and residential areas are relatively close to the road where the vehicle travels. When the horn honks, it causes excessive noise interference or even noise damage to the surrounding people and residential areas.

SUMMARY

20 **[0004]** An objective of the present invention is to provide a truck air horn system with an adjustable sound volume, to solve the problem in the prior art that the sound volume of the truck air horn cannot be adjusted and cannot be adapted to the surrounding situation.

25 **[0005]** The present invention is implemented by the following technical solutions.

25 **[0006]** A truck air horn system with an adjustable sound volume comprises an air horn, a horn air inlet pipe, an air volume-controlling electromagnetic valve, an electromagnetic valve air inlet pipe and a sound volume-controlling switch.

30 **[0007]** The sound volume-controlling switch is connected to an electromagnetic coil port of the air volume-controlling electromagnetic valve by a wire; an end of the electromagnetic valve air inlet pipe is connected to an air source, and another end thereof is connected to an air inlet of the air volume-controlling electromagnetic valve, an end of the horn air inlet pipe is connected to an air outlet of the air volume-controlling electromagnetic valve, and another end of the horn air inlet pipe is connected to an air inlet of the air horn.

30 **[0008]** The air volume-controlling electromagnetic valve comprises an

electromagnetic valve housing, an electromagnetic valve air outlet port, an electromagnetic valve air inlet port, the electromagnetic coil port, a first spring, a piston, an electromagnetic coil and a shift fork.

[0009] The electromagnetic valve air outlet port is disposed on the electromagnetic valve housing and connected to the air outlet of the electromagnetic valve, the electromagnetic valve air inlet port is disposed on the electromagnetic valve housing, and connected to the air inlet of the electromagnetic valve; the electromagnetic coil port is electrically connected to the electromagnetic coil by a wire.

[0010] The first spring, the piston, the shift fork and the electromagnetic coil are all disposed in the electromagnetic valve housing; an air passage is disposed in the electromagnetic valve housing, and the air passage is respectively connected to the air outlet of the electromagnetic valve and the air inlet of the electromagnetic valve; the air passage is opened or closed by sliding the piston.

[0011] A piston slide rail is disposed in the electromagnetic valve housing, the piston is movably disposed in the piston slide rail, an end of the first spring is abutted against an inner wall of the electromagnetic valve housing, and another end thereof is abutted against an end of the piston.

[0012] A shift fork slide rail and an electromagnetic coil accommodating portion are disposed in the electromagnetic valve housing; the shift fork slides in the shift fork slide rail, and the electromagnetic coil is disposed in the electromagnetic coil accommodating portion.

[0013] An end of the shift fork is clamped and connected with the piston, and another end of the shift fork is movably attracted to the electromagnetic coil.

[0014] The outer surface of the piston is provided with a circle of groove, the groove is perpendicular to an axial centerline of the piston, an opening is disposed in the end of the shift fork where the shift fork is clamped and connected with the piston, the opening is clamped and connected in the groove, and an iron sucking disk is disposed in the position of the shift fork corresponding to the electromagnetic coil.

[0015] The shift fork comprises a shift fork body, an upper end of the shift fork body is provided with the opening, and the opening is arc-shaped and cooperates with the groove.

[0016] Each of two sides of the shift fork body is disposed with one guide sliding block, the guide sliding blocks slidably cooperate with the shift fork slide rail, the shift fork body and the two guide sliding blocks form a cross shape, and the iron sucking disk is disposed at the center of the cross shape.

[0017] The shift fork body is perpendicular to an axial centerline of the piston.

[0018] The electromagnetic valve assembly further comprises an air volume-controlling switch, and the air volume-controlling switch is electrically connected to the electromagnetic coil port by a controlling switch connector.

5 **[0019]** The sound volume-controlling switch comprises a controlling switch connector, a first electrode, a second electrode, a second spring, and a wire post; the first electrode and the second electrode are both connected to the controlling switch connector by a wire, wherein the first electrode is a movable end, the second electrode is a fixed end, the second electrode is a hollow tube structure of which an end is closed and another end is
10 subjected to drawing down, the spring is disposed in the hollow tube of the second electrode, an end of the wire post is disposed in the hollow tube of the second electrode, and another end of the wire post extends from the hollow tube of the second electrode and is movably connected to the first electrode.

[0020] A longitudinal section of the wire post is approximately trapezoidal, the wire
15 post comprises a base and a binding post, and a circumscribed circle diameter of the base is larger than that of the binding post; and the base is electrically connected to the binding post.

[0021] A top end of the binding post is electrically connected to the first electrode, and the base is electrically connected to an inner side surface of the second electrode.

20 **[0022]** The truck air horn system with an adjustable sound volume has the following beneficial effects.

[0023] In the present technical solutions, the air volume-controlling electromagnetic valve, according to the current magnitude signal inputted by the sound volume-controlling switch, drives the electromagnetic coil in the air volume-controlling electromagnetic valve
25 to generate a magnetic field of a corresponding magnitude, thereby driving the piston to move for a corresponding displacement. Therefore, the size of a section of the air passage is controlled to adjust the air volume entering the air horn. The larger the current inputted to the air volume-controlling electromagnetic valve is, the larger the section of the air passage is, and thus the larger the sound volume of the horn is. On the contrary, the smaller the
30 current is, the smaller the sound volume is. Hence, the driver can freely adjust the sound volume of the air horn according to the driving environment and requirements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. 1 is a schematic view of an air horn system according to the present

invention.

[0025] FIG. 2 is a schematic view of an external structure of an air volume-controlling electromagnetic valve.

[0026] FIG. 3 is a structural schematic view of the air volume-controlling electromagnetic valve without a back cover.

[0027] FIG. 4 is a structural schematic view of an electromagnetic valve housing.

[0028] FIG. 5 is a structural schematic view of a piston.

[0029] FIG. 6 is a structural schematic view of a shift fork.

[0030] FIG. 7 is a schematic view of cooperation between the piston and the shift fork.

[0031] FIG. 8 is a schematic view of a closing state of the air volume-controlling electromagnetic valve.

[0032] FIG. 9 is a schematic view of a partially opening state of the air volume-controlling electromagnetic valve.

[0033] FIG. 10 is a schematic view of a fully opening state of the air volume-controlling electromagnetic valve.

[0034] FIG. 11 is a structural schematic structural view of a sound volume-controlling switch.

[0035] FIG. 12 is a schematic view of the sound volume-controlling switch in an off state.

[0036] FIG. 13 is a schematic view of the sound volume-controlling switch in an on state.

[0037] FIG. 14 is a circuit diagram of the air horn system.

[0038] Reference signs of the accompanying drawings: 1 air horn, 2 horn air inlet pipe, 3 electromagnetic valve air inlet pipe, 4 air volume-controlling electromagnetic valve, 5 sound volume-controlling switch, 6 power source, 41 electromagnetic valve housing, 42 electromagnetic valve air outlet port, 43 electromagnetic valve air inlet port, 44 electromagnetic coil port, 45 wire, 46 first spring, 47 piston, 48 shift fork, 49 electromagnetic coil, 50 piston slide rail, 51 electromagnetic coil accommodating portion, 52 shift fork slide rail, 53 air passage, 471 groove, 481 shift fork body, 482 opening, 483 guide sliding block, 484 iron sucking disk, 501 controlling switch connector, 502 first electrode, 503 wire post, 504 second electrode, 505 second spring.

DETAILED DESCRIPTION

[0039] The technical solutions of the present invention are explained in detail below by the embodiments, and the following embodiments are merely illustrative, and are merely intended to explain and illustrate the technical solutions of the present invention rather than limiting the technical solutions of the present invention.

5 **[0040]** The present application provides a truck air horn system with an adjustable sound volume, as shown in FIGS. 1 to 14, which comprises an air horn 1, a horn air inlet pipe 2, an air volume-controlling electromagnetic valve 4, an electromagnetic valve air inlet pipe 3, and a sound volume-controlling switch 5.

10 **[0041]** The air horn is a sound source, and is driven to sound by high pressure air provided by the horn air inlet pipe. The function of the air volume-controlling electromagnetic valve is to drive, according to a current magnitude signal inputted by the sound volume-controlling switch, an electromagnetic coil to generate a magnetic field of a corresponding magnitude, thereby driving the piston to move for a corresponding displacement. Therefore, the size of a section of an air passage is controlled to adjust the air
15 volume entering the air horn.

[0042] The sound volume-controlling switch is in the steering wheel for a driver. The driver can control the strength of pressing the controlling switch according to a surrounding road situation. The more urgent the situation is, the longer the pressing stroke of the switch is. And, the larger the current inputted to the air volume-controlling electromagnetic valve
20 is, the larger the section of the air passage is, and thus the larger the sound volume of the horn is. On the contrary, when the situation is not urgent, the pressing stroke of the switch is shorter, and the sound volume is smaller; on this condition, there is no excessive interference to surrounding pedestrians.

[0043] High-pressure air with a stable pressure can be obtained by the system from
25 an air reservoir of the truck to enter the air volume-controlling electromagnetic valve.

[0044] The sound volume-controlling switch 5 is connected to an electromagnetic coil port 44 of the air volume-controlling electromagnetic valve 4 by a wire and a controlling switch connector 501. An end of the electromagnetic valve air inlet pipe 3 is connected to an air source, and another end thereof is connected to an electromagnetic valve
30 air inlet port 43. An end of the horn air inlet pipe 2 is connected to an electromagnetic valve air outlet port 42, and another end of the horn air inlet pipe 2 is connected to an air inlet of the air horn 1.

[0045] The air volume-controlling electromagnetic valve 4 comprises an electromagnetic valve housing 41, the electromagnetic valve air outlet port 42, the

electromagnetic valve air inlet port 43, the electromagnetic coil port 44, a first spring 46, a piston 45, an electromagnetic coil 49, and a shift fork 48.

[0046] As shown in the accompanying drawing, in the present application, the electromagnetic valve housing is of a shell-shaped structure, and a cavity is disposed in the electromagnetic valve housing. The electromagnetic valve air outlet port is disposed on the electromagnetic valve housing and connected to the air outlet of the electromagnetic valve. The electromagnetic valve air inlet port is disposed on the electromagnetic valve housing and connected to the air inlet of the electromagnetic valve. The electromagnetic coil port 44 is electrically connected to the electromagnetic coil 49 by the wire 45.

[0047] The first spring, the piston, the shift fork and the electromagnetic coil are all disposed in the electromagnetic valve housing. The electromagnetic valve housing 41 is provided with a piston slide rail 50 and an air passage 53. The air passage is respectively connected to the air outlet of the electromagnetic valve and the air inlet of the electromagnetic valve. The axial centerline of the piston slide rail is perpendicular to the axial centerline of the air passage, so as to ensure that the piston can completely close the air passage and prevent leakage of air.

[0048] The piston is movably disposed in the piston slide rail. An end of the first spring is abutted against the inner wall of the electromagnetic valve housing, and another end thereof is abutted against an end of the piston. The air passage is opened, closed or partially opened by sliding the piston.

[0049] A shift fork slide rail 52 and an electromagnetic coil accommodating portion 51 are further disposed in the electromagnetic valve housing. The shift fork slides in the shift fork slide rail, and the electromagnetic coil is disposed in the electromagnetic coil accommodating portion.

[0050] An end of the shift fork is clamped and connected with the piston, and another end of the shift fork is movably attracted to the electromagnetic coil.

[0051] The outer surface of the piston is provided with a circle of groove 471 which is perpendicular to the axial centerline of the piston. In this way, it can be ensured that the piston does not shift when moving along the piston slide rail and the instability of airflows is avoided.

[0052] An opening 482 is disposed in the end of the shift fork where the shift fork is clamped and connected with the piston. The opening is clamped and connected in the groove. An iron sucking disk 484 is disposed in the position of the shift fork corresponding to the electromagnetic coil. The iron sucking disk is made of an iron material and can be

attracted by the electrified electromagnetic coil. In the present embodiment, the iron sucking disk is circular, and the center of the iron sucking disk coincides with the axial centerline of the electromagnetic coil. In this way, the efficiency of an attraction force of the electromagnetic coil for the iron sucking disk can be improved.

5 **[0053]** The shift fork 48 comprises a shift fork body 481. An upper end of the shift fork body is provided with the opening 482. The opening is arc-shaped and cooperates with the groove 471. The piston is driven to move by the movement of the shift fork.

[0054] Each of two sides of the shift fork body is disposed with one guide sliding block. The guide sliding blocks slidably cooperate with the shift fork slide rail. The shift
10 fork body and the two guide sliding blocks form a cross shape, and the iron sucking disk 484 is disposed at the center of the cross shape.

[0055] The shift fork body is perpendicular to the axial centerline of the piston, so as to ensure that the force for the piston is stable when the shift fork moves along with the iron sucking disk.

15 **[0056]** The air volume-controlling electromagnetic valve further comprises an air volume-controlling switch. The air volume-controlling switch is electrically connected to the electromagnetic coil port by a controlling switch connector. Change of the stroke of the air volume-controlling switch changes the current on the electromagnetic coil, and thus changes the attraction force for the iron sucking disk , so that the opening degree of the air
20 passage can be controlled.

[0057] The sound volume-controlling switch 5 comprises the controlling switch connector 501, a first electrode 502, a second electrode 504, a second spring 505, and a wire post 503. The first electrode and the second electrode are both connected to the controlling switch connector by the wire, wherein the first electrode is a movable end, and the second
25 electrode is a fixed end. The second electrode is a hollow tube structure of which an end is closed and another end is subjected to drawing down. The spring is disposed in the hollow tube of the second electrode. An end of the wire post is disposed in the hollow tube of the second electrode, and another end of the wire post extends from the hollow tube of the second electrode and is movably connected to the first electrode.

30 **[0058]** A longitudinal section of the wire post is approximately trapezoidal, the wire post comprises a base and a binding post, and a circumscribed circle diameter of the base is larger than that of the binding post. The base is electrically connected to the binding post.

[0059] A top end of the binding post is electrically connected to the first electrode, and the base is electrically connected to an inner side surface of the second electrode.

[0060] When the air volume-controlling electromagnetic valve is in a closed state, the electromagnetic coil is not powered on. At this time, there is no attraction force for the iron sucking disk of the shift fork, and the piston is at a tail end of the piston slide rail under elastic force of the first spring. The end of the piston completely blocks the air outlet. No air
5 flows through the horn air inlet pipe, and the horn does not sound.

[0061] When the air volume-controlling electromagnetic valve is in a partially open state, the electromagnetic coil is powered on, and has certain electromagnetic attraction force for the iron sucking disk on the shift fork. The shift fork is driven to overcome a part of the elastic force of the first spring to slide toward one side. The piston is driven by the
10 shift fork to synchronously slide. The air outlet is partially opened, and certain air volume passes therethrough; at this time, the sound volume of the horn is less than the maximal sound volume value.

[0062] When the air volume-controlling electromagnetic valve is in a fully open state, the electromagnetic coil is powered on. The current reaches a maximum value, and the
15 iron sucking disk on the shift fork is subjected to the maximal electromagnetic force. The shift fork is driven to overcome a part of the elastic force of the first spring to slide toward one side, and the piston is driven by the shift fork to slide synchronously. The air outlet is fully opened, and the air volume is maximal. At this time, the sound volume of the horn is the maximal sound volume value.

[0063] The sound volume-controlling switch is mounted in the steering wheel for the driver. The first electrode of the sound volume-controlling switch is a movable end, and the second electrode thereof is a fixed end. The second electrode is made of a high-resistivity material, and functions as a variable resistor in a circuit system. The wire post slides within the second electrode, and the wire post is electrically connected to the inside of the second
25 electrode only by means of the base. The second spring applies an upward elastic force to the wire post, so that the wire post can be back to the original position after use. There is a gap between the first electrode and the wire post.

[0064] When the horn is not used, there is a gap between the first electrode and the wire post, and the circuit is in an OFF state at this time.

[0065] Although the technical solutions of the present invention have been described in detail, it is apparent to those skilled in the art that the modifications, substitutions, modifications, etc., on the technical solutions should be within the protective scope of the present application.

CLAIMS

1. A truck air horn system with an adjustable sound volume, characterized in that the truck air horn system comprises: an air horn, a horn air inlet pipe, an air volume-controlling
5 electromagnetic valve, an electromagnetic valve air inlet pipe and a sound volume-controlling switch, wherein

the sound volume-controlling switch is connected to an electromagnetic coil port of the air volume-controlling electromagnetic valve by a wire; an end of the electromagnetic valve
10 air inlet pipe is connected to an air source, and another end thereof is connected to an air inlet of the air volume-controlling electromagnetic valve; an end of the horn air inlet pipe is connected to an air outlet of the air volume-controlling electromagnetic valve, and another end of the horn air inlet pipe is connected to an air inlet of the air horn.

2. The truck air horn system with an adjustable sound volume according to claim 1,
15 wherein the air volume-controlling electromagnetic valve comprises an electromagnetic valve housing, an electromagnetic valve air outlet port, an electromagnetic valve air inlet port, the electromagnetic coil port, a first spring, a piston, an electromagnetic coil and a shift fork;

the electromagnetic valve air outlet port is disposed on the electromagnetic valve housing
20 and connected to the air outlet of the electromagnetic valve, the electromagnetic valve air inlet port is disposed on the electromagnetic valve body, and connected to the air inlet of the electromagnetic valve; the electromagnetic coil port is electrically connected to the electromagnetic coil by a wire;

the first spring, the piston, the shift fork and the electromagnetic coil are all disposed in
25 the electromagnetic valve housing; an air passage is disposed in the electromagnetic valve housing, and the air passage is respectively connected to the air outlet of the electromagnetic valve and the air inlet of the electromagnetic valve; the air passage is opened or closed by sliding the piston;

a piston slide rail is disposed in the electromagnetic valve housing, the piston is movably
30 disposed in the piston slide rail, an end of the first spring is abutted against an inner wall of the electromagnetic valve housing, and another end thereof is abutted against an end of the piston;

a shift fork slide rail and an electromagnetic coil accommodating portion are disposed in the electromagnetic valve housing; the shift fork slides in the shift fork slide rail, and the

electromagnetic coil is disposed in the electromagnetic coil accommodating portion; and

an end of the shift fork is clamped and connected with the piston, and another end of the shift fork is movably attracted to the electromagnetic coil.

5 3. The truck air horn system with an adjustable sound volume according to claim 2, wherein an outer surface of the piston is provided with a circle of groove, the groove is perpendicular to an axial centerline of the piston, an opening is disposed in the end of the shift fork where the shift fork is clamped and connected with the piston, the opening is clamped and connected in the groove, and an iron sucking disk is disposed in the position of
10 the shift fork corresponding to the electromagnetic coil.

4. The truck air horn system with an adjustable sound volume according to claim 3, wherein the shift fork comprises a shift fork body, an upper end of the shift fork body is provided with the opening, and the opening is arc-shaped and cooperates with the groove;
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each of two sides of the shift fork body is disposed with one guide sliding block, the guide sliding blocks slidably cooperate with the shift fork slide rail, the shift fork body and the two guide sliding blocks form a cross shape, and the iron sucking disk is disposed at the center of the cross shape.

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5. The truck air horn system with an adjustable sound volume according to claim 4, wherein the shift fork body is perpendicular to the axial centerline of the piston.

6. The truck air horn system with an adjustable sound volume according to claim 2,
25 wherein the electromagnetic valve assembly further comprises an air volume-controlling switch, and the air volume-controlling switch is electrically connected to the electromagnetic coil port by a controlling switch connector.

7. The truck air horn system with an adjustable sound volume according to claim 1,
30 wherein the sound volume-controlling switch comprises a controlling switch connector, a first electrode, a second electrode, a second spring, and a wire post; the first electrode and the second electrode are both connected to the controlling switch connector by a wire, wherein the first electrode is a movable end, the second electrode is a fixed end, the second electrode is a hollow tube structure of which an end is closed and another end is subjected to

drawing down, the spring is disposed in the hollow tube of the second electrode, an end of the wire post is disposed in the hollow tube of the second electrode, and another end of the wire post extends from the hollow tube of the second electrode and is movably connected to the first electrode.

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8. The truck air horn system with an adjustable sound volume according to claim 7, wherein a longitudinal section of the wire post is approximately trapezoidal, the wire post comprises a base and a binding post, and a circumscribed circle diameter of the base is larger than that of the binding post; the base is electrically connected to the binding post;

10 and

a top end of the binding post is electrically connected to the first electrode, and the base is electrically connected to an inner side surface of the second electrode.