Trial decision

Invalidation No. 2014-800036

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The decision on the case of the patent invalidation trial between the parties above on Japanese Patent No. 5137153, entitled "Grout Injection Method and Device," dated December 17, 2015, came with a court decision of revocation of the trial decision for Claim 1 of the invention (2016 (Gyo-Ke) 10026, on December 26, 2016) at the Intellectual Property High Court; the invention relating to claims in the portion of which the decision was revoked was proceeded further, and another trial decision was handed down as follows:

Conclusion

The correction of the description and the scope of claims of Japanese Patent No. 5137153 to the corrected description and the scope of claims attached to the written correction request shall be approved.

The patent for the invention according to Claim 1 of Japanese Patent No. 5137153 shall be invalidated.

The costs in connection with the trial shall be borne by the demandee.

Reason

No. 1 History of the procedures

1 History through the first trial decision of the case of the patent invalidation trial

The history through the first trial decision is as follows.

May 22, 2012:	Application of the case (Japanese Patent Application No. 2012-116912)
November 22, 2012:	Registration of establishment of the patent right (Japanese Patent No. 5137153)
March 7, 2014:	Demand for invalidation trial of the case
April 7, 2014:	Submission of a written statement of the demandee
April 10, 2014:	Notification
July 25, 2014:	Submission of a written reply for the trial case and a written correction request of the demandee
August 21, 2014:	Written refutation of the trial case of the demandant
October 16, 2014:	Notification of matters to be examined
October 16, 2014:	Submission of an application for intervention of the intervention requester
November 11, 2014:	Submission of an oral proceedings statement brief of the demandee
November 12, 2014:	Submission of an oral proceedings statement brief of the demandant
November 14, 2014:	Decision on acceptance or non-acceptance of intervention
November 26, 2014:	Submission of a written statement of the demandant
November 26, 2014:	Oral proceeding
December 9, 2014:	Submission of a written statement of the demandant
December 22, 2014:	Submission of a written statement of the demandee
May 11, 2015:	Advance notice of a trial decision
December 17, 2015:	The first trial decision

2 The first trial decision

The conclusion of the first trial decision is

"The correction shall be approved as the description and scope of claims attached to the written correction request.

The patent for the invention according to Claim 2 of Japanese Patent No. 5137153 shall be invalidated

The invalidation demand for trial with respect to the patent of the invention according to Claim 1 of Japanese Patent No. 5137153 is found groundless

As for the costs in connection with the trial, 1/2 shall be borne by the demandant, and 1/2 shall be borne by the demandee."

3 Suit against the trial decision

The demandant filed a suit on February 1, 2016 with the Intellectual Property High Court for demanding revocation of the first trial decision.

The case was reviewed at the Intellectual Property High Court as 2016 (Gyo-Ke) 10026, and a court decision was rendered on December 26, 2016 with the main text

"1 In the trial decisions rendered by Japan Patent Office on December 17, 2015 concerning Invalidation No. 2014-800036, a part in which the request for examination regarding the patent of the invention according to Claim 1 of Japanese Patent No. 5137153 is rejected shall be cancelled.

2 The costs of litigation shall be borne by the defendant."

Therefore, since the above court decision was made final after that, "the request

for examination regarding the patent of the invention according to Claim 1 of Japanese Patent No. 5137153" should be examined again.

Also, in the first trial decision, a part "The patent for the invention according to Claim 2 of Japanese Patent No. 5137153 shall be invalidated" was made final.

4 History of procedures after remand

History of procedures after remand is as follows.

Also, within one week from a day on which the above court decision had become final and binding, there was no petition for demanding a designated period for request for correction from the demandee.

March 14, 2017: Submission of description of evidence by the demandant

March 31, 2017: Advance notice of a trial decision

No. 2 Request for correction

1 Content of the request for correction

The request for correction dated July 25, 2014 (hereinafter, referred to as "Correction of the case") requests to correct the description and scope of claims of Japanese Patent No. 5137153 as described in the corrected description and scope of claims attached to the written correction request, and the following matters shall be details of the correction according to Claim 1. (Underlines indicate amended portions.)

(1) Correction A

"A second division until the grout separated in the above-mentioned liquid separation board and respectively passing through discharge ports is injected into a ground from the plurality of injection ports through second injection hoses" in Claim 1 of the scope of claims, is corrected to "a second division until the grout separated in the liquid separation board and respectively passing through discharge ports with the same cross-sectional area is injected into a ground from the plurality of injection ports through second injection hoses."

(2) Correction B

"A second division until the grout separated in the above-mentioned liquid separation board and respectively passing through discharge ports is injected into a ground from the plurality of injection ports through second injection hoses" described in Paragraph [0020] in the description attached to the application, is corrected to "a second division until the grout separated in the liquid separation board and respectively passing through discharge ports with the same cross-sectional area is injected into a ground from the plurality of injection ports through second injection hoses."

2 Suitability of correction

(1) Regarding Correction A

A Correction A corrects "discharge ports" in Claim 1 to "discharge ports with the same cross-sectional area," and is intended for restriction of the scope of claims for patent.

B As it is obvious from A above, Correction A is to restrict the matters specifying the invention to a more specific concept, is not a correction that aims at altering category,

target, or purpose and therefore this does not substantially enlarge or modify the scope of claims of the patent.

C In view of the description "that is, it is divided into a first division which reaches a liquid separation board to which grout is press-fed by an injection pump through first injection hoses; and a second division until the grout separated in the liquid separation board and respectively passing through discharge ports with the same cross-sectional area is press-fed to one or more injection pipes provided with one or more injection holes through second injection hoses and the grout is injected into a ground from the injection holes, and is configured by adjusting a flow rate (discharge amount) of the grout. " in Paragraph [0010] of the specification of the patent publication, Correction A is a correction within a range described in the description or drawings attached to the application.

(2) Regarding Correction B

A In order to adjust the description of the scope of claims and the description of the detailed description of the invention along with the correction relating to Correction A, Correction B corrects "discharge ports" described in Paragraph [0020] of the description attached to the application to "discharge ports with the same cross-sectional area."

Therefore, Correction B is intended to explain the description which is not clear.

B In view of (1) B and C above, it is obvious that Correction B is not a correction that substantially enlarges or modifies the scope of claims of the patent, and is a correction within a range described in the description or drawings attached to the application.

(3) Summary

As described above, Correction of the case aims at matters prescribed in Patent Act Article 134-2(1) provisos No. 1 and No. 3, and complies with the provisions of Article 126(5) and (6) of the Patent Act as applied mutatis mutandis in the provisions of Article 134-2(9). Therefore, Correction of the case shall be approved.

No. 3 The invention according to the Patent

Since the corrections are approved as the above No. 2, the invention relating to Claim 1 of the Patent (hereinafter, referred to as "Invention 1") is recognized as follows, as specified by the matters described in Claim 1 of the corrected scope of claims attached to the written correction request of the case.

"[Claim 1]

A grout injection method which simultaneously injects grout at least through a plurality of injection holes installed in a ground,

forming a first division which reaches an inlet of discharge ports on a liquid separation board to which grout is press-fed by an injection pump through first injection hoses, and a second division until the grout separated in the liquid separation board and respectively passing through the discharge ports with the same cross-sectional area is injected into a ground from the plurality of injection ports through second injection hoses;

setting a total cross-sectional area of the plurality of injection ports to be larger

than a total cross-sectional area of the discharge ports;

uniformly separating the grout from the plurality of discharge ports on the liquid-separation board, by deciding a flow rate in advance, measuring ground resistance pressure, and loading the grout flowing in the first division to have compulsive pressure higher than the measured ground resistance pressure; and

injecting the grout flowing in the second division based on the ground resistance pressure through the injection holes."

No. 4 Allegations of the parties

1 Summary of Allegations and Evidence Submitted by the Demandant

(1) Reasons for invalidation

The damandant submitted Evidence A No. 1 to A No. 29 and alleged the following reasons for invalidation for Claim 1 of the invention, in the written demand for trial, the written refutation of the trial case dated August 21, 2014, the oral proceedings statement brief dated November 12, 2014, the written statement dated November 26, 2014, the written statement dated December 9, 2014, and the description of evidence dated March 14, 2017.

[Reasons for invalidation]

The invention relating to Claim 1 of the Patent is also invention described in Evidence A No. 1, and fall under Articles 29(1)(iii) of the Patent Act, and thus the appellant should not be granted a patent for them. The inventions could have been easily provided by a person skilled in the art based on the invention described in Evidence A No. 1, or based on the inventions described in Evidence A No. 1 and Evidence A No. 2, and thus the appellant should not be granted a patent under the provisions of Article 29(2) of the Patent Act. Thus, the patent falls under Article 123(1)(ii) of the Patent Act and should be invalidated.

(2) Specific allegation

A Regarding Evidence A No. 1

Regarding whether or not the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 is described in Evidence A No. 1.

It can be said that an injection test in the case of using a chemical liquid is described in [0074] [Fig. 26] of Evidence A No. 1. [Fig. 26] of Evidence A No. 1 shows the tendency of an actual water injection test and data of a test by injecting a chemical liquid.

Then, "injection speed q (l/minute)" of a horizontal axis in [Fig. 26] of Evidence A No. 1 is a "flow rate" per unit time, and according to [0061] [Table 1] of the corrected description of the case, "injection amount" of Invention 1 is a flow rate per minute, so that the "injection speed" of Evidence A No. 1 and the "flow rate" (injection amount) of Invention 1 can be directly compared.

Also, since "injection pressure" of a vertical axis in [Fig. 26] of Evidence A No. 1 obtains an optimal injection speed from a relationship with a ground situation and is decided according to ground resistance pressure, it indirectly measures the ground resistance pressure.

Then, also in Invention 1, the injection pressure of the grout (chemical liquid) is decided based on the measured ground resistance pressure, and if it is inappropriate, it is

supposed that test injection is carried out by changing the flow rate, or injection pressure is decided from the relationship between the flow rate and the injection pressure which have been previously obtained, so that it is not technically different from obtaining an appropriate injection pressure from the relationship between the injection pressure and the injection speed in Evidence A No. 1.

Also, in Invention 1, if the pressure of the grout flowing in the first division is adjusted, since the predetermined "flow rate" has been materialized, there is no need to measure the "ground resistance pressure" again, and further adjusting the pressure according to the result, "deciding a flow rate in advance, measuring ground resistance force," is meaningless. That is, Invention 1 actually obtains the relationship between the injection speed (flow rate per unit time) and the injection pressure, and adjusts that.

B Regarding Evidence A No. 2

Regarding whether or not the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 is described in Evidence A No. 2.

In Evidence A No. 2, it is described as a "flow rate test" ([0037]), as it is so, and it is obvious that the test is not a general soil test such as a water permeability test and the like. Also, there is no reason why the flow rate test should be limitedly construed to what is to be tested by injecting water.

Considering that it is exceptional to carry out the test at places other than the site of this work, it should be interpreted that the "flow rate test" of Evidence A No. 2 is carried out at the site of this work. Then, Evidence A No. 2 describes that a test injecting a chemical liquid is carried out at a site where injection is actually carried out.

C Regarding the well-known art

Regarding whether or not the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 has been conventionally a well-known art.

(A) Regarding Evidence A No. 5

Even if the test described in Evidence A No. 5 is a water injection test, in Evidence A No. 5, there is a description that "Although it is essentially necessary to conduct the test injection under the same conditions as this work, a simple method of predicting the injection form from a relationship between injection pressure and injection speed in the injection test using water instead of the chemical liquid has recently been proposed." (Page 280, Lines 4 to 8), and this means that the injection test using the chemical liquid has been conventionally carried out commonly. Also, it is not described that even if the water injection test of Evidence A No. 5 is carried out directly at the site of work is unclear, the chemical liquid injection method of Evidence A No. 5 is generally not carried out at a site of this work. It is obvious that it is best to carry out the injection test at the site of this work, and it is normal to carry out that at the site of this work.

Also, even if the ground resistance pressure will differ due to difference in the injection speed, since Invention 1 decides compulsive pressure for realizing a preferable flow rate, as in the test described in Evidence A No. 5, the injection speed must be changed so as to realize a predetermined flow rate.

(B) Regarding Evidence A No. 4 and Evidence A No. 6

In construction work carried out according to notification and interim guidelines described in Evidence A No. 4 and Evidence A No. 6, it is naturally predicted to inject a chemical liquid directly into a site where the chemical liquid is injected to carry out the test.

From a common sense point of view, while such a test is common, there is no description that permits use of a test using water instead of the chemical liquid.

Also, although Evidence A No. 4 and Evidence A No. 6 do not directly describe that the measurement of ground resistance pressure is carried out, the measurement of the ground resistance pressure is not special, but general procedure in the test injection.

Then, in [1] Evidence A No. 4, there is a description

"3-2 Field injection test

In conducting chemical liquid injection work, investigation is made in advance as to whether or not the injection of the chemical liquid as designed in an injection planning ground or a ground equivalent thereto is carried out" (Page 2, Line 7 from the bottom to Line 5 from the bottom) which means that the field injection test is the principle. Also, in [2] Evidence A No. 6, there is a description

"It is injected with an initial designed amount (when the designed amount changes due to test injection and the like, the designed amount after the change) as the target. At the time of injection, the situation of injection amount-injection pressure and circumstances during construction should be monitored at all times and it is injected appropriately while paying attention to the following cases." (Page 5, Line 2 from the bottom to Page 6, Line 2) which means that the ground resistance pressure is indirectly measured.

(C) Regarding Evidence A No. 24 to Evidence A No. 28

Regarding further well-known examples showing that the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 has conventionally been a well-known art.

a Evidence A No. 24 to Evidence A No. 25

On Page 244 of Evidence A No. 24 and Page 146 of Evidence A No. 25, there are descriptions that an injection speed range in a double pipe strainer construction method is set to be 8 to 20 l/minute, and an injection speed range in a double pipe packer construction method is made to 6 to 10 l/minute, and these include 6 l/minute which is the injection speed range of Invention 1 ([0057] of the corrected description of the case). Then, it has been conventionally and commonly practiced to test-inject the same chemical liquid (grout) as the construction prior to the chemical liquid injection of the construction, and carry out injection after confirming a relationship between pressure and flow rate.

b Evidence A No. 26

In "Tables 7.6 test injection" on Page 292 of Evidence A No. 26, it is shown that several kinds of chemical liquids including a silica sol-based injection material silica riser were used.

c Evidence A No. 27

In Fig. 7 to 9 on Page 66 of Evidence A No. 27, at an injection place where a silica riser is injected by a manchette tube as a chemical liquid, a relationship between permeation pressure and injection speed before and after the injection and the like are shown.

d Evidence A No. 28

In Claim 3 of Evidence A No. 28, there is a description "injection amount to each injection pipeline is respectively adjusted to be a required amount according to the injection resistance pressure of a ground," and this corresponds to "deciding a flow rate in advance, measuring ground resistance force" of Invention 1.

(D) Regarding an easily-arrived property

As described in (A) to (C) above, the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 is a well-known art. There is no meaning in the constitution of "deciding a flow rate in advance, measuring ground resistance force" itself, but it is meaningful to decide injection pressure of grout (chemical liquid) based on the measured ground resistance pressure. Therefore, it is a matter of course that when injecting the chemical liquid, if the ground resistance pressure is larger than expected and chemical liquid does not enter, the injection pressure is increased to ensure the injection of the chemical liquid, and on the other hand, if the ground resistance pressure is lower than expected and the entering of the chemical is too fast, the injection pressure is decreased. Then, when deciding the injection pressure of the construction based on the test injection, which parameter is used as an index is merely a simple conversion problem between different parameters, and it is not a matter requiring creativity as an invention. Furthermore, even if the well-known art which is the constitution of "deciding a flow rate in advance, measuring ground resistance force" is combined with a technology of multi-point injection, no synergistic effect occurs, and there is no description about the purpose or specific effect of adopting the constitution of "deciding a flow rate in advance, measuring ground resistance force" in the corrected description of the case.

D Summary

From the above A to C, the present invention 1 could have been easily conceived by a person skilled in the art based on the invention described in Evidence A No. 1, or, the invention described in Evidence A No. 1 and Evidence A No. 2, or the invention described in Evidence A No. 1 and Evidence A No. 2 and well-known art shown in Evidence A No. 4 to Evidence A No. 6.

[Means of proof]

Evidence A No. 1: Japanese Patent No. 3663113

Evidence A No. 2: Japanese Unexamined Patent Application Publication No. 2003-27457

Evidence A No. 3: Copy of a production drawing of YR40 Sleeve Pipe by HARA KOUGYOU CO., LTD. as an example of an injection pipe of a double packer construction method

Evidence A No. 4: "Notification and interim guidelines relating to construction of construction work by a chemical-injecting construction method",

No. 160 issued by Ministry of Construction Secretariat Technique, July 10, 1974, copies downloaded from the homepage of Ministry of Land, Infrastructure Transport and Tourism Kyushu Regional Development Bureau

Evidence A No. 5: "Geotechnical engineering/the business series 11 the prediction and actual condition of a soil improvement effect", Japanese Geotechnical Society, issued on February 15, 2000, copies of Pages 279 to 285, and 311

Evidence A No. 6: "Notification and interim guidelines relating to construction of construction work by a chemical-injecting construction method",

Notification No. 110-1 issued by Ministry of Construction Technical Investigation Secretariat Technique,
April 24, 1990
No. 188-1 issued by Ministry of Construction Technical Investigation
September 18, 1990

Interim Guidelines
No. 160 issued by Ministry of Construction Secretariat Technique
July 10, 1974
(Copies downloaded from the following URL of the homepage of the Ministry of Land, Infrastructure, Transport and Tourism Kanto Regional Development Bureau:
http://www.ktr.mlit.go.jp/ktr_content/content /000007052.pdf)

Evidence A No. 7: Lasting Grout Injection Method, Sankai-Do, Inc., issued on August 18, 2000, copies of Pages 34 and 35

Evidence A No. 8: New edition An illustration grout manual, Lattice CO., LTD, issued on April 15, 1982, copies of Pages 216 and 217

Evidence A No. 9: Design/construction guidelines of a chemical-injecting construction method, Japanese Grout Association, issued in June, 1989, copies of Pages 1 to 7, 32, 33, 38, 39, and 56

Evidence A No. 10: A durable grout injection method construction guideline, Japanese Grout Association, issued in March, 2012, copies of Pages 1, 2, 14, 27, and 28

Evidence A No. 11: A correct grout injection construction method-a book for understanding essence-, Japan chemical-injecting association, issued on January 31, 2002, copies of Pages 350 to 355

Evidence A No. 12: A copy of the written demand for trial (the demandant) dated March 7, 2014

Evidence A No. 13: A copy of the written reply of the trial case (the demandee) dated July 25, 2014

Evidence A No. 14: A copy of the written correction request (the demandee) dated July 25, 2014

Evidence A No. 15: A copy of the written refutation of the trial case (the demandant) dated August 21, 2014

Evidence A No. 16: A copy of the notification of matters to be examined (Japan Patent Office) dated October 16, 2014

Evidence A No. 17: A copy of the oral proceedings statement brief (the demandee)

dated November 11, 2014
Evidence A No. 18: A copy of the oral proceedings statement brief (the demandant) dated November 12, 2014
Evidence A No. 19: A copy of the written statement (the demandant) dated November 26, 2014
Evidence A No. 20: A copy of the first oral proceedings record (Japan Patent Office) dated November 26, 2014
Evidence A No. 21: A copy of the written statement (the demandant) dated December 9, 2014
Evidence A No. 22: A copy of the written statement (the demandee) dated December 22, 2014
Evidence A No. 23: Japanese Patent No. 5137153
Evidence A No. 24: "A correct grout injection construction method" edited by Japan Chemical-Injecting Association on January 31, 2002, Pages 244 to 245
Evidence A No. 25: Ryozo Yonekura, Shunsuke Shimada and Yoshitomo Kinoshita, "Lasting Grout Injection Method" August 18, 2000, Sankai-Do, Inc., Pages 143 to 151
Evidence A No. 26: Shunsuke Shimada, Takeshi Sato, and Minoru Taku, "Chemical Feeding Method of Leading-edge Technology" Riko-Tosho Publishing 1989, June 10, Pages 291 to 293
Evidence A No. 27: Tei Sasao, Takeshi Suga, Satoru Tsuchiya, and Shunsuke Shimada, "Development and Application of Ground Injection Construction Method in Joetsu Shinkansen Nakayama Tunnel Construction Area," Journal of the Japan Society of Civil Engineers, Vol. September, 1980, Pages 61 to 67
Evidence A No. 28: Japanese Patent No. 2552553
Evidence A No. 29: A copy of explanatory material (the demandant) of a technical explanation meeting on October 12, 2016 in 2016 (Gyo-ke) No. 10026

Also, Evidence A No. 3 and Evidence A No. 4 have been replaced with Reference Material 1 and Reference Material 2 attached to the written refutation (see first oral proceeding record).

Also, Evidence A No. 7 has the same contents as Evidence B No. 1 submitted by the demandee, and similarly, Evidence A No. 8, A No. 9, A No. 10, and A No. 11 respectively have the same contents as Evidence B No. 2, B No. 3, B No. 4, and B No. 5.

2 Summary of Allegations and Evidence Submitted by the Demandee

(1) Outline of the demandee's allegation

The demandee submitted Evidence B No. 1 to B No. 5 in the written reply of the trial case dated July 25, 2014, the oral proceedings statement briefs dated November 11, 2014, and the written statement dated December 22, 2014, and demanded the decision, "The demand for trial of the case was groundless, and costs in connection with the trial shall be borne by the demandant."

(2) Concrete allegation

A Regarding Evidence A No. 1

The demandant alleges that Evidence A No. 1 describes the constitution of "deciding a flow rate in advance, measuring ground resistance force."

However, Invention A-1 is an invention which carries out a water injection test

(water permeability test) to determine the appropriate injection pressure of the work, in advance prior to this work changes a flow rate and pressure to obtain a P-q curve, and estimates limit injection speed or limit injection pressure. That is, it is obvious that values which cannot be obtained without injecting water beyond the limit injection pressure P_{rf} cannot be measured at the site of this work, and if the injection pressure can be obtained directly by using a chemical liquid at the site of this work, there is no need to carry out the water injection (water permeability) test. [Figure 26] of Evidence A No. 1 becomes necessary, in order to grasp a relationship between a flow rate and pressure when actually injecting a chemical liquid, from the relationship between the flow rate and the pressure on the site ground obtained from the injection test, since only the water injection test is carried in the site of this work for ground improvement (see [0074], [0080], and [0082] of Evidence A No. 1).

On the other hand, Invention 1 is an invention which measures actual ground resistance pressure at the set flow rate so as to uniformly separate a grout at the site of this work for ground improvement.

B Regarding Evidence A No. 2

The demandant alleges that Evidence A No. 2 describes the constitution of "deciding a flow rate in advance, measuring ground resistance force." of Invention 1 of the case.

However, in Evidence A No. 2, there is no explanation about a "flow rate test," and just because the possibility of the "flow rate test" being carried out at the site of this work is not excluded, it is merely still unknown what kind of test is carried out, after all. Also, in Evidence A No. 2, there is a description that "by using such a flow rate control valve C, it is possible to adjust the screw 24 in advance to set to a predetermined discharge amount, based on the flow rate test before construction, and it is also possible to appropriately adjust the discharge amount by rotating the screw 24 according to an injection state during the injection." ([0037]), and in the branch pipes with different ground resistance pressure, it is inferred that it is merely a flow rate test carried out to adjust discharge amount to the predetermined discharge amount by adjusting the flow control valve C.

C Regarding the well-known art

Although the demandant alleges that the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 has been a conventionally well-known art, the allegation is groundless as stated below.

(A) Regarding Evidence A No. 5

Even if there is the description of the demandant's allegation in Evidence A No. 5, it merely cannot exclude the possibility of an injection test using a chemical liquid, and since Evidence A No. 5 is merely a document introducing an example of an actual experiment (see Page 279, Lines 11 to 13), it is not a proof that the P-q curve has been conventionally obtained by injecting the grout at the site commonly.

For example, even if it is publicly known that the P-q curve is obtained by injecting the chemical liquid (grout) at the site to be injected, the test for obtaining the P-q curve in Evidence A No. 5 gradually increases injection speed to carry out measurement (Page 280, Line 11 from the bottom to Line 6 from the bottom).

According to "Design/construction Guidelines of Chemical-Injection, Japanese Grout Association, issued in June, 1989 (Evidence A No. 9), Page 39, Lines 1 to 3, since the measured grout resistance pressure is different between such a case and the case of directly injecting a constant amount of a grout at once like the Invention 1 of the case, it cannot be a basis for proving that a method of measuring the ground resistance pressure like as Invention 1 is a well-known matter.

(B) Regarding Evidence A No. 4 and Evidence A No. 6

Evidence A No. 4 and Evidence A No. 6 are matters of attention and the like when performing a chemical-injecting construction method in a construction work, and does not describe a specific test result. Also, these guidelines, from the viewpoint of preventing the generation of health damage and the contamination of groundwater and the like, determines that it should be checked whether or not the injection of a chemical liquid as designed can be safely executed (see Page 8 of Evidence A No. 6), and does not prove that ground resistance pressure is actually measured on a ground subjected to this work. On the other hand, in these guidelines, it is regulated that a field injection test is carried out "in an injection planning ground or a ground equivalent thereto" (Page 2 of Evidence A No. 4 and Page 10 of Evidence A No. 6), and it is not supposed that the field injection test has to be carried out at the site of this construction.

(C) Regarding Evidence A No. 24 to Evidence A No. 28

At places pointed out by the demandant of Evidence A No. 24 and Evidence A No. 25, a reference range for setting the design injection amount of a chemical liquid is merely described.

At a place pointed out by the demandant of Evidence A No. 26, the injection amount of the water permeability test after injection is also described, and the "test injection" merely actually injects the chemical liquid experimentally to measure injection pressure, pump discharge amount and the like.

At a place pointed out by the demandant of Evidence A No. 27, a relationship between injection speed before and after injection when a test injection is carried out as an investigation for checking a waterproof effect of rock crack (mountain tunnel) and the like and injecting a silica riser which is a chemical liquid is recorded, and a relationship between permeation pressure and permeation speed is merely shown.

At a place pointed out by the demandant of Evidence A No. 28, adjusting injection amount to injection pipelines according to injection resistance pressure is described, and the order thereof is reversed from deciding a flow rate in advance and measuring ground resistance pressure at the flow rate.

(D) Regarding an easily-arrived property

As described in (A) to (C) above, the constitution of "deciding a flow rate in advance, measuring ground resistance force" of Invention 1 is not a well-known art. The reason for adopting the constitution of "deciding a flow rate in advance, measuring ground resistance force" is based on the following technical reasons.

That is, although a dual-type plunger is usually used for the injection of chemical grout (chemical liquid) for the purpose of stopping water in a soft ground and strengthening a ground (see [0052] of the corrected description of the case), it is impossible to completely eliminate pulsation due to the structure, and it is very difficult

to always ensure a constant discharge amount (flow rate), and furthermore, since precision thereof is not high, about 5% variation occurs in the discharge amount from each discharge port. Also, actual ground is not uniform, and there is a difference in ground resistance pressure, and the flow rate of the respective injection pipes change due to a slight difference in conditions including injection conditions other than injection pressure (for example, differences in injection method, differences in properties of grout, etc.) (see [0005]).

Then, in Invention 1, when injection is carried out at a flow rate decided in advance at the time of designing, even if any variation (difference) in ground resistance pressure of each injection pipeline is generated in an actual measurement, by setting absolute requirements to load compulsive pressure always higher than all ground resistance pressure (see [0045] and [0047]), the following working effects are attained. [1] A working effect that it becomes possible to simultaneously and uniformly separate grout into a plurality of injection ports, and it becomes possible to improve work efficiency (see [0023]), or [2] a working effect that it becomes possible to inject at a low flow rate (3 to 6 l/minute) to the plurality of injection ports with one or a few numbers of injection pumps, regardless of difference in ground resistance force, so that the grout can finely penetrate into the clearances of the sandy soil, and to further improve an injection effect (see [0024]).

D Summary

According to A to C above, it cannot be said that Invention 1 could not have been conceived by a person skilled in the art based on the invention described in Evidence A No. 1, or based on the inventions described in Evidence A No. 1 and Evidence A No. 2, or based on the inventions described in Evidence A No. 1 and Evidence A No. 2 and a well-known art.

[Means of proof]

Evidence B No. 1: Lasting Grout Injection Method, Sankai-Do, Inc., August, issued on August 18, 2000, copies of Pages 34 and 35

Evidence B No. 2: New edition An illustration grout manual, Lattice CO., LTD, issued on April 15, 1982, copies of Pages 216 and 217

Evidence B No. 3: Design/construction guidelines of a chemical-injecting construction method, Japanese Grout Association, issued in June, 1989, copies of Pages 1 to 7, 32, 33, 38, 39, and 56

Evidence B No. 4: A durable grout injection method construction guide line, Japanese Grout Association, issued in March, 2012, copies of Pages 1, 2, 14, 27, and 28

Evidence B No. 5: A correct grout injection method construction guide line-a book understanding essence-, Japan chemical-injecting association, issued on January 31, 2002, copies of Pages 350 to 355

No. 5 Judgment by the body

Hereinafter, Invention 1 will be judged (regarding Invention 2, the first trial decision has become final and binding).

1 Described Matters in Evidence A Nos. 1, 2, 4, 5, 6, 9, 10, 25, and 26

(1) Evidence A No. 1

Evidence A No. 1, which was distributed prior to the filing of the application of the Patent, describes the following matters. (Underlines are added in the trial decision; the same applies hereafter.)

A "Detailed Description of the Invention
[0001]
[Field of the Invention]
The present invention relates to the ground improvement of a large amount of soil, such as ground improvement for rapid construction in liquefaction preventive construction or large-scale construction, and especially to a ground injection device and a ground injection construction method which install a plurality of injection pipelines in a ground to be improved, and simultaneously, selectively, and automatically inject an injection liquid from the plurality of injection pipelines."

B "[0012]
Then, an objection of the present invention is to provide a ground injection device and a ground injection construction method using the device which simultaneously and automatically injects an injection liquid with an optimal set flow rate or set pressure, when injecting the injection liquid into a target soil layer from a plurality of injection pipelines installed in a ground to improve the ground, thereby rapidly and certainly improving the ground in a wide range and improving defects existing in the above mentioned prior art. "

C "[0015]
[Embodiments of the invention]
Hereinafter, the present invention will be depicted using the attached drawings.
[0016]
Figure 1 is an explanatory view of one example of a ground injection device according to the present invention. Figure 2 is an explanatory view of another example of an injection liquid distribution part shown in Fig. 1. Figure 3 is an explanatory view of another example of an injection liquid pressurization part shown in Fig. 1. Figure 4 is an explanatory view of an annular distribution container. Figure 5 is an explanatory view of a drum-type distribution container. Figure 6 is a front view of a multistage type distribution container, and Fig. 7 is a side view of Fig. 6. Figures 8 and 9 show examples using a multistage branch pipe. Figures 10 and 11 show examples using a plural-direction branch body. Figure 12 is an explanatory view of another example of the injection liquid distribution part shown in Fig. 1. Figure 13 is an explanatory view of further another example of the injection liquid distribution part in Fig. 1. Figure 14, 15, and Fig. 16 are explanatory views of another example of the ground injection device according to the present invention. Figure 17 shows one example of an injection pipeline of an injection part in Fig. 1, and is a cross-sectional view showing a state installed in the ground. Figure 18 shows one example of the injection pipeline equipped with a bag packer, and is a cross-sectional view showing a state installed in the ground. Figure 19 shows one example of a double-pipe double packet injection pipeline. Figure 20 shows another example of another injection pipeline, and (a), (b), and (c) are cross-sectional views respectively showing a single pipe, a double pipe, and a triple pipe. Figure 21 shows another example of the injection pipeline of the double

pipe double packer. Figure 22 shows further another example of the injection pipeline, and is a cross-sectional view showing a state in which an inner pipe of the double pipe is slid upward to inject. Figure 23 shows further another example of the injection pipeline, and is a cross sectional view of the one in which the plurality of injection pipelines is provided in the injection pipe so as to open discharge ports thereof at different positions in an axial direction. Figure 24 shows one example showing a formation mode of a horizontal consolidation layer. Figure 25 shows one example showing a formation mode of a laminated consolidation layer of a consolidation layer of Fig. 24. Figure 26 is a graph showing a relationship between injection pressure and injection speed.

[0017]

The present invention device is a device which injects a ground injection liquid into a ground through a plurality of injection pipelines installed in the ground to consolidate the ground, and as shown in Fig. 1, is composed of a control part X, an injection pressurization part Y, an injection liquid distribution part Z, an injection part W, and a liquid feeding system A. When operation is manually performed, the control part X is not required. Hereinafter, an example using the control part will be specifically depicted.

[0018]

As shown in Fig. 1, an injection liquid pressurization part Y pressurizes the injection liquid from an injection liquid tank 2 with a grout pump 1, and feeds that to the injection liquid distribution part Z through the liquid feeding system A as a pressurized injection liquid. The grout pump 1 receives an instruction from an injection monitoring board X1 of the control part X, and pressurizes the injection liquid to a required pressure. Also, the pressurization part Y of Fig. 1, as shown in Fig. 3, may use a compressor 3 instead of the grout pump 1. That is, a pressurization container 4 is filled with the injection liquid 5, and the injection liquid 5 from the injection liquid tank 2 is pressurized by the actuation of the compressor 3 to be the pressurized injection liquid.

[0019]

The injection liquid distribution part Z is equipped with a plurality of branch pipes S, S...S. These branch pipes S, S...S have coupling parts SO coupled with injection pipelines 9, 9...9 at respective tip ends thereof. The coupling parts SO can change the coupling of the branch pipe S to other injection pipelines 9, 9...9 at the time when the injection of a predetermined amount is finished through the predetermined injection pipelines 9, 9...9 or when it reaches a predetermined injection pressure. The above mentioned branch pipes S, S...S are each disposed so as to extend from the distribution container 6 coupled with the pressurization part Y through the liquid feeding system A, as shown in Fig. 1, and are coupled with the injection pipelines 9 at the coupling parts SO at the tip ends. Then, the pressurized injection liquid from the pressurization part Y is distributed into respective distribution pipes S, S...S through a distribution container 6, and sent to the injection pipeline 9. The distribution container 6, not shown, may be equipped with an agitation device. Also, each distribution pipe S, S... S may be directly coupled with the liquid feeding system A from the pressurization part Y without passing through the distribution container 6. Also, in Fig. 1, by measuring the total amount of f_1, f_2...f_i, f_n, a flow rate of a liquid feeding flowmeter f0 can be grasped, and thus the liquid feeding flowmeter f0 is not necessarily required.

D "[0025]
Figures 8, 9, and 10 show an example of the injection liquid distribution part Z consisting of a multistage distribution body or a plural-direction branch body. When a large number of the branch pipes is aligned in a row in the pipe body while using the pipe body as the injection liquid distribution part Z as it is, since a pressure distribution is changed with a loss of water head in the pipe by liquid feeding from one side to the other side, flow rates to the respective branch pipes S, S...S are changed. Such a problem, as shown in Fig. 8, Fig. 9, and Fig. 10, can be improved using the injection liquid distribution part Z consisting of the multistage distribution body or the plural-direction branch body. Figure 8 and 9 show the multistage branch body, in which a plurality of branch pipes are branched off from one branch pipe to be multistage. V may be a throttle valve, or an orifice. In this way, the loss water head is equalized and the distribution of the injection liquid becomes possible under the same condition.
[0026]
Figure 10 shows the injection liquid distribution part Z which makes a multidirectional branch pipe become multistage. V_1 is an example of the minimum unit body of the multidirectional branch pipe made from plural-direction branch pipes, is a valve of a three-way channel, and makes the injection liquid simultaneously flow separately in channels in two directions, right and left. The channels in the two directions right and left may be possible by a throttle, or may be provided with an orifice.
[0027]
Figure 11 shows another example of a multidirectional branch body. $V_{11}...V_{1n}$ are branch valves having throttle valves, and of course can serve as stop valves. If the valves are adjusted to a predetermined throttle degree; for example, if they are made to be the same throttle degree, when pressurizing and feeding an injection liquid of 60 l/minute, in the case where n of V_{1n} is 5, it separately flows in every branch at 12 l/minute.
$V_{21}...V_{2n}$ is a valve having a flow dividing valve (flow divider) of the multidirectional branch pipe, and uses one dividing a flow into a flow rate of the same amount, even if the right and left loads on the downstream side vary in size. For example, if a load on one channel becomes larger and the flow rate intends to become smaller, the opening of the valve is automatically adjusted, and actuates so as to make the same flow rate flow in the right and left channels. Thus, if divided into any number of stages (n-stage), the branching of the number of 2^n becomes possible.
[0028]
In Fig. 1 to Fig. 2, and Fig. 4 to Fig. 7, the branch pipes S, S...S are respectively mounted with branch valves V_1, $V_2...V_i$, V_n and/or orifices O_1, $O_2...O_i$, O_n, and are further mounted with branch flowmeters f_1, $f_2...fi$, fn and/or branch pressure meters P1, P2...Pi, Pn if necessary. These branch pipes S, S...S communicate with the plurality of injection pipelines 9, 9...9 to be mentioned through the coupling part SO, and feed the pressurized injection liquid from the pressurization part Y to the respective injection pipelines 9, 9...9. Also, the branch flowmeters f_1 to f_n may be provided on the upstream side of the orifices O_1 to O_n, or on the upstream side of the branch valves V_1 to V_n. Also, the orifices O_1 to O_n may be provided at the branch pipes S, S...S on the upstream side of the branch valves V_1 to V_n, and may be directly provided on a wall surface of the distribution container 6 or a pipe wall of a conduit 7 of the liquid feeding

system A. Also, by using the branch valves V_1 to V_n having a throttling function, it can also have an orifice function. Furthermore, by making the branch valves V_1 to V_n have a function as a stop valve, a liquid feeding valve V_0 is not necessarily required.
[0029]
On the liquid feeding system A of the pressurized injection liquid from the injection liquid pressurization part Y to the injection liquid distribution part Z, namely, the conduit 7, the liquid feeding flowmeter f_0 and/or a liquid feeding pressure meter P_0 are equipped with. Furthermore, a liquid feeding valve V_0 is provided in the conduit 7 downstream of the liquid feeding flowmeter f and/or the liquid feeding pressure meter P or upstream of the branch pipe S."

E "[0036]
Also, the above mentioned branch flowmeters f_1, f_2...f_i, and f_n are rotary flowmeters or electromagnetic flowmeters and the like, and an electrical signal outputted by a pulse is inputted in the control part X and counted. Furthermore, a flow rate in the respective branch pipes S, S...S is defined by selecting or changing calibers and openings (the throttle of the channel) of the liquid feeding valve V0 and the branch valves V_1, V_2...V_i, V_n, or calibers of the orifices O_1, O_2...O_i, O_n, or a number or calibers thereof. Also, an inverter 3 is controlled by an instruction to the injection liquid pressurization part Y from the control part X based on information from the liquid feeding flowmeter and/or the liquid feeding pressure meter, or the branch flowmeter and/or the branch pressure meter to adjust a number of rotations of the grout pump 1, control a flow rate/minute f_0 or injection pressure P_0, and control a flow rate of the branch pipe S.
[0037]
Furthermore, as shown in Fig. 2, the injection liquid distribution part Z in Fig. 1 may be one which removes the branch flowmeters f_1, f_2...f_i, and f_n and the branch pressure meters P_1, P_2...P_i, and P_n from the respective branch pipes S, S...S. Also, in Fig. 2, even without branch valves V_1 to V_n, only orifices O_1 to O_n may be sufficient as described later. Also, it is possible to provide the same function as the orifices O_1 to O_n by throttling the branch valves V_1 to V_n to adjust the opening thereof. In that case, the orifices O_1 to O_n are not required. Also, the opening of the branch valves can be adjusted with hydraulic pressure to enable remote control."

F "[0039]
As shown in Fig. 1, the injection part W is composed of the plurality of injection pipelines 9, 9...9 installed in the ground 8, is respectively coupled to the respective branch pipes S, S...S of the injection liquid distribution part Z, and injects the pressurized injection liquid from the injection liquid pressurization part Y into the ground 8 through the plurality of injection pipelines 9, 9...9 via the branch pipes S, S...S, thereby consolidating the ground 8.
[0040]
Although as the injection pipeline 9 used herein, various injection pipelines are used, if showing one example, it is as shown in Fig. 17, 18, 19, 20, 21, 22, and 23.
[0041]
The injection pipeline 9 in Fig. 17 is a bound injection pipe configured by binding a plurality of thin pipes 10, 10...10 through fixed plates 11, 11...11. The fixed plate 11 may be a binding band. The respective thin pipes 10, 10...10 have tip end discharge

ports 12, 12...12 respectively opened at different positions in an axial direction, and these discharge ports 12, 12...12 are equipped with rubber sleeves 13, 13...13, and are installed in the ground 8 so as to be embedded in a sleeve grout 15 injected in an injection hole 14. The injection liquid from the discharge port 12 penetrates and is injected into the ground 8 by breaking the solidified sleeve grout 15. Also, it is not necessary to use the rubber sleeves 13 or the sleeve grout 15."

G "[0051]
Hereinafter, the ground injection construction method according to the present invention, namely the ground injection construction method which injects a ground injection liquid into a ground through a plurality of injection pipes installed in the ground, and consolidates the ground will be depicted.
[0052]
The ground injection construction method according to the present invention is carried out by using the ground injection device of the present invention. As the ground injection device, as shown in Fig. 1 for example, a device is used, which includes the injection liquid pressurization part Y pressurizing the injection liquid; the injection liquid distribution part Z which is coupled with the pressurization part Y, has the branch valves V_1, V_2...V_i, and V_n respectively communicated with the plurality of injection pipelines 9, 9...9 and the plurality of branch pipes S, S...S equipped with either one or both of the branch flowmeters f_1, f2...f_i, and f_n and the branch pressure meters P_1, P_2...P_1, and P_n according to necessary, and distributes the pressurized injection liquid from the pressurization part Y to the respective branch pipes S, S...S to feed that to the respective pipelines 9, 9...9; the liquid feeding flowmeter f_0 and/or the liquid feeding pressure meter P_0 equipped on the liquid injection system A of the pressurized injection liquid from the injection liquid pressurization part Y to the injection liquid distribution part Z; namely, the conduit 7; and the control part X configured by connecting an operation board X2, an injection recording board X3, and a data input device X4 to an injection monitoring board X1 which are respectively connected to the liquid feeding flowmeter f_0 and/or the liquid feeding pressure meter P_0, the injection pressurization part Y, the branch valves V_1, V_2...V_i, and V_n, and either one or both of the branch flowmeters f_1, f_2...f_i, and f_n and the branch pressure meters P_1, P_2...P_i, and P_n by signal circuits.
[0053]
Also, the branch valve V1'n may not necessarily be connected by a signal circuit. The throttle of the valve is set to a predetermined value in advance, and when the injection of the predetermined amount is finished, or when it reaches a predetermined pressure, by changing the coupling of the branch pipes S, S...S to other injection pipelines 9, 9...9, valve control during injection is not required.
[0054]
In the above mentioned ground injection device, as shown in Fig. 1, the injection liquid distribution part Z may be further equipped with the pressurized injection liquid distribution container 6 coupled with the liquid feeding system A (conduit 7). In that case, the respective branch pipes S, S...S, as shown in Fig. 1, are equipped so as to respectively extend from the distribution container 6, and distribute the pressurized injection liquid from the pressurization part Y into the respective branch pipes S, S...S through the distribution container 6. The distribution container 6 is effective because it can inject the pressurized injection liquid into the respective branch pipes S, S...S

under the same condition. That is, if the branch pipes S, S...S are directly connected to a long conduit without passing through the distribution container 6, a pressure gradient is generated in the pipe, so that the pressurized injection liquid is difficult to jet under the same condition, and discharge amount to the respective pipes S, S...S differs. So as to prevent that, the distribution container 6 is preferably used. Also, the liquid feeding pressure meter P_0 can also be provided on the distribution container 6.

[0055]

Furthermore, the plurality of branch pipes S, S...S may be respectively equipped with the orifices O1, O_2...O_i, and O_n on the upstream side of the branch flowmeters f_1, f_2...f_i, and f_n and/or the branch pressure meters P_1, P_2...P_i, and P_n.

[0056]

The operation board X2, the injection recording board X3, and the data input device X4 of the control part X are built in the control part X and are connected to the injection monitoring board X1, or are connected to the control part X from the outside of the control part X by a signal circuit.

[0057]

By using the ground injection device mentioned above, first, required set values of the branch flowmeters f_1, f_2...f_i, and f_n and/or the branch pressure meters P_1, P_2...P_i, and P_n; namely, required set values or a limit range according to a ground state, are stored in the data input device X4 of the control part X about each of the branch pipes S, S...S.

[0058]

Next, data during injection from the liquid feeding flowmeter f_0 and/or the liquid feeding pressure meter P_0, or the branch flowmeters f_1, f_2...f_i, and f_n and/or the branch pressure meters P_1, P_2...P_i, and P_n are stored in the injection recording board X3 of the control part X sequentially for each of the branch pipes S, S...S.

[0059]

When the injection monitoring board X1 of the control part X indicates that the data of the branch flowmeters f_1, f_2...f_i, and f_n and/or the branch pressure meters P_1, P_2...P_i, and P_n reach the set values or exceed the set values and a predetermined limit range, by the operation board X2 of the control part X, the branch valves V_1, V_2...V_i, and V_n and/or the injection liquid pressurization part Y are actuated with respect to the respective branch pipes S, S...S to adjust a fed liquid, or the injection is finished by closing the branch valves V_1, V_2...V_i, and V_n, and if the branch flowmeters f_1, f_2...f_i, and f_n and/or the branch pressure meters P_1, P_2...P_i, and P_n reach the set values or exceed the set values with regard to the remaining branch pipes S, S...S, the same operation is repeated to carry out injection.

[0060]

In the above mentioned operation, manual operation is carried out if required. Also, for the branch pipe finishing the injection when reaching a predetermined amount, or for the branch pipe finishing the injection when injection pressure reaches a limit value, by switching the branch valves V_1, V_2...V_i, and V_n to a return pipeline R, the injection can be finished without stopping the pressurized injection liquid from the finished branch pipes. That is, since the pressurized injection liquid continues flowing without stopping, even if the injection partially finishes, the condition of the pressurized injection liquid does not change. Therefore, without adjusting the injection pressurization part Y, the injection is attained under the same condition until the injection of all branch pipes is completed.

[0061]
Furthermore, in this case, as shown in Fig. 16, without switching the branch valves V_1, V_2, V_3...V_i, and V_n to the return pipeline R, the coupling parts SO, SO...SO of the branch pipes S, S...S are switched from a first injection block to an injection pipeline of another injection block; namely, a second injection block, and it is also possible to continue the injection as is.
[0062]
In the ground injection construction method of the present invention, by injecting the injection liquid into an injection stage with generally the same depth through the plurality of injection pipelines 9, 9...9 installed in the ground 8 in this way, a continuous plate-like consolidation layer; namely, a first improved block in Fig. 1, is formed, and by repeating the injection, for example, a further plate-like consolidation layer; namely, a second improved block, is formed on a lower layer to form a laminated body.
[0063]
In the present invention, generally the same depth means the injection depth of injection pipe length generally the same in the horizontal direction; for example, a tunnel boring construction and the like performing injection in lateral direction. Also, in the present invention, the first improved block and the second improved block may be provided in the vertical direction as shown in Fig. 1, or may be provided in the horizontal direction as shown in Fig. 24.
[0064]
In this case, as mentioned above, the information of the liquid feeding flowmeter f_0 and the liquid feeding pressure meter P_0 is sent to the control part X, and the control part X instructs the injection liquid pressurization part Y based on the information to adjust the inverter 3 and control to attain the optimal injection rate F_0 and injection pressure P_0. That is, as shown in Fig. 1, the branch pipes S, S...S are respectively provided with the branch flowmeters f1, f2...fi, and fn or the branch pressure meters P1, P2...Pi, and Pn, the information thereof is transmitted to the control part X, and as a matter of course, it is possible to inject the pressurized injection liquid with the injection speed f0 and the injection pressure P_0 within a predetermined range. Especially, if the ground condition changes or injection is simultaneously carried out from the discharge ports in the vertical direction, it is possible to inject in the same way. Also, as in Fig. 1, if the ground condition in each block in the horizontal direction is generally the same, the injection is simultaneously carried out from the plurality of injection pipelines provided planarly at intervals to generally the same soil layer or depth by using a simple device without a branch pressure meter or a branch flowmeter, thereby enabling simple injection. In this case, average injection speed of the respective injection pipelines in the improved block is controlled, and the whole injection amount is also controlled. The injection liquid is simultaneously fed and injected from one liquid feeding part Y to the plurality of injection pipelines 9, 9...9 with the predetermined flow rate of the pressurized injection liquid or the predetermined pressure, and thus the ground 8 in a wide range can be rapidly and simply improved."

H "[0072]
Then, when constructing the ground injection using the device of Fig. 14, for example, prior to the injection in a first stage, a water injection test is performed to take out a P-q curve (curve 1) shown in Fig. 26; namely, a P (injection pressure P)-q (injection speed

or flow rate 1/minute) curve. Fig. 26 is an injection pressure-flow rate (injection amount/minute) curve. In Fig. 26, the injection speed and the injection pressure are in a proportional relationship until a point O_1, and it becomes perfect infiltration injection without generating ground breakage. However, until the points O_1 to O_2, the injection speed and the injection pressure are not in the proportional relationship, although cracking is partially generated, there is no injection pressure drop at which the ground breaks and the injection liquid deviates. The injection pressure of the point O_2 is made to be limit injection pressure P_{r0} and limit water injection speed (flow rate) q_{r0}. Thus, the limit injection pressure P_{r0} and the limit injection flow rate q_{r0} (injection speed) at which the ground breaks can be known.

[0073]

Also, unlike the water injection test, when injecting a chemical liquid, the ground is strengthened as the injection progresses. In Fig. 26, those are in a linear relationship until a point F_1, and those are not a straight line, but do not break from the points F_1 to F_2. Therefore, P_{rf} at the point F_2 is made to be limit pressure and q_{rf} limit injection flow rate. Thus, the final limit injection pressure and the limit injection flow rate (injection speed) are respectively set as P_{rf} and Q_{rf}, and the injection of design injection amount (integrated injection amount) is carried out within this limit. Then, the injection is finished when the design injection amount is injected, and if the limit injection pressure is reached before the design injection amount is reached, the injection is finished at that point.

[0074]

Here, in Fig. 14, by assuming a number n of injection pipelines T as n=100, an orifice caliber=1.0 mm, and liquid feeding flowmeter f_0=150 l/minute, when injection is simultaneously carried out from discharge ports positioned on the first stage of the injection pipelines (T1 to T100), the branch pressure meter P_{11} indicates 2 kg/cm^2 (Note by the trial decision: "2 kg/cm^2" is considered to be an error of "2 kgf/cm^2"), the branch flow meter f_{11} indicates 1.5 1/minute, and the liquid pressure meter P_0=30 kgf/cm^2. In a water permeability test before the injection in the first stage, it was q_{1r0}=5 l/minute. Also, it was q_{1r0}=5 kgf/cm^2 (Note by the trial decision: "q_{1r0}" is considered to be an error of "P_{1r0}"). It is set to P_{1rf}=7.5 kgf/cm^2 (1.5 times P_{1r0}). Also, planned injection amount in the injection pipeline T_{11} was set as Q_{11}=100 l. The injection pressure of P_1 during the injection was within 3.0 kgf/cm^2, and the injection of 100 l was completed at average injection speed q_1=1.5 l/minute."

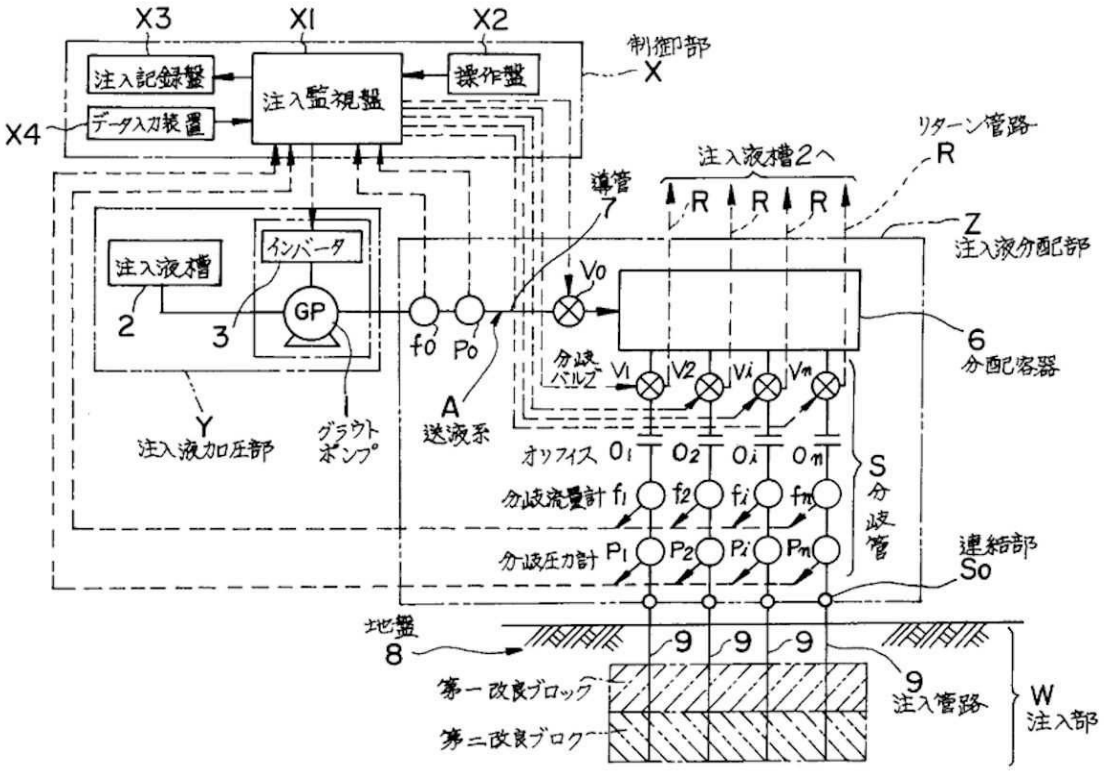
I "[0079]

In Fig. 14, the plurality of injection pipelines 9 configured by binding the plurality of thin pipes 10, 10...10 shown in Fig. 17 as the injection pipeline T are installed in the ground 8. Also, the branch pressure meter P1'n is provided on at least one of the branch pipes S, S...S from the distribution container 6. The injection pipelines 9, 9...9 (the injection pipelines are expressed as T in Fig. 14) are installed in the ground 8 so as to position the discharge ports 12, 12...12 at positions different in the axial direction respectively on the first to the n-th stages having different soil layers. Next, among the liquid feeding valves V_{01} to V_{0n}, only the V01 is opened, from the first distribution container 6, the discharge port 12 simultaneously feeds the injection liquid to the thin pipes 10 (T_{11} to T_{n1}) of the injection pipelines 9 (T_1 to T_n) positioned on the first state, and injects that to the first stage through the thin pipes T_{11} to T_{n1}.

[0080]
The number of the branch pipes from each distribution container is made to be n=100, the caliber of the orifice is made to be 1.0 mm, and it is set to be the flow rate f_0 of the liquid feeding flowmeter=150 l/minute at the pressure of the liquid feeding pressure meter P_0=30 kgf/cm^2, average injection speed from the discharge port is 1.5 1/minute. By a preliminary water permeability test, if it is P_{1r0}=6 kgf/cm^2 and q_{1r0}=4 l/minute, and initial injection pressure P_{10} indicated by the branch pressure meter is within 6 kgf/cm^2, inter-granular permeation is carried out without breaking the ground.

[0081] If the injection is advanced, and the injection of the whole injection amount Q1=100l×100=10000l of the discharge port of n(=100) on the first stage can be injected within the limit injection pressure P_{1f} (set as =1.5×P_{1r0}), the liquid feeding valve V_{01} is closed to finish the injection of the first stage, and only the liquid feeding valve V_{02} is opened to shift to the injection of the second stage."

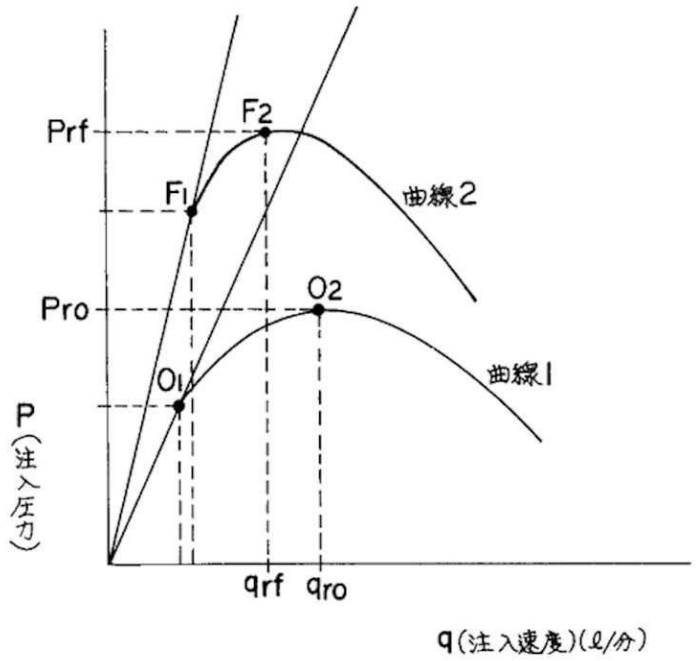
J Fig. 1 and Fig. 26 are as follows.
[Fig. 1]



注入記録盤　Injection recording board
データ入力装置　Data input device
注入監視盤　Injection monitoring board
操作盤　Operation board
制御部　Control part
注入液槽　Injection liquid tank
インバータ　Inverter

注入液加圧部　Injection liquid pressurization part
グラウトポンプ　Grout pump
導管　Conduit
送液系　Liquid feeding system
注入液槽２へ　To injection liquid tank 2
リターン管路　Return pipeline
注入液分配部　Injection liquid distribution part
分岐バルブ　Branch valve
分配容器　Distribution container
オリフィス　Orifice
分岐流量計　Branch flowmeter
分岐圧力計　Branch pressure meter
分岐管　Branch pipe
連結部　Coupling part
地盤　Ground
第一改良ブロック　First improved block
第二改良ブロック　Second improved block
注入管路　Injection pipeline
注入部　Injection part

[Fig. 26]



曲線２　Curve 2
曲線１　Curve 1
（注入圧力）　(Injection pressure)

（注入速度）　(Injection speed)
（ℓ／分）　(l/minute)

K　As described above, considering the error of H above, it is recognized that Evidence A No. 1 describes the following invention (hereinafter, referred to as "Invention A-1").

"A ground injection construction method using a ground injection device which simultaneously injects a ground injection liquid into a ground through a plurality of injection pipelines installed in the ground to consolidate the ground, and is composed of a control part X, an injection liquid pressurization part Y, an injection liquid distribution part Z, an injection part W, and a liquid feeding system A,

the ground injection device comprising: the injection liquid pressurization part Y which pressurizes the injection liquid from an injection liquid tank 2 with a grout pump 1, and feeds that to the injection liquid distribution part Z through the liquid feeding system A as a pressurized injection liquid;

the liquid feeding system A of the pressurized injection liquid from the injection liquid pressurization part Y to the injection liquid distribution part Z; namely, a conduit 7 equipped with a liquid feeing flowmeter f_0 and a liquid feeding pressure meter P_0;

the injection liquid distribution part Z which is provided with a pressurized injection liquid distribution container 6 coupled with the liquid feeding system A (conduit 7), and a plurality of branch pipes S, S...S equipped so as to extend from the distribution container 6, respectively communicates with a plurality of injection pipelines 9, 9...9 at coupling parts SO at tip ends, mounted with branch valves V_1, V_2...V_i, V_n and orifices O_1, O_2...O_i, O_n, and mounted with branch flowmeters f_1, f_2...fi, fn and/or branch pressure meters P_1, P_2...P_i, P_n; and

the control part X configured by connecting an operation board X2, an injection recording board X3, and a data input device X4 to an injection monitoring board X1 which are respectively connected to the liquid feeding flowmeter f_0 and the liquid feeding pressure meter P_0, the injection pressurization part Y, the branch valves V_1, V_2...V_i, and V_n, the branch flowmeters f_1, f_2...f_i, and f_n, and the branch pressure meters P_1, P_2...P_i, and P_n by signal circuits, wherein the injection pipeline 9 is a bound injection pipe configured by binding a plurality of thin pipes 10, 10...10 through fixed plates 11, 11...11, the respective thin pipes 10, 10...10 having tip end discharge ports 12, 12...12 respectively opened at different positions in an axial direction,

wherein when constructing the ground injection prior to the injection in a first stage, a water injection test is performed to take out a P-q curve (curve 1); namely, a P (injection pressure P)-q (injection speed or flow rate 1/minute) curve, and thus the limit injection pressure P_{r0} and the limit injection flow rate q_{r0} (injection speed) at which the ground breaks can be known,

wherein by assuming a number n of injection pipelines T as n=100, an orifice caliber=1.0 mm, and liquid feeding flow meter f_0=150 l/minute, and when injection is simultaneously carried out from discharge ports positioned on the first stage of the injection pipelines (T1 to T100), the branch pressure meter P_{11} indicates 2 kgf/cm^2, the branch flow meter f11 indicates 1.5 1/minute, and the liquid feeding pressure meter P_0=30 kgf/cm^2, and in a water permeability test before the injection in the first stage, it was q_{1r0}=5 l/minute and P_{1r0}=5 kgf/cm^2,

wherein limit injection P_{rf} and limit injection flow rate (injection speed) qrf when injecting the chemical liquid (injection liquid) are set based on the limit injection pressure P_{r0} and the limit injection flow rate (injection speed) q_{r0}, and the injection pressure P and the flow rate q of the injection liquid fed into the respective injection pipelines are made to be within a limit of the limit injection P_{rf} and the limit injection flow rate (injection speed) qrf,

wherein since it was P_{1r0}=5 kgf/cm^2 in the water permeability test before the injection in the first stage, limit injection pressure P_{rf}=5 kgf/cm^2 which is 1.5 times that

or planned injection amount in the injection pipeline T_{11} is respectively set to Q_{11}=100 l,

wherein the injection of the planned injection amount Q_{11}=100 l in the injection pipeline T_{11} is completed within an injection pressure of P_1 during injection of 3.0 kgf/cm^2, at average injection speed q_1=1.5 1/minute, without reaching the limit injection pressure P_{rf}=7.5 kgf/cm^2."

(2) Evidence A No. 2

Evidence A No. 2 which was distributed prior to the application of the Patent, describes the following matters.

A [Detailed Description of the Invention]

[0001]

[Field of the Invention] The present invention relates to a ground injection device and construction method which inject a ground injection liquid into a ground through injection pipelines installed in the ground to consolidate the ground, especially to a ground injection device and construction method which carry out injection by a predetermined discharge amount regardless of pressure change during injection, and can optionally adjust the discharge amount according to an injection situation, and specifically relates to a ground injection device and construction method which adjust a throttle of a cross section of a conduit feeding the ground injection liquid to the injection pipelines and can carry out injection by a predetermined discharge amount.

[0002]

[Conventional Art] As a ground improvement technology which injects an injection liquid into a ground to improve the ground, conventionally, there is known a method which installs injection pipes in a ground to be improved, and carries out injection while shifting injection stages by pulling up these injection pipes from a lower side to an upper side one by one or pushing down them from the upper side to the lower side.

[0003] However, the target ground to be injected is mostly weak alluvium, and is configured by laminating soil layers having different values of water permeability. Therefore, it is extremely cumbersome to accomplish the optimal injection for each soil layer by shifting the injection stage; namely, to accomplish injection with optimal injection pressure, injection speed, injection amount, injection rate, and the like, and it takes a long time, becomes uneconomical, and is substantially impossible.

[0004] Also, in recent years, it is required to prevent liquefaction by ground injection. For such liquefaction prevention, economically rapid construction of large capacity soil is necessary. However, in the conventional injection construction method, such rapid construction is impossible.

[0005] Especially, as described above, the ground is configured by laminating the soil

layers having different levels of water permeability, therefore, injection pressure varies between each soil layer, causing a pressure change or a change in injection pressure during injection, and due to this pressure change in the ground, it is very difficult to carry out the ground injection at a constant rate of discharge amount.

[0006] [Problem to be solved by the invention] Also, when injection is simultaneously carried out from one pump into a plurality of injection pipelines installed in the ground, if the injection pressure of the ground at each injection pipeline discharge port differs, an injection liquid is discharged only into the injection pipeline with low pressure, and it is impossible to simultaneously inject a predetermined injection amount into the plurality of injection pipelines.

[0007] Furthermore, a method is also proposed, which simultaneously feeds the injection liquid from one pump to a large number of the injection pipes through a large number of orifices or injection ports to inject that into the ground. In this method, for each injection pipe, if the change of the resistance pressure of the ground is wide, or if the ground resistance pressure at each injection pipe changes during an injection process, pump pressure fluctuates, and thus it is difficult to inject into each injection pipe at a predetermined discharge speed. Also, since it is also difficult to carry out injection from the rest injection pipes while maintaining a predetermined pressure and discharge amount after the completion of injection of any of the injection pipes, among the large number of the injection pipes, it has not actually been put to practical use.

[0008] For example, when the injection of some injection pipes among the plurality of injection pipe is completed, valves of the injection pipelines are closed, pressure in a liquid feeding pipe rapidly increases, and the injection amount to the rest injection pipe suddenly increases, so that it becomes difficult to continue injection by maintaining a constant injection amount at a constant injection pressure. Also, it is difficult to vary the discharge amount from the injection pipe for each injection pipe according to the injection situation.

[0009] Then, the object of the present invention is to provide a ground injection device and construction method which can carry out injection by a predetermined discharge amount, and improve defects existing in the publicly known techniques mentioned above, regardless of changes in injection pressure when performing ground injection.

[0010] Furthermore, another object of the present invention is to provide a ground injection device and construction method, which can carry out injection at a predetermined injection speed, simultaneously from a plurality of injection pipelines, even if the permeation resistance pressures of a plurality of injection pipeline discharge ports are different from each other, can easily carry out injection until the last one injection pipeline, even if among the plurality of injection pipelines, a part of injection is completed to stop injection, without influencing the remaining injection pipelines, while maintaining a predetermined pressure and discharge amount, can adjust the discharge amount of each injection pipeline according to an injection situation, during the injection, and improve defects existing in the publicly known techniques mentioned above.

[0011] Furthermore, another object of the present invention is to provide a ground injection device and construction method which are suitable for ground improvement of large capacity soil, such as liquefaction preventive construction or ground improvement for rapid construction in large scale construction, especially installed with a plurality of injection pipelines in a ground to be improved, and can simultaneously, selectively, and

automatically inject an injection liquid from the plurality of injection pipelines."

B "[0016]
[Embodiments of the invention] Hereinafter, the present invention will be depicted by reference to the attached drawings.
[0017] Figure 1 is a flow sheet of one example of the present invention device. Figure 2 is a graph showing a relationship between resistance pressure P at an orifice caliber φ 2.0 mm and a flow rate f from the orifice, about each liquid pressure. Figure 3 is a graph showing a relationship between resistance pressure P at an orifice caliber φ 2.5 mm and the flow rate f from the orifice, about each liquid pressure. Figure 4 is an explanatory view of an injection liquid pressurization part and another example according to the present invention. Figure 5 is a flow sheet of a modified example of a ground injection device according to the present invention. Figure 6 is a cross-sectional view of one example of a flow rate control valve used as a throttle part of the present invention. Figure 7 is a cross-sectional view of another example of the flow rate control valve. Figure 8 is a cross-sectional view of an example of an injection liquid return system used for the present invention. Figure 9 is a cross-sectional view of another example of the throttle part according to the present invention. Figure 10 is an explanatory view of further another form of the throttle part according to the present invention. Figure 11 is a partial cross-sectional view showing an operation state of the throttle part of Fig. 10. Figure 12 is a partial cross-sectional view of a modified example of the throttle part of Fig. 10. Figure 13 is a partial cross-sectional view of further another modified example of the throttle part of Fig. 10. Figure 14 is a flow sheet of another example of the ground injection device according to the present invention. Figure 15 is a flow sheet of further another example of the round injection device according to the present invention. Figure 16 is a flow sheet of further another example of the ground injection device according to the present invention. Figure 17 is a flow sheet of one example of the present invention device connected to a center management part. Figure 18 is an explanatory view specifically showing the device of Fig. 1 having the center management part. Figure 19 is an operation flow chart of a centralized control device X1. Figure 20 is a screen showing data of 10 liquid feeding systems of Fig. 18. Figure 21 is a cross-sectional view of a state that the injection pipelines of one example according to the present invention are embedded in the ground. Figure 22 is a cross-sectional view of a state that the injection pipelines of another example according to the present invention are embedded in the ground. Figure 23 is a cross-sectional view of a state that the injection pipelines of further another example of the present invention are embedded in the ground.
[0018] As shown in Fig. 1, the present invention ground injection device A is a device which injects a ground injection liquid 5 into a ground 3 through one or a plurality of injection pipelines 2, 2...2 installed in the ground 3 to consolidate the ground 3, and is basically composed of an injection liquid pressurization part 1 pressurizing the ground injection liquid 5 to a predetermined pressure, conduits 6 feeding the injection liquid 5 to the injection pipelines 2, and throttle parts 7 provided on the conduits 6. Also, the throttle parts 7 may be provided at upper end parts of the conduits 6; namely, branch points of a liquid feeding system 13 and the conduits 6, or outlets from a distribution device 11 mentioned below to the conduits 6.
[0019] Also, as shown in Fig. 1, an injection liquid return system RS; namely, a liquid

feeding flowmeter f_0 and/or a liquid feeding pressure meter P_0, and an injection liquid return device RA are provided in the liquid feeding system 13 reaching the throttle parts 7 of the ground injection liquid 5; the return device RA is controlled by a flow rate pressure control device 10 so as to maintain a predetermined injection pressure P_0; and a part of the injection liquid is returned to an injection liquid tank 4 through a return pipeline R. That is, the injection liquid return system RS receives signal information from the liquid feeding pressure meter P_0 and/or the liquid feeding flowmeter f_0 by the flow rate pressure control device 10, and transmits the signal to the injection liquid return device RA. The injection liquid return device RA, based on the information from the liquid feeding pressure meter P_0 and/or the liquid feeding flowmeter f_0, divides the injection liquid in the liquid feeding system 13 from the liquid feeding system 13 to the return pipeline R to return that to the injection liquid tank 4, thereby maintaining the liquid pressure of the liquid feeding system 13 at a required pressure, and thus maintains the discharge amount of the injection liquid fed from the conduit 6 to the injection pipelines 2 through the throttle parts 7 at a predetermined amount.

[0020] In Fig. 1, the ground injection liquid 5 is jetted from a high pressure part on an upstream side of the throttle part 7 to a low pressure part on a downstream side. In that case, if the differential pressure between the injection pressure P_0 of the pressurized ground injection liquid 5 and the injection pressure P_{1n} of the ground 3 to be injected is taken to be sufficiently large, even if the injection pressure of the respective conduits 6, 6, ... 6 on the downstream side of the throttle parts 7 varies, the discharge amount (injection speed) of each conduit 6 is almost the same if an area of the throttle part 7 is the same. Then, the discharge amount is decided according to the injection pressure P_0 and an area of a hole of the throttle part 7.

[0021] However, in Fig. 1, the ground injection liquid 5 is not necessarily injected from the whole conduits 6, 6...6 from the beginning to the end of injection precisely in the same way, and depending on the target injection site, the conduit 6 which completes early and ends the injection comes out. However, if a part of the conduits 6, 6...6 ends the injection, the injection amount is distributed into the remaining other conduits 6, 6...6, so that pressure in the conduits 6 becomes high, and the discharge amount from the remaining other conduits 6, 6...6 is increased. So as to prevent that, by adjusting an inverter (not shown) of a pump 14 to adjust a number of rotations, a flow rate is adjusted by decreasing pressure, or the return system is actuated. Thus, regardless of variations in a number of the conduits 6 during the injection, the pressure of the liquid feeding system 13 can be maintained at a predetermined value, and the injection of a predetermined flow rate from the respective conduits 6, 6...6 can be automatically continued.

[0022] Also, in Fig. 1, from injection start to completion, the injection pressure P_0 is set to any value by an injection liquid return system RS to automatically return ground injection liquid 5, and discharge amount corresponding to the injection pressure P_0 and the number of the operating conduits 6, 6...6 can be optionally obtained. Furthermore, by providing the inverter not shown on the pump 14, within the most suitable flow rate range (pressure range), it can be adjusted to the predetermined flow rate or pressure. Thus, the injection liquid pressurization part 1 which pressurizes the ground injection liquid to the predetermined pressure by the injection liquid return system RS, or the inverter, or furthermore by combining those, is referred to, in the present invention, as the injection liquid pressurization part 1 having a flow rate pressure control function.

Also, in Fig. 1, the distribution device 11 is provided between the liquid feeding system 13 and the conduits 6, and the conduits 6, 6...6 may be extended from the distribution device 11. Also, 12 are coupling parts between the conduits 6 and the injection pipelines 2. Furthermore, the conduits 6, as shown in Fig. 1, may be optionally provided with branch valves V_1, V_2...V_i, and V_n, in addition, a pressure meter (pressure detector) 8, and a flowmeter (flow rate detector) 9.

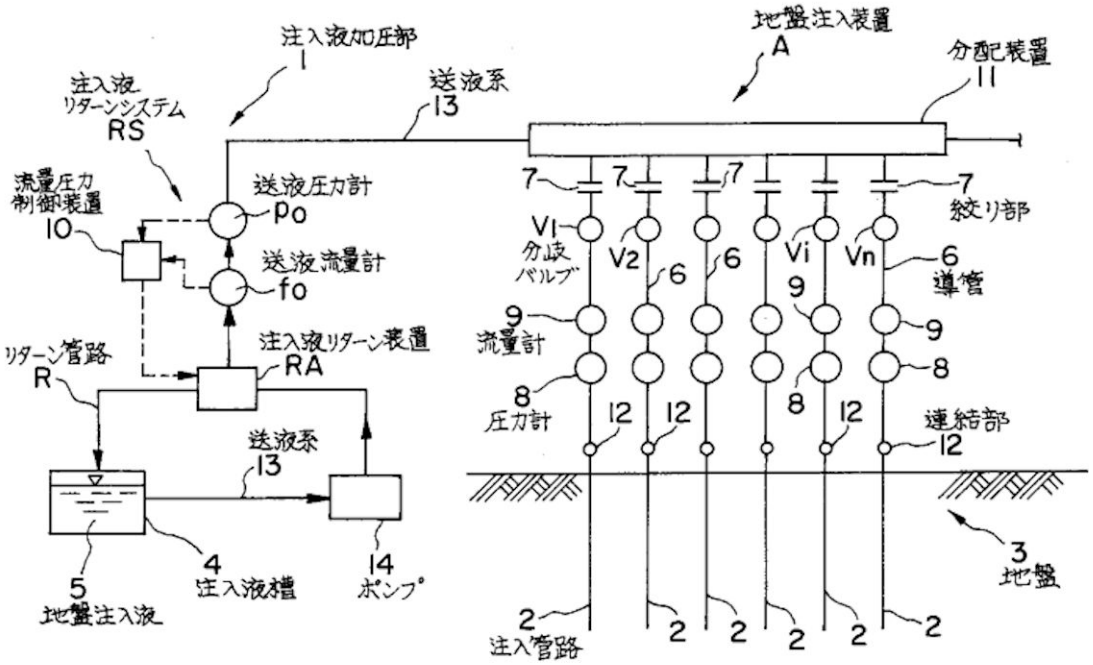
[0023] Fig. 2 and Fig. 3 are graphs of changes in a flow rate f (l/minute) from the orifice, if the pressurized ground injection liquid 5 (liquid pressure on an upstream side of the throttle part 7 (orifice)=P_0) in the distribution device 11 of FIG. 1 is injected from the orifice (throttle part 7), when the caliber of the orifice is made to be 2.0 mm and 2.5 mm, the liquid pressure on the upstream side of the orifice is kept at the predetermined pressure by using the return system RS, and the liquid pressure (ground resistance pressure) on the downstream side of the orifice is changed variously.

[0024] From Fig. 2 and Fig. 3, when the liquid pressure P_0 is sufficiently higher than the ground resistance pressure P, the flow rate f is decided by the liquid pressure P and the caliber of the orifice O, and even if the fluid pressure P fluctuates, the flow rate f hardly fluctuates. Also, it can be seen that when the difference between the fluid pressures P_0 and P falls within a certain range, the flow rate f rapidly decreases. Generally, the liquid pressure P_0 is made to be 20 to 100 kgf/cm^2, and the difference between P_0 and P is 5 kgf/cm^2 or more, preferably, 10 kgf/cm^2."

C [0085] Fig. 21 is the cross-sectional view of the state that the injection conduits according to the present invention are embedded in the ground, and shows an example using the injection pipelines 2 made by binding a plurality of thin pipes 32 as the injection pipelines 2. The respective thin pipes 32, 32...32 have tip end discharge ports 33 respectively opened at different positions in the axial direction, and are installed in the ground 3 so as to be embedded in a sleeve grout 35 filled in a drilling hole 34. The ground injection liquid from the discharge ports 33 breaks the solidified sleeve grout 35, penetrates and is injected into the ground 3 through the ground wall 3a. Also, it is not necessary to use this sleeve grout 35."

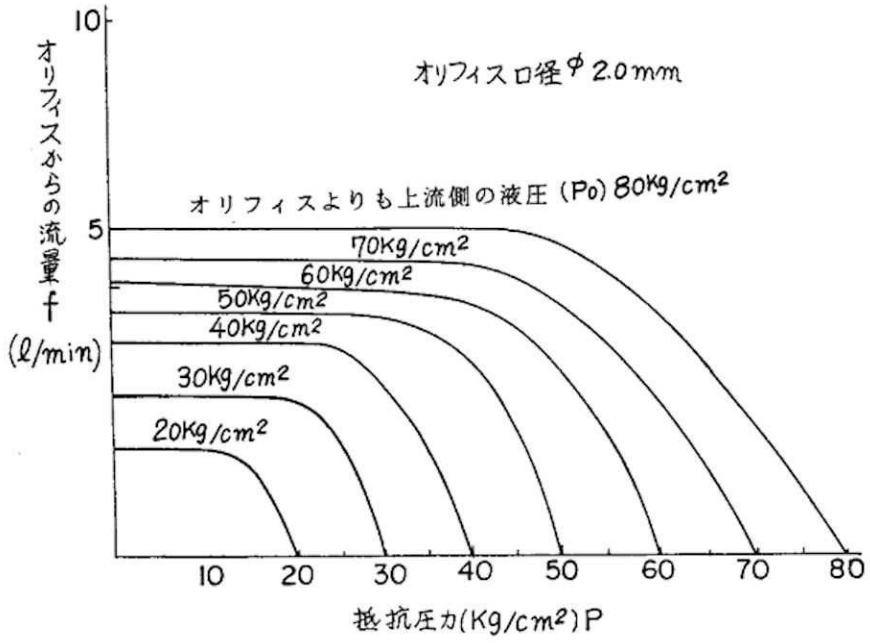
D Figure 1, Fig. 2, and Fig. 3 are as follows.

[Fig. 1]



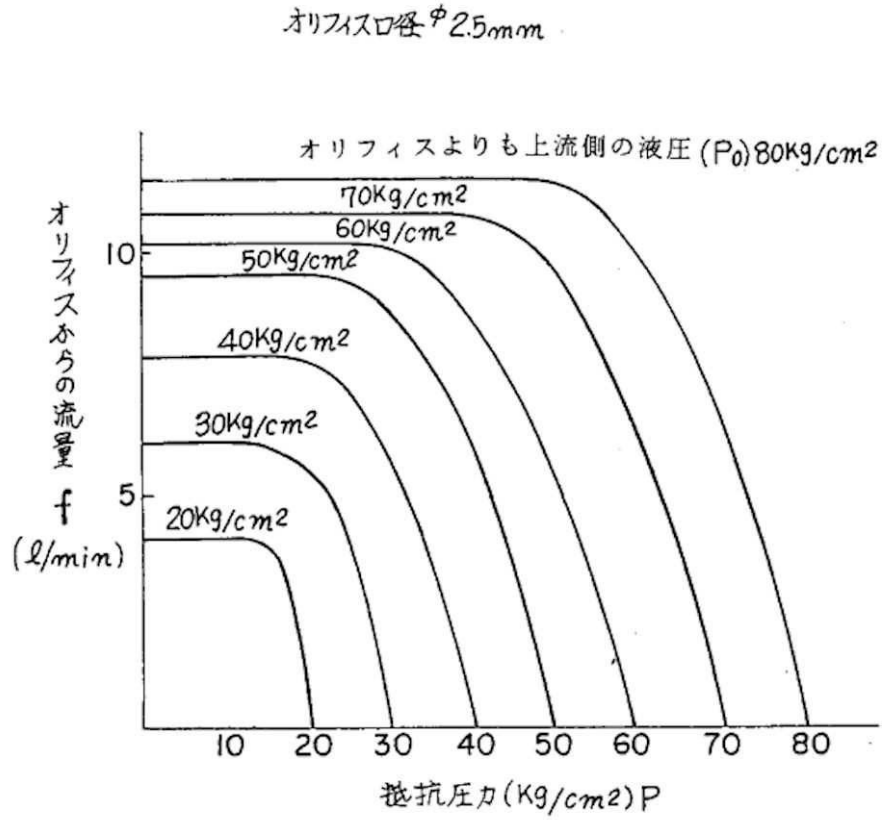
注入液加圧部　Injection liquid pressurization part
注入液リターンシステム　Injection liquid return system
送液系　Liquid feeding system
流量圧力制御装置　Flow rate pressure control device
リターン管路　Return pipeline
地盤注入液　Ground injection liquid
注入液槽　Injection liquid tank
送液圧力計　Liquid feeding meter
送液流量計　Liquid feeding flowmeter
注入液リターン装置　Injection liquid return device
ポンプ　Pump
地盤注入装置　Ground injection device
分配装置　Distribution device
絞り部　Throttle part
分岐バルブ　Branch valve
流量計　Flowmeter
圧力計　Pressure meter
注入管路　Injection pipeline
導管　Conduit
連結部　Coupling part
地盤　Ground

[Fig. 2]



オリフィスからの流量　　Flow rate from orifice
オリフィス口径　Orifice caliber
オリフィスよりも上流側の液圧　　Liquid pressure on the upstream side of orifice
抵抗圧力　　Resistance pressure

[Fig. 3]



オリフィスからの流量　　Flow rate from orifice
オリフィス口径　Orifice Caliber
オリフィスよりも上流側の液圧　　Liquid pressure on the upstream side of orifice
抵抗圧力　　Resistance pressure

E　As described above, it is recognized that Evidence A No. 2 describes the following invention (hereinafter, referred to as "Invention A-2").

"A ground injection device A and construction method which inject a ground injection liquid 5 into a ground 3 through one or a plurality of injection pipelines 2, 2...2 installed in the ground 3 to consolidate the ground 3,

wherein the ground injection device A being composed of an injection liquid pressurization part 1 pressurizing the ground injection liquid 5 to a predetermined pressure, conduits 6 coupled to the injection liquid pressurizing part 1 and feeding the injection liquid 5 to the injection pipelines 2, and throttle parts 7 provided on the conduits 6,

wherein the pressurization part 1 has an injection liquid return system RS provided in a liquid feeding system 13 reaching the throttle parts 7 of the ground injection liquid 5, provided with a liquid feeding flowmeter f_0 and a liquid feeding pressure meter P_0 and an injection liquid return device RA, controlling the injection liquid return device RA by a flow rate pressure control device 10 so as to maintain a predetermined injection pressure P_0, and returning a part of the injection liquid to an

injection liquid tank 4 through a return pipeline R; and a flow rate pressure control function of pressurizing the ground injection liquid to the predetermined pressure by an inverter provided on the pump 14,

wherein a distribution device 11 is provided between the liquid feeding system 13 and the conduits 6, the conduits 6, 6...6 being extended from the distribution device 11, the conduits 6 and the injection pipelines 2 being coupled by coupling parts 12, the conduits 6 being provided with branch valves V_1, V_2...V_i, and V_n, in addition, a pressure meter (pressure detector) 8, and a flowmeter (flow rate detector) 9, the throttle parts 7 being provided at outlets from a distribution device 11 to the conduits 6, the injection pipelines 2 being made by binding a plurality of thin pipes 32, the respective thin pipes 32, 32...32 having tip end discharge ports 33 respectively opened at different positions in the axial direction,

wherein although the ground injection liquid 5 is jetted from a high pressure part on an upstream side of the throttle part 7 to a low pressure part on a downstream side, if the differential pressure between the injection pressure P_0 of the pressurized ground injection liquid 5 and the injection pressure P_{1n} of the ground 3 to be injected is taken to be sufficiently large, even if the injection pressure of the respective conduits 6, 6, ... 6 on the downstream side of the throttle parts 7 varies, the discharge amount (injection speed) of each conduit 6 is almost the same if an area of the throttle part 7 is the same, and then, the discharge amount is decided according to the injection pressure P_0 and an area of a hole of the throttle part 7."

(3) Evidence A No. 4

Evidence A No. 4 which was distributed prior to the application of the Patent, describes the following matters.

"3-2 Field injection test

In conducting chemical liquid injection work, investigation is made in advance as to whether or not the injection of the chemical liquid as designed in an injection planning ground or a ground equivalent thereto is carried out." (Page 2)

(4) Evidence A No. 5

Evidence A No. 5 which was distributed prior to the application of the Patent, describes the following matters.

A "In order to realize permeation injection, the most certain approach is to conduct a test injection and confirm the injection form. Although it is essentially necessary to conduct the test injection under the same conditions as this work, a simple method of predicting the injection form from a relationship between injection pressure and injection speed in the injection test using water instead of the chemical liquid has recently been proposed." (Page 280)

B "Injection conditions in group injection are as shown in Table-5.8; they are the same relaxation material and injection rate as under the condition that a fine consolidated shape can be obtained with the P-q curves at a single point injection." (Page 284)

(5) Evidence A No. 6

Evidence A No. 6, which was distributed prior to the filing of the application of the Patent, describes the following matters.

A "Regarding condition clearing matters, etc. relating to a chemical liquid injection construction method

...

2. Matters to be submitted by the contractor at a construction plan meeting, etc.

...

(1) Regarding construction method [1] Injection pressure [2] Injection speed..." (Page 7)

B "3-2 Field injection test

In conducting chemical liquid injection work, investigation is made in advance as to whether or not the injection of the chemical liquid as designed in an injection planning ground or a ground equivalent thereto is carried out." (Page 10)

(Also, encircled numbers 1 to 3 are displayed as [1] to [3]. The same applies hereafter.)

(6) Evidence A No. 9

Evidence A No. 9, which was distributed prior to the filing of the application of the Patent, describes the following matters.

"[7] Field injection test

Although a field injection test is carried out in order to set a chemical liquid or an injection construction method to be adopted to a target ground, to investigate whether or not the intended effect can be demonstrated, and to reflect that on design, there are the following two patterns as a case; in any case, it is necessary to be carried out under a condition as close as possible to that of the construction.

...

Case 2 It is checked whether or not the designed one matches with the site

...

Generally, it is often done on a small scale at the current position as to whether or not the effect of Case 2 as designed can be demonstrated.

In this case, difference in the effect is often seen in the pattern as shown below considering specifications as designed and several cases close to it. In this case, if the effect as designed cannot be obtained, field tests in some patterns are required to be performed again after review.

Generally, it is done using a shaft and the like just before excavation, and after checking the effects after injection, drilling is further visually recognized." (Page 33)

(7) Evidence A No. 10

Evidence A No. 10, which was distributed prior to the filing of the application of the Patent, describes the following matters.

A "[8] Field injection test

A field injection test is carried out in order to set an injection material or an injection construction method to be adopted to a target ground, to check whether or not

the intended effect can be expected, and to reflect that on construction.
[Explanation]

The field injection test is carried out to a target soil layer condition to be a basic material of a construction plan, such as optimal injection material, construction method, a range, or an injection amount. Based on the design specifications, the field injection test plan is created, and the field injection test is carried out. Based on the result, construction specifications are decided after consultation. Therefore, it is preferable to carry out the field injection test under a condition as close as possible to the construction.

In the test method, in order to check whether or not the content of the construction plan is suitable for the site, in many cases, difference in the effect is seen according to the construction specifications as designed or by comparing several kinds of patterns close to that, and basically it is carried out out of a target range.

Injection speed is checked in a limit injection speed test, and an injection ratio, injection amount, injection hole clearances, and the like are checked from various tests by carrying out investigation boring after the field injection test." (Page 14)

B "3. Limit injection speed (q_{cr}) testing method
...

Although it is ideal to obtain limit injection speed using a chemical liquid to be actually used, it is conceivable that the chemical liquid is gelled to make it difficult to interpret an experiment result, and this work is influenced because a large amount of chemical liquid is injected. Therefore, the injection test is carried out by using water instead of chemical liquid in this test." (Page 27)

(8) Evidence A No. 25

Evidence A No. 25, which was distributed prior to the filing of the application of the Patent, describes the following matters.

A "6.1 Management of injection pressure
...In order to effectively carry out pressure management, it is necessary to check the initial condition of injection pressure in the ground at the site by carrying out test injection." (Page 143)

B "6.2 Management of injection speed

Injection speed is one of factors that influences on an injection form (permeation injection/split injection) of an injection material in a ground, and is closely related to an injection effect.... If the injection speed is too slow, it will not be accompanied by an economic effect even if the injection effect is good, so it is important to select an optimal injection speed.

As a reference injection speed, Japan chemical-injecting association shows values as shown in Table 6.1, and it is usually constructed at 6 to 20 l/minute in most cases.... Although I mentioned the concept of limit injection speed, this basic idea is taking the position of carrying out split permeation injection in consideration of economic efficiency. Values in Table 6.1 determined by experience should also be considered as taking the split permeation injection." (Pages 145 to 146)

(9) Evidence A No. 26

Evidence A No. 26, which was distributed prior to the filing of the application of the Patent, describes that prior to injection construction (Page 293), test injection is carried out using the same injection material (silica riser) as the injection construction to check injection conditions such as a flow rate or injection pressure (Tables 7 and 6 on Page 292).

2 Regarding Invention 1

(1) Comparison

First, Invention 1 and Invention A-1 will be compared.

A "a ground," "discharge ports 12," "a grout pump 1," "conduits 7," "a distribution container 6," "orifices O_1, O_2...O_i, and O_n," and "injection pipelines 9" of Invention A-1 respectively correspond to "a ground," "injection ports," "an injection pump," "first injection hoses," "a liquid separation board," "discharge ports," and "second injection hoses" of Invention 1.

B "An injection liquid" of Invention A-1 is "injected in a ground to consolidate the ground," and thus corresponds to "a grout" of Invention 1. Also, "a ground injection construction method using a ground injection device" of Invention A-1 corresponds to "a grout injection method" of Invention 1.

Then, "a ground injection construction method using the ground injection device" "which simultaneously injects a ground injection liquid into a ground through a plurality of injection pipelines installed in the ground to consolidate the ground" of Invention A-1 corresponds to "a grout injection method which simultaneously injects grout at least through a plurality of injection holes installed in a ground" of Invention 1.

C A section until "the orifices O_1, O_2...O_i, and O_n" of "branch pipes S, S...S" among "an injection liquid pressurization part Y," "a liquid feeding system A," and "an injection liquid distribution part Z" of Invention A-1, corresponds to "a first division which reaches an inlet of a discharge port on a liquid separation board to which grout is press-fed by an injection pump through first injection hoses" of Invention 1.

Also, a section from "the orifices O_1, O_2...O_i, and O_n" of "the branch pipes S, S...S" of "the injection liquid distribution part Z" to "tip end discharge ports 12, 12...12" of "a plurality of thin pipes 10, 10...10" of "the injection pipeline 9" of Invention A-1, and "a second division until the grout separated in the liquid separation board and respectively passing through discharge ports with the same cross-sectional area is injected into a ground from the plurality of injection ports through second injection hoses" of the Invention 1 are common in the point that "a second division until the grout separated in the liquid separation board and respectively passing through discharge ports is injected into a ground from the plurality of injection ports through second injection hoses."

D In the fact that "by assuming a number n of injection pipelines T as n=100, an orifice caliber=1.0 mm, and liquid feeding flowmeter f_0=150 l/minute, and when injection is simultaneously carried out from discharge ports positioned on the first stage of the injection pipelines (T1 to T100), the branch pressure member P_{11} indicates 2

kgf/cm^2, the branch flow meter f11 indicates 1.5 1/minute, and the liquid pressure meter P_0=30 kgf/cm^2" of Invention A-1, a numerical value of the liquid feeding pressure sensor P_0 indicating pressure on the upstream side of the orifices O_1, O_2...O_i, and O_n is 30 kgf/cm^2, and a numerical value of the branch pressure meter P_{11} indicating pressure on the downstream side of the same is 2 kgf/cm^2, so that according to the numerical values of the respective pressure meters, it is obvious that an opening area of the discharge ports of the injection pipelines is larger than an opening area of the orifices O_1, O_2...O_i.

E Then, Invention 1 and Invention A-1 correspond to each other in the following corresponding features.

Corresponding features: A grout injection method which simultaneously injects grout at least through a plurality of injection holes installed in a ground,

forming a first division which reaches an inlet of a discharge port on a liquid separation board to which grout is press-fed by an injection pump through first injection hoses, and a second division until the grout separated in the liquid separation board and respectively passing through discharge ports is injected into a ground from the plurality of injection ports through second injection hoses; and

setting a total cross-sectional area of the plurality of injection ports to be larger than a total cross-sectional area of the discharge ports.

Also, the two inventions are different in the following different features 1 and 2.

Different feature 1: The discharge ports have the same cross-sectional area in Invention 1, whereas it is unclear whether or not they have the same sectional area in Invention A-1.

Different feature 2: Invention 1 uniformly separates the grout from the plurality of discharge ports on the liquid-separation board, by deciding a flow rate in advance, measuring ground resistance pressure, and loading the grout flowing in the first division to have compulsive pressure higher than the measured ground resistance pressure; and injects the grout flowing in the second division based on the ground resistance pressure through the injection holes, whereas, it is unknown whether or not Invention A-1 does so.

(2) Judgment

Different features 1 and 2 will be examined.

A Different feature 1

(A) Seeing described matters of Evidence A No. 1 (1 (1) C above), as another example of a multidirectional branch body, branch valves V_{11}...V_{1n} also serving as stop valves and having throttle valves are described, and it is described that if the valves are adjusted to a predetermined throttle degree, for example, if they are made to be the same throttle degree, when pressurizing and feeding an injection liquid of 60 l/minute, in the case where n of V_{1n} is 5, it separately flows at 12 l/minute through each valve.

It is obvious that the branch valves V_{11}...V_{1n} having the throttle valves have a

function of adjusting the throttle degree, and the orifices of Invention A-1 also have a function of throttling cross-sections of the pipelines. Then, considering that the branch valves $V_{11}...V_{1n}$ having the throttle valves are another example in Evidence A No. 1 describing Invention A-1, it can be easily conceived by a person skilled in the art to apply making the branch valves $V_{11}...V_{1n}$ have the same throttle degree to the orifices O_1, $O_2...O_i$, and O_n of Invention 1. Therefore, it could have been easily conceived by a person skilled in the art to make the throttle degree of the orifices O_1, $O_2...O_i$, and O_n of Invention A-1 have the same throttle degree described in Evidence A No. 1; namely, make the orifices O_1, $O_2...O_i$, and O_n have the same cross-sectional area.

(B) Also, in Evidence A No. 2, Invention A-2 described in 1 (2) E above is described, "the throttle parts 7" in which "an area is the same" of Invention A-2 correspond to "discharge ports with the same cross-sectional area" of Invention 1. Then, Invention A-1 and Invention A-2 belong to the same technical field, and are inventions relating to adjustment of a flow rate or pressure of grout, so that concerning the discharge ports ("the orifices" of Invention A-1 and "the throttle parts 7" of Invention A-2) relating to the adjustment, it could have been easily conceived by a person skilled in the art to replace the orifices of Invention A-1 with those with the same cross-sectional area similar to the throttle parts 7 of Invention A-2.

B Different feature 2

(A) Regarding the constitution of Invention 1 relating to the different feature 2

The constitution of Invention relating to the different feature 2 is described again as follows (Separate descriptions by the trial decision).

(a) Deciding a flow rate in advance, measuring ground resistance pressure, and
(b-1) Loading the grout flowing in the first division to have compulsive pressure higher than the measured ground resistance pressure, the grout is uniformly separated from the plurality of discharge ports on the liquid-separation board, and
(b-2) Injecting the grout flowing in the second division based on the ground resistance pressure through the injection ports.

As described above, although Invention 1 has the constitutions of (a), (b1), and (b2) (hereinafter, referred to as the "constitution (a)" and the like), in the test injection, how to measure ground resistance pressure and how to use the measured ground resistance pressure to inject grout in this construction are respectively independent technical matters, so that, at least, easily-arrived properties of the constitution (a) of how to measure ground resistance pressure and the constitutions (b1) and (b2) of how to use the measured ground resistance pressure in this construction may be taken into consideration separately.

Hereinafter, first the constitution (a) of "deciding a flow rate in advance, measuring ground resistance pressure" will be examined.

(B) Regarding the constitution (a)

a Regarding Evidence A No. 1 and A No. 2

(a) Regarding the water injection test described in Evidence A No. 1

The demandant alleges that Evidence A No. 1 (Paragraph [0074] and [Fig. 26])

describes the constitution (a) of "deciding a flow rate in advance, measuring ground resistance pressure" of Invention 1. With regard to the fact that the meaning of the constitution (a) is to measure ground resistance pressure using a chemical liquid at a site of this work, there is no dispute between the parties.

Then, Invention A-1 will be examined.

As described 1(1) K above, Invention A-1 has the following constitutions (Separate descriptions by the trial decision. The same applies hereafter.).

(A1) When constructing the ground injection prior to the injection in a first stage, a water injection test is performed to take out a P-q curve (curve 1); namely, a P (injection pressure P)-q (injection speed or flow rate 1/minute) curve, and thus the limit injection pressure P_{r0} and the limit injection flow rate q_{r0} (injection speed) at which the ground breaks can be known,
(B1) By assuming a number n of injection pipelines T as n=100, an orifice caliber=1.0 mm, and liquid feeding flowmeter f_0=150 l/minute, and when injection is simultaneously carried out from discharge ports positioned on the first stage of the injection pipelines (T1 to T100), the branch pressure meter P_{11} indicates 2 kgf/cm^2, the branch flow meter f11 indicates 1.5 1/minute, and the liquid feeding pressure meter P_0=30 kgf/cm^2, and in a water permeability test before the injection in the first stage, it was q_{1r0}=5 l/minute and P_{1r0}=5 kgf/cm^2,
(A2) Limit injection P_{rf} and limit injection flow rate (injection speed) qrf when injecting the chemical liquid (injection liquid) are set based on the limit injection pressure P_{r0} and the limit injection flow rate (injection speed) q_{r0}, and the injection pressure P and the flow rate q of the injection liquid fed into the respective injection pipelines are made to be within a limit of the limit injection P_{rf} and the limit injection flow rate (injection speed) qrf,
(A3) Since it was P_{1r0}=5 kgf/cm^2 in the water permeability test before the injection in the first stage, limit injection pressure P_{rf}=7.5 kgf/cm^2 which is 1.5 times that and planned injection amount in the injection pipeline T_{11} is respectively set to Q_{11}=100 l,
(B2) The injection of the planned injection amount Q_{11}=100 l in the injection pipeline T_{11} is completed within an injection pressure of P_1 during injection of 3.0 kgf/cm^2, at average injection speed q_1=1.5 1/minute, without reaching the limit injection pressure P_{rf}=7.5 kgf/cm^2."

It is recognized that "ground resistance pressure" of Invention 1 is "injection pressure" (Paragraph [0018] of the corrected description of the case) and a "flow rate" means a flow rate (injection amount) per unit time. In the relationship between the water injection test described in Evidence A No. 1 and the chemical liquid injection, in order to set the injection pressure P, the limit injection pressure P_{rf} is used. However, even with the above description, the limit injection pressure P_{rf} is the upper limit value for preventing ground breakage and the like, and merely sets the ground resistance pressure (injection pressure) within the limit of the limit injection pressure P_{rf}, and it is not recognized that the ground resistance pressure (injection pressure) is measured by deciding the flow rate in advance, as in Invention 1.

Therefore, it cannot be recognized that Evidence A No. 1 describes the constitution (a) of Invention.

(b) Regarding Evidence A No. 2

Even in Evidence A No. 2, although it is described that a flow rate test before construction is carried out, it is not clearly described that the flow rate test is carried out by injecting the chemical liquid at the site where the actual injection is performed, and depending on circumstances, it may be possible to carry out the test in other places with similar conditions, to carry out a general soil test such as permeability test, and to carry out the test by injecting water, so that it cannot be recognized that Evidence A No. 2 describes the constitution (a) of Invention 1.

b Regarding the well-known art

(a) Examination

In Evidence A Nos. 4, 5, 6, 9, 10, 25, and 26, there are descriptions as noted above in 1 (3) to (9). As described in each of them, it is usual to measure the ground resistance pressure (injection pressure) before the ground injection, and since it is natural that the ground resistance pressure must be that of the construction site, it can be said that the measurement is performed within the range that is recognized as the construction site, regardless of whether it is within an injection target range itself (Invention 1 is not limited to a case in which the ground resistance pressure is measured within the injection target range itself.).

Then, as described in a(a) above, although the "flow rate" of Invention 1 is the injection amount (injection speed) per unit time, in view of the fact that it is described that the "injection rate" must be determined at the time of construction planning in Evidence A No. 6 which is the Notice of Ministry of Construction (Ministry of Land, Infrastructure and Transport), or the fact that it is described that it is presupposed that the injection speed is presupposed to be decided at the time of construction planning, in Evidence A No. 10 which is a guideline of industry groups, it can be understood that the "flow rate" (injection speed) is decided in advance before injection construction, even though there is room for change depending on the situation of a construction site and the like. Then, since the "flow rate" (injection speed) and the ground resistance pressure are associated with each other (see [Fig. 26] of Evidence No. 1 and [Fig. 2] [Fig. 3] of Evidence A No. 2), the measurement of the ground resistance pressure is based on a predetermined "flow rate" (injection speed).

Also, even if it is unclear whether the measurement of the ground resistance pressure is commonly carried out using a chemical liquid or is carried out using water, from each description mentioned above, none of the descriptions mentioned above excludes the measurement of the ground resistance pressure using a chemical liquid. Instead, in Evidence A No. 5, there is a description that "a simple method of predicting the injection form from a relationship between injection pressure and injection speed in the injection test using water instead of the chemical liquid has recently been proposed," as a natural premise of this description, it is seen that an injection test using a chemical liquid has been widely carried out conventionally.

As described above, it can be recognized that it was a well-known matter widely known by a person skilled in the art as one method of measuring at the time of the filing of the application of the Patent, "deciding a flow rate in advance, and measuring ground resistance force," which is the constitution (a) of Invention 1; namely, carrying out test injection at site using the same injection material (grout) prior to injection construction, and deciding a flow rate in advance and measuring injection pressure (ground resistance

force).

(b) The demandee's allegation

The demandee alleges that even if obtaining the P-q curve by injecting a chemical liquid (grout) at a site to be injected, the measured ground resistance pressure is different in the case in which injection speed is gradually increased and in the case in which a constant amount of grout is injected as in Invention 1 (No. 4-2(2)C(A) above).

However, the fact that the ground resistance pressure can be measured when the injection rate is gradually increased means that as a matter of course it is possible to measure the ground resistance pressure at a specific injection speed, so that it is not an obstacle to the recognition that the measurement like the latter; namely, the measurement of the ground resistance pressure of the invention 1 is a well-known art.

Other allegations of the demandee, in light of the description of (a) above, cannot be accepted.

(c) Summary

Therefore, since the constitution (a) of Invention 1 is a well-known art, in Invention A-1 which sets ground resistance pressure (injection pressure) within the limit of limit injection pressure P_{fr}, it can be appropriately conceived by a person skilled in the art to adopt the constitution (a) of Invention 1 relating to Different feature 2 which is the well-known art for the decision of the injection pressure.

(C) Regarding the constitutions (b1) and (b2)

a In Invention A-1, since it is that a value of the liquid feeding pressure meter P_0 (30 kgf/cm^2) > a value of the branch pressure meter P_{11} (2 kgf/cm^2), a pressure value of "the branch flowmeter P_{11}" which is one of "the branch pressure meters P_1, P_2...P_i, and P_n" mounted to "the branch pipes S, S...S" of Invention A-1, and a pressure value of "the liquid feeding pressure meter P_0" equipped on "the conduit 7" respectively correspond to "ground resistance pressure" and "compulsive pressure higher than ground resistance pressure" of Invention 1.

Then, as described in A above, it can be easily conceived to make discharge ports have the same cross-sectional area, so that if combining a magnitude relationship between the values of the above two pressure meters, with the same reason as described in Paragraphs [0009] to [0018] of the description of the patent of the case, it is possible to uniformly separate grout from a plurality of discharge ports.

Then, since the fact that "by assuming a number n of injection pipelines T as n=100, an orifice caliber=1.0 mm, and liquid feeding flowmeter f_0=150 l/minute, and when injection is simultaneously carried out from discharge ports positioned on the first stage of the injection pipelines (T1 to T100), the branch pressure meter P_{11} indicates 2 kgf/cm^2, the branch flow meter f11 indicates 1.5 1/minute, and the liquid feeding pressure meter P_0=30 kgf/cm^2, and in a water permeability test before the injection in the first stage, it was q_{1r0}=5 l/minute and P_{1r0}=5 kgf/cm^2" of Invention A-1 corresponds to the fact that "the first division uniformly separates the grout from the plurality of discharge ports on the liquid-separation board, by loading the flowing grout to have compulsive pressure higher than ground resistance pressure, and the second division injects the flowing grout based on the ground resistance pressure through the injection holes" which is the constitutions (b1) and (b2), Invention A-1 is equipped with the

constitutions (b1) and (b2).

b Also, seeing Invention A-2 described in Evidence A No. 2, "a high pressure part on an upstream side of the throttle part 7," "a low pressure part on a downstream side" "of the throttle part 7," "the discharge amount(injection speed)," "the injection pressure P_{1n} (of the ground 3 to be injected)," "the injection pressure P_0 (of the pressurized ground injection liquid 5)," "the ground injection liquid 5," "the distribution device 11," "tip end discharge ports 33," and "the throttle part 7" of Invention A-2, respectively correspond to "a first division," "a second division," "a flow rate," "ground resistance pressure," "compulsive pressure," "grout," "a liquid separation board," "discharge ports," and "injection ports" of Invention 1.

Also, the fact that "the differential pressure between the injection pressure P_0 of the pressurized ground injection liquid 5 and the injection pressure P_{1n} of the ground 3 to be injected is taken sufficient largely" of Invention A-2, corresponds to "compulsive pressure higher than ground resistance pressure" of Invention 1, and similarly, the fact that "the discharge amount (injection speed) of each conduit 6 is almost the same if an area of the throttle part 7 is the same" corresponds to "uniformly separating the grout from the plurality of discharge ports."

Then, the fact that "wherein a distribution device 11 is provided between the liquid feeding system 13 and the conduits 6, the conduits 6, 6...6 being extended from the distribution device 11, the conduits 6 and the injection pipelines 2 being coupled by coupling parts 12, the conduits 6 being provided with branch valve V_1, V_2...V_i, and V_n, in addition, a pressure meter (pressure detector) 8, and a flowmeter (flow rate detector) 9, the throttle parts 7 being provided at outlets from a distribution device 11 to the conduits 6, the injection pipelines 2 being made by binding a plurality of thin pipes 32, the respective thin pipes 32, 32...32 having tip end discharge ports 33 respectively opened at different positions in the axial direction,

wherein although the ground injection liquid 5 is jetted from a high pressure part on an upstream side of the throttle part 7 to a low pressure part on a downstream side, if the differential pressure between the injection pressure P_0 of the pressurized ground injection liquid 5 and the injection pressure P_{1n} of the ground 3 to be injected is sufficiently large, even if the injection pressure of the respective conduits 6, 6, ... 6 on the downstream side of the throttle parts 7 varies, the discharge amount (injection speed) of each conduit 6 is almost the same if an area of the throttle part 7 is the same, and then, the discharge amount is decided according to the injection pressure P_0 and an area of a hole of the throttle part 7" of Invention A-2, if expressed in terms of Invention 1, corresponds to the fact that "the first division uniformly separates the grout from the plurality of discharge ports on the liquid-separation board, by loading the flowing grout to have compulsive pressure higher than ground resistance pressure, and the second division injects the flowing grout based on the ground resistance pressure through the injection holes."

Invention A-1 and Invention A-2 belong to the same technical field, and are inventions relating to adjustment of a flow rate or pressure of grout, so that concerning the constitution relating to the adjustment, it could have been easily conceived by a person skilled in the art to make the constitutions (b1) and (b2) by applying Invention A-1 to Invention A-2.

(D) According to the above, the constitution relating to Different feature 2 of invention 1 could have been easily made by a person skilled in the art, based on Invention 1 and the well-known art, or based on Invention A-1 and Invention A-2, and the well-known art.

C Summary

As described above, Invention 1 could have been easily conceived by a person skilled in the art prior to the filing of the application, based on the invention described in Evidence A No. 1 and the well-known art or based on the inventions described in Evidence A No. 1 and Evidence A No. 2 and the well-known art.

No. 6 Closing

Therefore, the appellant should not be granted a patent for Invention 1 under the provisions of Article 29(2) of the Patent Act, and thus, the patent falls under Article 123(1)(ii) of the Patent Act and should be invalidated.

With regard to the costs in connection with the trial, the demandee shall be borne under the provisions of Article 64 of the Code of Civil Procedure which is applied mutatis mutandis in the provisions of Article 169(2) of the Patent Act.

Therefore, the trial decision shall be made as described in the conclusion.

July 5, 2017

Chief administrative judge: ONO, Chuetsu
Administrative judge: MAEKAWA, Shinki
Administrative judge: FUJITA, Toshiyuki