CLAIMS

1. A flow-undisrupted process comprising:

a boring step of attaching a main body portion **41** of a T-shaped pipe **4**, which includes the main body portion **41** and a branch pipe portion **42**, to an existing pipe **1**, and boring the existing pipe **1** with a hole saw **H** ~~by opening/closing~~ when a first gate **G1** for opening/closing the branch pipe portion **42** opens, in order to install a bypass pipe;

a plug insertion step of attaching a case **5** to the existing pipe **1**, rotating an endmill **E** arranged in the case **5** together with the case **5** to form a cut groove **10** that is cut open over generally half a circumference, and inserting a plug into the existing pipe **1** through the cut groove **10**;

prior to the boring step, a step of providing the T-shaped pipe **4** that has, in the branch pipe portion **42**, a half-circumference groove **20** that is cut open over half the circumference in a circumferential direction **R**;

after the boring step, a first gate insertion step of inserting the first gate G1 into the half-circumference groove 20;

after the ~~boring~~ first gate insertion step, a connection step of connecting a piping member **6** to the branch pipe portion **42** of the T-shaped pipe **4**; and

after the connection step, a step of pulling the first gate **G1**, which has been inserted into the half-circumference groove **20**, out of the branch pipe portion **42**,

wherein in the plug insertion step, the first gate **G1** or another first gate, which has the same shape and the same structure as the first gate **G1**, is inserted as the plug into the existing pipe **1** through the cut groove **10**.

2. The flow-undisrupted process according to claim 1, wherein in the plug insertion step, the first gate **G1** is inserted as the plug into the existing pipe **1** through the cut groove **10**.

3. The flow-undisrupted process according to claim 1 or 2, wherein:

after the boring step, the connection step is performed by connecting a butterfly valve, as the piping member **6**, to the branch pipe portion **42**; and

the step of pulling the first gate **G1** out of the branch pipe portion **42** is performed with the butterfly valve closed.

4. The flow-undisrupted process according to claim 3, comprising:

a step of connecting a bypass pipe to the butterfly valve; and

after connecting the bypass pipe, a step of stopping a flow of a fluid in the existing pipe **1** with the first gate **G1**.

5. The flow-undisrupted process according to claim 2, wherein:

the branch pipe portion **42** includes a first tube portion **44** that extends toward directly above the half-circumference groove **20** and defines a first access passage **43** for the first gate **G1**;

the process further comprises a step of installing a second gate **G2** in the branch pipe portion **42**, wherein the second gate **G2** advances/retracts horizontally and parallel to a radial direction of the branch pipe portion **42** to open/close the first access passage **43**; and

the process comprises a step of opening~~/closing~~ the first access passage **43** by the second gate **G2**, and pulling the first gate **G1** out of the branch pipe portion **42**.

6. The flow-undisrupted process according to claim 5, wherein:

the case **5** includes a second tube portion **54** that extends toward directly above the cut groove **10** and defines a second access passage **53** for the first gate **G1**;

the process further comprises:

a step of removing the second gate **G2** from the first tube portion **44**;

a step of installing the second gate **G2** in the second tube portion **54**, wherein the second gate **G2** advances/retracts horizontally and parallel to a radial direction of the case **5** and opens/closes the second access passage **53**; and

a step of opening~~/closing~~ the second access passage **53** by the second gate **G2**, and pulling the first gate **G1**, which has been

inserted into the existing pipe **1**, out of the existing pipe **1**.

7. A flow-undisrupted boring apparatus comprising a first gate **G1** in a branch pipe portion **42** of a T-shaped pipe **4**, wherein:

a half-circumference groove **20** that is cut open over half ~~the~~ a circumference in a circumferential direction **R** is formed in the branch pipe portion **42** of the T-shaped pipe **4**;

the half-circumference groove **20** includes a pair of semicircular portions **21** that protrude downward at opposite ends, and a constant-width groove portion **22** that extends in the circumferential direction **R** and connects together the semicircular portions **21**;

the first gate **G1** includes a valve body **11** having a circular portion that is inserted into the branch pipe portion **42** through the half-circumference groove **20**, a pair of valve body-side portions **12** that protrude toward sides of the valve body **11**, a pair of guiders **13** that protrude downward from the valve body-side portion **12**, and a sealing rubber packing **14**;

the rubber packing **14** includes:

a pair of string-like upper portions **15** that are attached to an upper half portion of the circular portion and are in contact with a pair of parallel first end surfaces that define the groove portion **22**;

a string-like lower portion **16** that is attached to a lower half portion of the circular portion and is in contact with an inner periphery surface of the branch pipe portion **42**; and

a pair of middle portions **17** that are attached respectively to opposite sides of the valve body **11**;

the pair of upper portions **15** extend from above to be continuous with the middle portions **17** and the lower portion **16** extend from below to be continuous with the middle portions **17**;

the middle portions **17** each include a semicylindrical portion **18** that fits into the semicircular portion; and

the middle portions **17** each include an upper surface **F0** that is bonded to a lower surface of the valve body-side portion **12**, a first side surface **F1** that is bonded to a side surface of the valve body **11**, and a second side surface **F2** that is bonded to the guider **13**.

8. A flow-undisrupted boring apparatus comprising:

a T-shaped pipe **4** and a first gate **G1**, wherein the T-shaped pipe **4** includes a main body portion **41** and a branch pipe portion **42**, wherein:

a half-circumference groove **20** that is cut open over half a circumference in a circumferential direction **R** is formed in the branch pipe portion **42**;

the first gate **G1** enters the branch pipe portion **42** through the half-circumference groove **20** to stop a flow of a fluid in the branch pipe portion **42**;

a first tube portion **44**, which extends toward directly above the half-circumference groove **20** and defines a first access passage **43** of the first gate **G1**, is coupled to the branch pipe

portion **42**;

a second gate **G2** is provided that advances/retracts parallel to a radial direction of the branch pipe portion **42** to open/close the first access passage **43**;

a sheath **2** is provided that accommodates the second gate **G2** therein while the second gate **G2** leaves the access passage **43** open;

the first tube portion **44** is provided with a first attachment flange **45**, to which the sheath **2** including the second gate **G2** is attached;

a first accommodating portion **46** for a small valve body **V** is provided in a portion of the first tube portion **44** that is on an inner side of the first attachment flange **45**; and

an operation portion **31** is provided, with which it is possible to open/close the small valve body **V** in the first accommodating portion **46** from outside the first tube portion **44**, thereby enabling attachment/detachment of the sheath **2**.