GROUTING TYPE CUTTER HEAD OF SHIELD MACHINE UNDERPENETRATING EXISTING PIPELINE

TECHNICAL FIELD

The present invention relates to the technical field of shield, and in particular to a grouting type cutter head of a shield machine underpenetrating an existing pipeline.

BACKGROUND

When the shield machine crosses the existing pipeline, because there is already a pipeline above the existing pipeline, when the shield machine is shut down for maintenance, the part in contact with the cutter head and the shield machine will collapse due to the influence of the shield tunnel and gravity, resulting in the displacement and deformation of the existing pipeline, causing the damage of the existing pipeline, and affecting the safety performance of the shield operation.

SUMMARY

An objective of the present invention is to provide a grouting type cutter head of a shield machine underpenetrating an existing pipeline to solve the problem that a part in contact with a cutter head and a shield machine will collapse due to the influence of the shield tunnel and gravity proposed in the above background, resulting in the displacement and deformation of the existing pipeline, causing the damage of the existing pipeline, and affecting the safety performance of the shield operation.

In order to achieve the above objective, the present invention provides the following technical solutions. A grouting type cutter head of a shield machine underpenetrating an existing pipeline includes a shield machine casing and a cutter head. A surface of the shield machine casing is disposed with a placement groove, an outer surface of the shield machine casing is disposed with limiting grooves and a connecting groove, inner sides of the connecting grooves are fixedly connected to screws, an inner side of the placement groove is fitted and connected to a connecting plate, and an outer surface of the connecting plate is fixedly connected to limiting blocks and connecting blocks; the inner sides of the connecting grooves are disposed with storage grooves, inner sides of the storage grooves are fixedly connected to support springs, surfaces of the support springs are fixedly connected to a protective plate, a surface of the connecting plate is disposed with a groove, and an inner side of the groove is fitted and connected to a baffle; an inner side of the baffle is penetrated and connected to grouting pipes,

surfaces of the grouting pipes are fixedly connected to a control plate, an outer surface of the control plate is fixedly connected to a fixing block, and a surface passage of the control plate is connected to a slurry conveying pipe; the surfaces of the grouting pipes are disposed with through grooves, and inner sides of the through grooves are fixedly connected to support blocks, and the inner sides of the through grooves are movably connected to protective covers; inner walls of the grouting pipes are fixedly connected to guide blocks, and inner sides of the guide blocks are fixedly connected to telescopic springs; and an inner wall of the shield machine casing is fixedly connected to a telescopic cylinder, an inner surface of the baffle is fixedly connected to connecting rods, surfaces of the connecting rods are fixedly connected to compression springs, outer surfaces of the connecting rods are sleeved with abutting columns, and a surface of the control plate is fixedly connected to positioning blocks.

Preferably, the limiting blocks are connected in two groups on opposite sides of the connecting plate, the limiting blocks and the limiting grooves are in contact with each other, and the connecting blocks are oppositely connected in two groups to adjacent surfaces where the connecting plate and the limiting blocks are in contact with each other.

Preferably, the connecting blocks and the connecting grooves are in contact with each other, surfaces of the connecting blocks are penetrated by through holes, the screws penetrate through the surfaces of the connecting blocks through the through holes, and a curvature of the surface of the connecting plate is consistent with that of the shield machine casing.

Preferably, the protective plates are slidably connected to the shield machine casing through the storage grooves, two ends of the support springs are fixedly connected to the inner side of the storage grooves and a surface of the protective plate, and the protective plates are elastically slidably connected to the connecting grooves through the support springs.

Preferably, the grouting pipes are hollow inside, the grouting pipes penetrate through the surface of the connecting plate, a surface of the control plate has a circular arc shape, and an output shaft of the telescopic cylinder is fixedly connected to the fixing block.

Preferably, the slurry conveying pipe is connected to passages of the grouting pipes through the control plate, the through grooves are uniformly disposed on the outer surfaces of the grouting pipes, and the protective covers and the support blocks are in contact with each other.

Preferably, an outer surface of the protective cover has a circular arc shape, two ends of the telescopic springs are fixedly connected to surfaces of the guide blocks and the protective covers,

and the protective covers are elastically rotatably connected to the through grooves through the telescopic springs.

Preferably, the connecting rods are connected to the surface of the baffle in two groups, the baffle is fitted and contacted to the connecting plate through the groove, the surface of the baffle is penetrated by circular holes, and the baffle is penetrated by the grouting pipes through the circular holes.

Preferably, surfaces of ends of the abutting columns away from the connecting rods have a semicircular spherical shape, and the positioning blocks are connected to surfaces where the abutting columns and the control plate are in contact with each other.

Preferably, two ends of the compression springs are fixedly connected to the inner sides of the abutting columns and ends of the connecting rods away from the baffle, and the abutting columns are elastically slidably connected to the connecting rods through the compression springs.

Compared with the prior art, the present disclosure has the following advantageous effects.

1. Through the connection of the shield machine casing and the placement groove, the fitting and connecting operation of the connecting plate on the shield machine casing is convenient under the action of the placement groove; under the action of the limiting grooves and the connecting groove, the position support effect of the connecting plate on the shield machine casing is realized through the connection of the connecting plate and the limiting blocks and the connection of the connecting plate and the connecting blocks; the regulating effect of the action length of the grouting pipes on the connecting plate is achieved through the connection of the telescopic cylinder and the fixing block and the connection of the control plate and the grouting pipes; and through the action of grouting pipes and the slurry conveying pipe, the grouting effect is achieved, and the grouting reinforcement performance of the shield machine during shutdown operation is improved.

2. Through the connection of the grouting pipes and the through grooves, under the action of the support blocks and the protective covers, through the connection of the guide blocks and the telescopic springs, the elastic rotation effect of the protective covers on the grouting pipes is realized; under the action of the protective covers, the plugging effect of grouting pipes when inserting soil is achieved, the soil is prevented from entering the grouting pipes, and the action effect of grouting use is improved; under the connection of the baffle and the connecting rods

and through the abutment contact of the abutting columns and the control plate, when the position of the control plate changes, the position of the baffle on the connecting plate changes, and the baffle abuts against the soil, thereby avoiding dripping and leakage during grouting pipes grouting operation; and under the connection of the protective plates and the support springs, the elastic sliding effect of the protective plates on the connecting grooves is realized under the action of the support springs, and the protective operation when the connecting blocks and the connecting grooves are connected is completed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic engineering diagram of the present invention;

FIG. 2 is a schematic front perspective diagram of a structure of the present invention;

FIG. 3 is a partial perspective schematic diagram of a structure of the present invention;

FIG. 4 is a bottom perspective schematic diagram of a structure of a connecting plate of the present invention;

FIG. 5 is a perspective explosion schematic diagram of a connecting structure of a shield machine casing and the connecting plate of the present invention;

FIG. 6 is a perspective dynamic schematic diagram of a connecting structure of the connecting plate and a grouting pipe of the present invention;

FIG. 7 is an enlarged schematic diagram of a structure at A in FIG. 6 of the present invention;

FIG. 8 is a partial perspective schematic diagram of a structure of the shield machine casing of the present invention;

FIG. 9 is a structural perspective schematic diagram of the grouting pipe of the present invention;

FIG. 10 is a partial perspective cross-sectional diagram of a structure of the grouting pipe of the present invention; and

FIG. 11 is an expanded perspective schematic view of a connecting structure of the grouting pipe and a protective cover in FIG. 10 of the present invention.

Reference numerals and denotations thereof: 1-shield machine casing; 11-placement groove; 12-limiting groove; 13-connecting groove; 14-screw; 2-cutter head; 3-connecting plate; 31-limiting block; 32-connecting block; 4-protective plate; 41-support spring; 42-storage groove; 5-grouting pipe; 51-control plate; 52-fixing block; 53-support block; 54-protective cover;

55-guide block; 56-telescopic spring; 6-slurry conveying pipe; 7-telescopic cylinder; 8-baffle; 81-abutting column; 82-connecting rod; 83-compression spring; and 84-positioning block.

DETAILED DESCRIPTION

Referring to FIGS. 1-11, an example of the present invention is provided.

The present invention relates to a grouting type cutter head of a shield machine underpenetrating an existing pipeline, including a shield machine casing 1 and a cutter head 2. A surface of the shield machine casing 1 is disposed with a placement groove 11, an outer surface of the shield machine casing 1 is disposed with limiting grooves 12 and connecting grooves 13, inner sides of the connecting grooves 13 are fixedly connected to screws 14, an inner side of the placement groove 11 is fitted and connected to a connecting plate 3, and an outer surface of the connecting plate 3 is fixedly connected to limiting blocks 31 and connecting blocks 32; the inner sides of the connecting grooves 13 are disposed with storage grooves 42, inner sides of the storage grooves 42 are fixedly connected to support springs 41, surfaces of the support springs 41 are fixedly connected to protective plates 4, a surface of the connecting plate 3 is disposed with a groove, and an inner side of the groove is fitted and connected to a baffle 8; an inner side of the baffle 8 is penetrated and connected to grouting pipes 5, surfaces of the grouting pipes 5 are fixedly connected to a control plate 51, an outer surface of the control plate 51 is fixedly connected to a fixing block 52, and a surface passage of the control plate 51 is connected to a slurry conveying pipe 6; the surfaces of the grouting pipes 5 are disposed with through grooves, and inner sides of the through grooves are fixedly connected to support blocks 53, and the inner sides of the through grooves are movably connected to protective covers 54; inner walls of the grouting pipes 5 are fixedly connected to guide blocks 55, and inner sides of the guide blocks 55 are fixedly connected to telescopic springs 56; and an inner wall of the shield machine casing 1 is fixedly connected to a telescopic cylinder 7, an inner surface of the baffle 8 is fixedly connected to connecting rods 82, surfaces of the connecting rods 82 are fixedly connected to compression springs 83, outer surfaces of the connecting rods 82 are sleeved with abutting columns 81, and a surface of the control plate 51 is fixedly connected to positioning blocks 84. Through the connection of the shield machine casing 1 and the placement groove 11, under the action of the placement groove 11, the mounting operation of the connecting plate 3 on the shield machine casing 1 is convenient, and the overall replacement and mounting effect of the connecting plate 3 and the parts used thereof are achieved.

Further, the limiting blocks 31 are connected in two groups on opposite sides of the connecting plate 3, the limiting blocks 31 and the limiting grooves 12 are in contact with each other, and the connecting blocks 32 are oppositely connected in two groups to adjacent surfaces where the connecting plate 3 and the limiting blocks 31 are in contact with each other. Through the connection of the connecting plate 3 and the limiting blocks 31, under the connection of the connecting plate 3 and the connecting blocks 32, the supporting and connecting effect of a position of the connecting plate 3 on the shield machine casing 1 is realized.

Further, the connecting blocks 32 and the connecting grooves 13 are in contact with each other, surfaces of the connecting blocks 32 are penetrated by through holes, the screws 14 penetrate through the surfaces of the connecting blocks 32 through the through holes, and a curvature of the surface of the connecting plate 3 is consistent with that of the shield machine casing 1. Through the abutting contact between the connecting blocks 32 and the connecting grooves 13, under the connection between the connecting blocks 32 and the screws 14, the mounting and support effect of the connecting plate 3 on the shield machine casing 1 is realized.

Further, the protective plates 4 are slidably connected to the shield machine casing 1 through the storage grooves 42, two ends of the support springs 41 are fixedly connected to the inner sides of the storage grooves 42 and surfaces of the protective plates 4, and the protective plates 4 are elastically slidably connected to the connecting grooves 13 through the support springs 41. Through the sliding connection of the protective plates 4 and the storage grooves 42, under the connection of the support springs 41 and the protective plates 4, the protective effect of the connection of the connecting blocks 32 in the connecting grooves 13 is realized, and the blockage of the connecting grooves 13 caused by soil is avoided.

Further, the grouting pipes 5 are hollow inside, the grouting pipes 5 penetrate through the surface of the connecting plate 3, a surface of the control plate 51 has a circular arc shape, and an output shaft of the telescopic cylinder 7 is fixedly connected to the fixing block 52. Through the connection of the grouting pipes 5 and the control plate 51, under the connection of the control plate 51 and the fixing block 52, through the action of the telescopic cylinder 7 and the fixing block 52, the effect of regulating the use position of the grouting pipes 5 on the connecting plate 3 is realized, and the effect of grouting using of the grouting pipes 5 in s shield tunnel is achieved.

Further, the slurry conveying pipe 6 is connected to passages of the grouting pipes 5

through the control plate 51, the through grooves are uniformly disposed on the outer surfaces of the grouting pipes 5, and the protective covers 54 and the support blocks 53 are in contact with each other. Through the passage connection of the slurry conveying pipe 6 and the grouting pipes 5, under the action of the slurry conveying pipe 6, the grouting conveyance in the grouting pipes 5 is convenient, and the effect of grouting using of the grouting pipes 5 is achieved.

Further, an outer surface of the protective cover 54 has a circular arc shape, two ends of the telescopic springs 56 are fixedly connected to surfaces of the guide blocks 55 and the protective covers 54, and the protective covers 54 are elastically rotatably connected to the through grooves through the telescopic springs 56. Through the connection of the support blocks 53 and the through grooves on the grouting pipes 5, under the connection of the protective covers 54 and the telescopic springs 56, the regulating effect of the action angle of the protective covers 54 is achieved, thereby achieving the protective effect on the grouting pipes 5 when the grouting pipes 5 are not used by grouting, preventing soil from entering into the grouting pipes 5, and affecting the service performance of the grouting pipes 5.

Further, the connecting rods 82 are connected to the surface of the baffle 8 in two groups, the baffle 8 is fitted and contacted to the connecting plate 3 through the groove, the surface of the baffle 8 is penetrated by circular holes, and the baffle 8 is penetrated by the grouting pipes 5 through the circular holes. Through the connection of the baffle 8 and the connecting rods 82, under the action of the baffle 8, the abutting protective effect when the grouting pipes 5 and the tunnel are inserted into grouting is realized, and the dripping situation of grouting is avoided.

Further, surfaces of ends of the abutting columns 81 away from the connecting rods 82 have a semicircular spherical shape, and the positioning blocks 84 are connected to surfaces where the abutting columns 81 and the control plate 51 are in contact with each other. Through the connection of the connecting rods 82 and the abutting columns 81, the regulating effect of the connection position of the baffle 8 on the connecting plate 3 is realized under the abutting contact between the abutting columns 81 and the control plate 51.

Further, two ends of the compression springs 83 are fixedly connected to the inner sides of the abutting columns 81 and ends of the connecting rods 82 away from the baffle 8, and the abutting columns 81 are elastically slidably connected to the connecting rods 82 through the compression springs 83. Through the connection of the connecting rods 82 and the compression springs 83, under the action of the compression springs 83, the regulating effect of the

connection position between the abutting columns 81 and the connecting rods 82 is realized, and the stability performance of the abutting contact between the baffle 8 and the tunnel surface is improved.

Working principles are as follows. When the shield machine is shut down for operation, a switch is controlled to start the telescopic cylinder 7, and the positions of the control plate 51 and the grouting pipes 5 on the connecting plate 3 is changed under the connection of the output shaft of the telescopic cylinder 7 and the fixing block 52. Through the passage connection of the slurry conveying pipe 6 and the grouting pipes 5, through the action of the slurry conveying pipe 6, the grouting operation of the grouting pipes 5 to the relevant position of the tunnel is completed, and the stability performance is improved. When the positions of the grouting pipes 5 are changed, the control plate 51 and the abutting columns 81 are in contact with each other, and the position of the baffle 8 on the connecting plate 3 is changed under the connection of the compression springs 83 and the connecting rods 82. At this time, the baffle 8 and the tunnel are in contact, thereby preventing the grouting pipes 5 from flowing out from insertion gaps of the grouting pipes 5 during grouting, and improving the grouting performance and efficiency. Under the connection of the connecting blocks 32 and the screws 14, the protective operation of the connecting grooves 13 is completed through the action of the protective plates 4, thereby preventing the soil from entering the connecting grooves 13, influencing the disassembly and assembly operation of the connecting plate 3 on the shield machine casing 1, and improving the service performance of the connecting plate 3.