

A SYNCHRONOUS CONSTRUCTION SYSTEM AND CONSTRUCTION PLATFORM FOR CROSS PASSAGE

TECHNICAL FIELD

[0001] The present invention belongs to the technical field of tunnel boring, and in particular to a synchronous construction system and construction platform for a cross passage.

BACKGROUND

[0002] *Code for Design of Metro* (GB 50157-2013) and *Code for Design on Rescue Engineering for Disaster Prevention and Evacuation of Railway Tunnel* (TB 10020-2017) specify that between two single line section tunnels, if the continuous length of the tunnels is greater than 600 m, there shall be a cross passage, and Class A fireproof doors that can be opened in both directions shall be installed at both ends of the passages.

[0003] A mechanical process for excavating the cross passage by using full-face tunnel boring equipment has high efficiency and high safety, and has been gradually popularized and applied at present. When excavating the cross passage by the mechanical process, relevant supporting devices, such as a launch device, an electrical control cabinet, and a hydraulic pump station need to be arranged in a main tunnel, and a space in the main tunnel will be unavoidably occupied. Therefore, in order to prevent the relevant supporting devices during cross passage construction from influencing the passing of a material transport vehicle during main tunnel construction, the cross passage is generally constructed after the main tunnel construction is completed. It is not difficult to understand that in such a manner, the cross passage construction and the main tunnel construction are divided into two independent processes, and there is still room for improvement of the construction efficiency.

[0004] A utility model patent with the authorized announcement number CN219840653U discloses a synchronous construction platform for a cross passage, the construction platform includes a framework, a first track, a second track and a track changing device (turnout) are arranged on the framework, both the first track and the second track may dock with the main tracks in the main tunnel, and the track changing device is configured to switch a docking state of the first track and the second track with the main tracks. The first track may support a jacking system required for tunneling construction of the cross passage, the second track may allow a material vehicle and persons to pass through during the main tunnel construction, and cross

passage tunneling equipment may be jacked forward to excavate the cross passage during the main tunnel construction.

[0005] The above patent only considers a material transportation problem of the main tunnel during construction. However, materials, such as segments to be assembled or muck generated during excavation also need to be transported during the cross passage construction. In the above patent, it may be determined that the main tracks in the main tunnel only include two tracks or two lines of tracks. When the materials to be transported in the main tunnel and the cross passage are respectively transported by different transport vehicles, there will unavoidably be a phenomenon that the vehicles meet each other, the first track and the second track on the synchronous construction platform need to be flexibly used during vehicle meeting, so that one material transport vehicle may give way to the other material transport vehicle, and at this moment, one material transport vehicle needs to stop for waiting for a period of time, so that the material transportation will be influenced. Additionally, if one material transport vehicle generates a fault problem to stop at a rear side of the synchronous construction platform in the main track, the other material transport vehicle may normally pass only after waiting for the repair completion or towing away of the fault vehicle. If the waiting time is too long, the main tunnel or cross passage tunneling equipment needs to be shut down for a period of time, so that the construction efficiency will be influenced. Therefore, how to ensure no mutual influence between the material transportation in the main tunnel and the cross passage is still a problem to be solved at present.

SUMMARY

[0006] The objective of the present invention is to provide a synchronous construction system for a cross passage to solve the technical problem of low construction efficiency due to mutual influence of material transportation during synchronous construction of a main tunnel and the cross passage in the prior art. The objective of the present invention is to provide a synchronous construction platform for a cross passage. The synchronous construction platform for a cross passage may be used for construction of a main tunnel provided with at least four lines of main tracks, so as to realize no mutual interference between main tunnel material transportation and cross passage material transportation, and the construction efficiency is improved.

[0007] In order to realize the above objective, the synchronous construction system for a cross passage provided by the present invention has the following technical solution:

[0008] A synchronous construction system for a cross passage includes a synchronous

construction platform and at least four lines of main tracks arranged in a main tunnel and distributed at intervals in a transverse direction, among which two lines of main tracks allow a main tunnel material transport vehicle to pass through, the other two lines of main tracks allow a cross passage material transport vehicle to pass through, the synchronous construction platform is provided with traveling wheels capable of traveling along at least two lines of main tracks, two docking tracks allowing the main tunnel material transport vehicle to pass through and an arrangement area for arranging cross passage tunneling equipment are arranged on the synchronous construction platform, the two docking tracks are positioned at a transverse side of the arrangement area, and docking sections configured to dock with the two lines of main tracks allowing the main tunnel material transport vehicle to pass through are respectively arranged at front ends and rear ends of the two docking tracks.

[0009] As further improvement, each of the two docking tracks respectively includes an external expansion section deviating to a side far away from the arrangement area relative to the respective docking section.

[0010] As further improvement, the synchronous construction platform includes a large-span section and a small-span section connected to a rear side of the large-span section, a transverse span of the large-span section is greater than a span between the two lines of main tracks at the outermost side, the arrangement area is arranged in the large-span section, a transverse span of the small-span section is greater than a transverse span of the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, traveling wheels configured for the small-span section are configured to travel along the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, a connecting position of the small-span section and the large-span section is positioned at a transverse end of the large-span section, and a space between the other transverse ends of the small-span section and the large-span section meets the passing of the cross passage material transport vehicle.

[0011] As further improvement, traveling wheels configured for the large-span section are configured to travel along the two lines of main tracks at the outermost side.

[0012] As further improvement, the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment includes a material transfer device configured to receive materials on the cross passage material transport vehicle and forwards transfer the materials.

[0013] As further improvement, the material transfer device includes upright posts arranged on the synchronous construction platform and a track beam supported by the upright posts, a material crane travels on the track beam, the track beam sequentially includes a material

conveying section, a transition section and a material receiving section from a front side to a rear side, the material conveying section is positioned in a middle position of the synchronous construction platform, and the material receiving section deviates to a side far away from the docking track relative to the material conveying section.

[0014] As further improvement, the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment includes a tunneling main machine and a muck discharging device configured to receive muck discharged from the tunneling main machine and convey the muck into a muck hopper of the cross passage material transport vehicle.

[0015] As further improvement, the muck discharging device is composed of a muck discharging pipe connected to a tail of a screw conveyor of the tunneling main machine.

[0016] Beneficial effects: The present invention creatively provides a synchronous construction system for a cross passage capable of realizing no mutual interference between the main tunnel material transportation and cross passage material transportation. Specifically, the main tracks have at least four lines, during construction, the main tunnel material transport vehicle for transporting materials related to the main tunnel may pass along two lines of tracks, the cross passage material transport vehicle for transporting materials related to the cross passage may pass along the other two lines of main tracks, and during traveling along the main tracks, main tunnel materials and cross passage materials have no mutual interference. At the same time, the docking tracks and the arrangement area are arranged on the synchronous construction platform, relevant tunneling equipment during construction of the cross passage may be arranged in the arrangement area, and the main tunnel material transport vehicle may go to the docking tracks of the synchronous construction platform from the main tracks along the docking sections. The docking tracks are arranged at one side of the arrangement area, so at this moment, the main tunnel material transport vehicle cannot influence a normal working of the cross passage construction equipment, the synchronous construction of the cross passage and the main tunnel and the synchronous transportation of the materials may be ensured, and the synchronous construction efficiency is improved.

[0017] In order to realize the above objective, the synchronous construction platform for a cross passage provided by the present invention has the following technical solution.

[0018] A synchronous construction platform for a cross passage is provided with traveling wheels capable of traveling along at least two lines of main tracks in a main tunnel, two docking tracks allowing a main tunnel material transport vehicle to pass through and an arrangement area for arranging cross passage tunneling equipment are arranged on the synchronous

construction platform, the two docking tracks are positioned at a transverse side of the arrangement area, and docking sections configured to dock with two lines of main tracks allowing the main tunnel material transport vehicle to pass through are respectively arranged at front ends and rear ends of the two docking tracks.

[0019] As further improvement, each of the two docking tracks respectively includes an external expansion section deviating to a side far away from the arrangement area relative to the respective docking section.

[0020] As further improvement, the synchronous construction platform for a cross passage includes a large-span section and a small-span section connected to a rear side of the large-span section, a transverse span of the large-span section is greater than a span between the two lines of main tracks at an outermost side in the main tunnel, the arrangement area is arranged in the large-span section, a transverse span of the small-span section is greater than a transverse span of the two lines of main tracks allowing the main tunnel material transport vehicle to pass through in the main tunnel, traveling wheels configured for the small-span section are configured to travel along the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, a connecting position of the small-span section and the large-span section is positioned at a transverse end of the large-span section, and a space between the other transverse ends of the small-span section and the large-span section meets a passing of the cross passage material transport vehicle.

[0021] As further improvement, traveling wheels configured for the large-span section are configured to travel along the two lines of main tracks at the outermost side in the main tunnel.

[0022] As further improvement, the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment includes a material transfer device configured to receive materials on the cross passage material transport vehicle and forwards transfer the materials.

[0023] As further improvement, the material transfer device includes upright posts arranged on the synchronous construction platform and a track beam supported by the upright posts, a material crane travels on the track beam, the track beam sequentially includes a material conveying section, a transition section and a material receiving section from a front side to a rear side, the material conveying section is positioned in a middle position of the synchronous construction platform, and the material receiving section deviates to a side far away from the docking track relative to the material conveying section.

[0024] As further improvement, the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment includes a tunneling main

machine and a muck discharging device configured to receive muck discharged from the tunneling main machine and convey the muck into a muck hopper of the cross passage material transport vehicle.

[0025] As further improvement, the muck discharging device is composed of a muck discharging pipe connected to a tail of a screw conveyor of the tunneling main machine.

[0026] Beneficial effects are as follows: The present invention creatively provides a synchronous construction platform capable of being used for construction of a main tunnel provided with at least four lines of main tracks in transverse distribution at intervals. Specifically, during construction, the main tunnel material transport vehicle for transporting materials related to the main tunnel may pass along two lines of tracks, the cross passage material transport vehicle for transporting materials related to the cross passage may pass along the other two lines of main tracks, and during traveling along the main tracks, main tunnel materials and cross passage materials have no mutual interference. At the same time, the docking tracks and the arrangement area are arranged on the synchronous construction platform, relevant tunneling equipment during construction of the cross passage may be arranged in the arrangement area, and the main tunnel material transport vehicle may go to the docking tracks of the synchronous construction platform from the main tracks along the docking sections. The docking tracks are arranged at one side of the arrangement area, so at this moment, the main tunnel material transport vehicle cannot influence a normal working of the cross passage construction equipment, the synchronous construction of the cross passage and the main tunnel and the synchronous transportation of the materials may be ensured, and the synchronous construction efficiency is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] FIG. 1 is a local axial (main tunnel) view during construction of an embodiment of a synchronous construction system for a cross passage in the present invention.

[0028] FIG. 2 is a front view of an embodiment of a synchronous construction system for a cross passage in the present invention.

[0029] FIG. 3 is a top view of a docking section position (a track beam is omitted) in an embodiment of a synchronous construction system for a cross passage in the present invention.

[0030] FIG. 4 is an axial view of an external expansion section position during construction of an embodiment of a synchronous construction system for a cross passage in the present invention.

[0031] FIG. 5 is an axial view of a docking section position during construction of an embodiment of a synchronous construction system for a cross passage in the present invention.

[0032] FIG. 6 is a top view of a docking section position (including a track beam) during construction in an embodiment of a synchronous construction system for a cross passage in the present invention.

[0033] FIG. 7 is a schematic diagram of a muck discharging structure of a tunneling main machine during construction of an embodiment of a synchronous construction system for a cross passage in the present invention.

[0034] Reference numerals description:

[0035] 1 main track; 2 synchronous construction platform; 3 main tunnel material transport vehicle; 4 cross passage material transport vehicle; 5 tunneling main machine; 101 first track; 102 second track; 201 traveling wheel; 202 docking track; 203 upright post; 204 material crane; 205 back pull device; 206 track beam; 207 small-span section; 208 large-span section; 2021 docking section; 2022 external expansion section; 2061 material conveying section; 2062 transition section; 2063 material receiving section; 401 muck vehicle; 402 segment vehicle; 501 screw conveyor; and 502 muck discharging pipe.

DETAILED DESCRIPTION

[0036] During synchronous construction of a main tunnel and a cross passage, a basic premise is that relevant matched equipment used during construction of the cross passage shall not influence a passing of a material transport vehicle for transporting main tunnel construction materials (called as a main tunnel material transport vehicle for short hereafter). In a construction process of the cross passage, materials also need to be transported, the materials mainly include segments to be assembled and muck generated in an excavation process, of course a corresponding transport vehicle, i.e., a cross passage material transport vehicle needs to be configured, and the cross passage material transport vehicle may travel along main tracks to transport the materials to a corresponding position.

[0037] In order to solve the problem of mutual interference of the cross passage material transport vehicle and the main tunnel material transport vehicle in a transportation process, the present invention has a basic technical idea that four or more lines of main tracks are arranged in the main tunnel, and the main tunnel material transport vehicle and the cross passage material transport vehicle respectively travel along corresponding two lines of main tracks, so that a mutual interference condition of the main tunnel material transport vehicle and the cross

passage material transport vehicle may be avoided. At the same time, two docking tracks docking with the two lines of tracks corresponding to the main tunnel material transport vehicle are arranged on the synchronous construction platform, and front ends and the rear ends of the two docking tracks may respectively dock with the above two lines of tracks. During construction, relevant equipment required during cross passage tunneling may be placed onto the synchronous construction platform, and during cross passage tunneling, the main tunnel material transport vehicle may travel from the main tracks to the docking tracks and to the main tracks, so through the synchronous construction platform, the cross passage material transport vehicle may travel to a position close to the synchronous construction platform along the corresponding two lines of tracks, so as to transport the materials during the cross passage construction.

[0038] The present invention will be further illustrated in detail in conjunction with embodiments and drawings hereafter.

[0039] Specific embodiment of a synchronous construction system for a cross passage provided by the present invention:

[0040] A whole of the synchronous construction system for a cross passage provided by the embodiment, as shown in FIG. 1 to FIG. 3, includes a synchronous construction platform 2 and main tracks 1 capable of being arranged in a main tunnel in use. The main tracks 1 are four lines of tracks (I shape), all of the main tracks 1 are distributed at intervals in a transverse direction of the main tunnel, in the four lines of main tracks 1, the two lines of main tracks 1 allow a main tunnel material transport vehicle 3 to pass through, and the other two lines of main tracks 1 allow a cross passage material transport vehicle 4 to pass through. For convenient description, as shown in FIG. 3, the two lines of main tracks 1 allowing the cross passage material transport vehicle 4 to pass through are defined as first tracks 101, and the two lines of main tracks 1 allowing the main tunnel material transport vehicle 3 to pass through are defined as second tracks 102.

[0041] It needs to be noted here that the cross passage material transport vehicle 4 and the main tunnel material transport vehicle 3 do not specifically indicate a certain vehicle or a certain compartment, according to the tunneling requirements of the cross passage and the main tunnel, they may include muck vehicles for transporting muck, segment vehicles for transporting segments, cutter transport vehicles for transporting cutters, etc.

[0042] The synchronous construction platform 2 is provided with traveling wheels 201 capable of traveling along the two lines of main tracks 1, the two lines of main tracks 1 corresponding to the traveling wheels 201 may realize an effect of supporting the synchronous

construction platform 2, a specific quantity of the traveling wheels 201 is not limited herein, and those skilled in the art may flexibly select according to a carrying capacity. Preferably, by considering the carrying capacity, under a condition of meeting a transverse span of the synchronous construction platform 2, the traveling wheels 201 may be configured to travel along the two lines of main tracks 1 at an outermost side, so as to ensure the longer supporting span of the traveling wheels 201 on the synchronous construction platform 2, so that the high carrying and supporting capacity may be realized. In other implementations, according to different weight and gravity center layout distribution of equipment carried on the synchronous construction platform 2, the traveling wheels 201 may also be configured to travel along another two lines of main tracks 1, for example, the first and third lines of main tracks 1 counted from the left to right in FIG. 1.

[0043] Two docking tracks 202 allowing the main tunnel material transport vehicle 3 to pass through are arranged on the synchronous construction platform 2, docking sections 2021 are respectively arranged at the front ends and the rear ends of the two docking tracks 202, and the docking sections 2021 may dock with the second tracks 102. During construction, the main tunnel material transport vehicle 3 may go to the docking tracks 202 from the second tracks 102 along the docking section 2021, and may return to the main tracks 1 from the docking section 2021 at the other end after traveling for a distance along the docking tracks 202, so that the normal passing is realized.

[0044] An arrangement area is also formed on the synchronous construction platform 2, and the arrangement area is configured to arrange cross passage tunneling equipment. The cross passage tunneling equipment refers to relevant equipment required during construction of the cross passage, includes a tunneling main machine 5 and supporting devices required by the tunneling main machine 5, such as an electric control cabinet and a hydraulic pump station as shown in FIG. 1, and further includes a material transfer device, etc. The material transfer device is configured to receive materials from the cross passage material transport vehicle 4, and forwards transfer and transport the materials. The above docking tracks 202 are positioned at one side of a transverse direction of the arrangement area, i.e., the right side in FIG. 1, so when the main tunnel material transport vehicle 3 moves along the docking tracks 202, the cross passage construction equipment and the main tunnel material transport vehicle 3 may not generate mutual interference, and the normal proceeding of the synchronous construction is ensured.

[0045] Through analysis, it could be known that during construction according to the embodiment, the main tunnel material transport vehicle 3 and the cross passage material

transport vehicle 4 respectively travel and move along different tracks. As shown in FIG. 3, the main tunnel material transport vehicle 3 may travel along the second tracks 102, and pass through the docking tracks 202, and then continuously travel along the second tracks 102, and the cross passage material transport vehicle 4 may travel to a rear side of the synchronous construction platform 2 along the first tracks 101 to meet the cross passage construction requirements. Compared with the prior art, the embodiment has the advantages that during construction, the material transportation during the cross passage construction and the material transportation during the main tunnel construction are respectively independent, the main tunnel material transport vehicle 3 and the cross passage material transport vehicle 4 have no mutual influence, which may realize synchronous construction and synchronous transportation, and have higher construction efficiency.

[0046] As shown in FIG. 1 to FIG. 3, more equipment is needed during the cross passage construction, and a long length may also be realized in the front and rear direction of the synchronous construction platform 2. In different relevant equipment, a size of the tunneling main machine 5 is the greatest, and an occupied space is the largest. For a main tunnel with a small diameter, the main tracks 1 are generally arranged at a bottom portion of the main tunnel, the space at the bottom portion of the main tunnel is limited, and at this moment, the problem that the main tunnel material transport vehicle 3 may not smoothly pass through the docking tracks 202 may occur. As shown in FIG. 3 and FIG. 4, in a preferable solution, the two docking tracks 202 further include an external expansion section 2022 outwards deviating relative to the docking sections 2021, and a distance between the external expansion section 2022 and the arrangement area is greater than a distance between the docking sections 2021 and the arrangement area, so as to ensure that the main tunnel material transport vehicle 3 will not interfere with the large-size equipment in the arrangement area when passing through. Of course, in other implementations, for a main tunnel with a large diameter, a distance between two adjacent lines of main tracks 1 is sufficient, and a width of the synchronous construction platform 2 is sufficient for placing the equipment, and the docking tracks 202 may be made into the tracks with the same extending direction as the second tracks 102 in the main tracks 1.

[0047] In order to enable the cross passage material transport vehicle 4 to move to a position closer to the tunneling main machine 5 to conveniently realize material receiving and transportation, further, from different transverse spans, as shown in FIG. 3, the synchronous construction platform 2 includes a large-span section 208 and a small-span section 207, the small-span section 207 is connected to a rear side of the large-span section 208, and a connecting manner is preferably hinging. The transverse span of the large-span section 208 is

greater than the span between the two lines of main tracks 1 at the outermost side, so as to ensure that the synchronous construction platform 2 has a larger area to place the equipment, the arrangement area is practically positioned in the large-span section 208, and the traveling wheels 201 configured for the small-span section 207 practically travel along the second tracks 102. As shown in FIG. 3, a connecting position of the small-span section 207 and the large-span section 208 is positioned at a transverse end of the large-span section 208, and a space between the other transverse ends of the small-span section 207 and the large-span section 208 meets a passing of the cross passage material transport vehicle 4. Therefore, during construction, the cross passage material transport vehicle 4, for example, the muck vehicle 401 and the segment vehicle 402 may move to the position close to the large-span section 208, i.e., the position closer to the equipment configured for the arrangement area, so that the material conveyance and transportation is convenient. As mentioned above, the transverse span of the large-span section 208 is larger, at this moment, by considering the supporting and carrying capacity, the traveling wheels 201 configured for the large-span section 208 preferably travel along the two lines of main tracks 1 at the outermost side. It needs to be noted herein that a traveling speed of the main tunnel material transport vehicle 3 is low, the second tracks 102 respectively positioned in different span sections may not be welded or may be connected by fasteners as long as the end portions may realize smooth docking to allow the main tunnel material transport vehicle 3 to pass through.

[0048] Additionally, no matter whether the synchronous construction platform 2 has the equal span in the front and rear length direction or different sections with different spans are included, for the main tunnel with the small diameter, for example, the main tunnel with the diameter below 7 m, during practical construction, the cross passage material transport vehicle 4 is practically positioned in a non-center lateral side of the main tunnel. The size of the tunneling main machine 5 is large, and the tail end of the tunneling main machine 5 may reach a center position of the main tunnel. In order to enable the cross passage material transport vehicle 4 to conveniently transport the materials to the position of the tunneling main machine 5, in the embodiment, the above material transfer device includes upright posts 203 and a track beam 206, the upright posts 203 are directly arranged on the cross passage construction platform, and the track beam 206 is arranged on the upright posts 203 and is supported by the upright posts 203. The material crane 204 (track crane) may travel along the track beam 206. As shown in FIG. 6, the track beam 206 sequentially includes a material conveying section 2061, a transition section 2062 and a material receiving section 2063 front a front side to a rear side, the material conveying section 2061 (the projection in a vertical direction) is positioned in a middle position

of the synchronous construction platform 2, and the material receiving section 2063 deviates to a side of the first track 101 or a side far away from the docking tracks 202 relative to the material conveying section 2061. Therefore, the material crane 204 may move to a position above and close to the segment vehicle 402 along the track beam 206, and segments or other materials in the segment vehicle 402 are hoisted and conveyed to the position of the tunneling main machine 5, as shown in FIG. 5, the position of the material crane 204 may be integrally moved to approach to the cross passage material transport vehicle 4, and the materials is conveniently hoisted and transported. Identically, in other implementations, if the diameter of the main tunnel is large, there is a sufficient space in the main tunnel to meet the requirement of the tunneling main machine 5 to depart and transport the corresponding materials, and the track beam 206 may be made to present a straight line shape. Or, the material transfer device in another form, for example, a material transfer vehicle (crane truck) provided with a crane jib, is used, the material transfer vehicle may flexibly move on the synchronous construction platform 2, and move to and from between the segment vehicle 402 and the tunneling main machine 5 to transfer and transport the materials.

[0049] The tunneling main machine 5 may be a TBM main unit or a pipe jacking machine main unit, as shown in FIG. 1, during construction, a back pull device 205 needs to be used, if the tunneling main machine 5 is the pipe jacking machine main unit, the back pull device 205 needs to be provided with a back pull cylinder, and the back pull cylinder pushes the tunneling main machine 5 and the segments to realize forward tunneling. Additionally, the tunneling main machine 5 is also connected to a muck discharging device, the muck discharging device is mainly used for receiving muck from the tunneling main machine 5, and discharging the muck into a muck hopper of the cross passage material transport vehicle 4, i.e., the muck vehicle 401.

[0050] For the main tunnel with the small diameter, in order to ensure that the muck discharged from a screw conveyor 501 of the tunneling main machine 5 may be smoothly discharged to the muck vehicle 401, as shown in FIG. 7, the tail end of the screw conveyor 501 of the tunneling main machine 5 is connected to a muck discharging pipe 502 with a turning section, the muck discharging pipe 502 may guide the muck to flow to the muck vehicle 401 to realize the smooth muck discharging, and the muck discharging pipe 502 forms the above muck discharging device. The muck discharging pipe 502 has the more compact size, and is more suitable for the main tunnel with the small diameter, practically, for the main tunnel with the large diameter, the muck discharging device may use a belt conveyor, one end of the belt conveyor may be arranged under a muck outlet at a tail of the screw conveyor 501, and the other end extends out of the synchronous construction platform 2. During construction, the

muck vehicle 401 may travel to a position under the belt conveyor to receive the muck.

[0051] It further needs to be noted that in different implementations, the main tracks 1 may further be provided with five or more lines of tracks, most basically, at this moment, two lines of main tracks 1 will be still needed for allowing the main tunnel material transport vehicle 3 to pass through, and two lines of main tracks 1 are used for allowing the cross passage material transport vehicle 4 to pass through. However, under a possible condition, the synchronous construction platform 2 may be further provided with three rows of traveling wheels 201: a left line, a middle line and a right line of traveling wheels to travel along the three lines of main tracks 1.

[0052] Specific embodiment of a synchronous construction platform for a cross passage provided by the present invention is as follows:

[0053] An embodiment of the synchronous construction platform for a cross passage is the synchronous construction platform in the embodiment of the above synchronous construction system for a cross passage, and it is not concretely illustrated herein.

[0054] Finally, it should be pointed out that the above description is only preferred embodiments of the invention and is not intended to limit the invention. Although the invention has been described in detail with reference to the above-mentioned examples, it is still possible for those skilled in the art to modify the technical means described in the above-mentioned examples without creative work, or to make equal substitutions of some or all of the technical configurations therein. Any modifications, equivalent substitutions, and improvements etc. made within the spirit and principle of the present invention shall fall within the protection scope of the present invention.

CLAIMS

What is claimed is:

1. A synchronous construction system for a cross passage, comprising a synchronous construction platform and at least four lines of main tracks arranged in a main tunnel and distributed at intervals in a transverse direction, wherein two lines of main tracks allow a main tunnel material transport vehicle to pass through, the other two lines of main tracks allow a cross passage material transport vehicle to pass through, the synchronous construction platform is provided with traveling wheels capable of traveling along at least two lines of main tracks, two docking tracks allowing the main tunnel material transport vehicle to pass through and an arrangement area for arranging cross passage tunneling equipment are arranged on the synchronous construction platform, the two docking tracks are positioned at a transverse side of the arrangement area, and docking sections configured to dock with the two lines of main tracks allowing the main tunnel material transport vehicle to pass through are respectively arranged at front ends and rear ends of the two docking tracks.

2. The synchronous construction system for a cross passage according to claim 1, characterized in that each of the two docking tracks respectively comprises an external expansion section deviating to a side far away from the arrangement area relative to the respective docking section.

3. The synchronous construction system for a cross passage according to claim 1 or 2, characterized in that the synchronous construction platform comprises a large-span section and a small-span section connected to a rear side of the large-span section, a transverse span of the large-span section is greater than a span between the two lines of main tracks at an outermost side, the arrangement area is arranged in the large-span section, a transverse span of the small-span section is greater than a transverse span of the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, traveling wheels configured for the small-span section are configured to travel along the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, a connecting position of the small-span section and the large-span section is positioned at a transverse end of the large-span section, and a space between the other transverse ends of the small-span section and the large-span section meets a passing of the cross passage material transport vehicle.

4. The synchronous construction system for a cross passage according to claim 3, characterized in that traveling wheels configured for the large-span section are configured to travel along the two lines of main tracks at the outermost side.

5. The synchronous construction system for a cross passage according to claim 1 or 2, characterized in that the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment comprises a material transfer device configured to receive materials on the cross passage material transport vehicle and forwards transfer the materials.

6. The synchronous construction system for a cross passage according to claim 5, characterized in that the material transfer device comprises upright posts arranged on the synchronous construction platform and a track beam supported by the upright posts, a material crane travels on the track beam, the track beam sequentially comprises a material conveying section, a transition section and a material receiving section from a front side to a rear side, the material conveying section is positioned in a middle position of the synchronous construction platform, and the material receiving section deviates to a side far away from the docking track relative to the material conveying section.

7. The synchronous construction system for a cross passage according to claim 1 or 2, characterized in that the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment comprises a tunneling main machine and a muck discharging device configured to receive muck discharged from the tunneling main machine and convey the muck into a muck hopper of the cross passage material transport vehicle.

8. The synchronous construction system for a cross passage according to claim 7, characterized in that the muck discharging device is composed of a muck discharging pipe connected to a tail of a screw conveyor of the tunneling main machine.

9. A synchronous construction platform for a cross passage, provided with traveling wheels capable of traveling along at least two lines of main tracks in a main tunnel, wherein two docking tracks allowing a main tunnel material transport vehicle to pass through and an arrangement area for arranging cross passage tunneling equipment are arranged on the synchronous construction platform, the two docking tracks are positioned at a transverse side of the arrangement area, and docking sections configured to dock with two lines of main tracks allowing the main tunnel material transport vehicle to pass through are respectively arranged at front ends and rear ends of the two docking tracks.

10. The synchronous construction platform for a cross passage according to claim 9, characterized in that each of the two docking tracks respectively comprises an external expansion section deviating to a side far away from the arrangement area relative to the respective docking section.

11. The synchronous construction platform for a cross passage according to claim 9 or 10,

characterized in that the synchronous construction platform for a cross passage comprises a large-span section and a small-span section connected to a rear side of the large-span section, a transverse span of the large-span section is greater than a span between the two lines of main tracks at an outermost side in the main tunnel, the arrangement area is arranged in the large-span section, a transverse span of the small-span section is greater than a transverse span of the two lines of main tracks allowing the main tunnel material transport vehicle to pass through in the main tunnel, traveling wheels configured for the small-span section are configured to travel along the two lines of main tracks allowing the main tunnel material transport vehicle to pass through, a connecting position of the small-span section and the large-span section is positioned at a transverse end of the large-span section, and a space between the other transverse ends of the small-span section and the large-span section meets a passing of a cross passage material transport vehicle.

12. The synchronous construction platform for a cross passage according to claim 11, characterized in that traveling wheels configured for the large-span section are configured to travel along the two lines of main tracks at the outermost side in the main tunnel.

13. The synchronous construction platform for a cross passage according to claim 9 or 10, characterized in that the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment comprises a material transfer device configured to receive materials on the cross passage material transport vehicle and forwards transfer the materials.

14. The synchronous construction platform for a cross passage according to claim 13, characterized in that the material transfer device comprises upright posts arranged on the synchronous construction platform and a track beam supported by the upright posts, a material crane travels on the track beam, the track beam sequentially comprises a material conveying section, a transition section and a material receiving section from a front side to a rear side, the material conveying section is positioned in a middle position of the synchronous construction platform, and the material receiving section deviates to a side far away from the docking track relative to the material conveying section.

15. The synchronous construction platform for a cross passage according to claim 9 or 10, characterized in that the cross passage tunneling equipment is arranged in the arrangement area, and the cross passage tunneling equipment comprises a tunneling main machine and a muck discharging device configured to receive muck discharged from the tunneling main machine and convey the muck into a muck hopper of the cross passage material transport vehicle.

16. The synchronous construction platform for a cross passage according to claim 15,

characterized in that the muck discharging device is composed of a muck discharging pipe connected to a tail of a screw conveyor of the tunneling main machine.