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(54) **FERRITIC STAINLESS STEEL SHEET**

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(57) **ABSTRACT**

Provided is a ferritic stainless steel sheet having excellent corrosion resistance and workability equal to or better than SUH409L. The ferritic stainless steel sheet contains 0.025% or less C, 0.01% to 1.00% Si, 0.05% to 1.00% Mn, 0.020% to 0.040% P, 0.030% or less S, 0.001% to 0.100% Al, 12.5% to 14.4% Cr, 0.01% to 0.80% Ni, 0.11% to 0.40% Ti, 0.010% to 0.100% Nb, and 0.020% or less N by mass %, the remainder being Fe and inevitable impurities.

FIG. 1

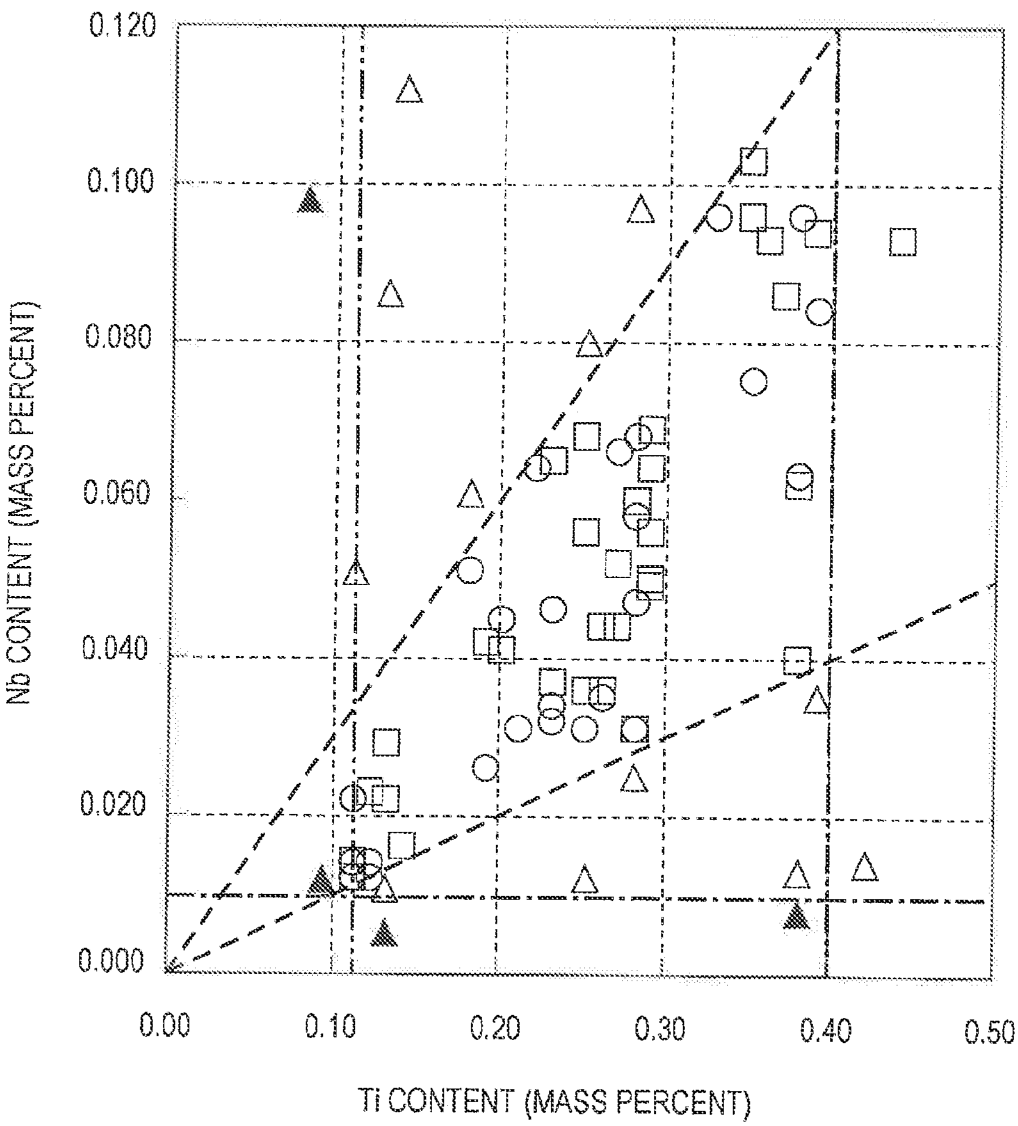
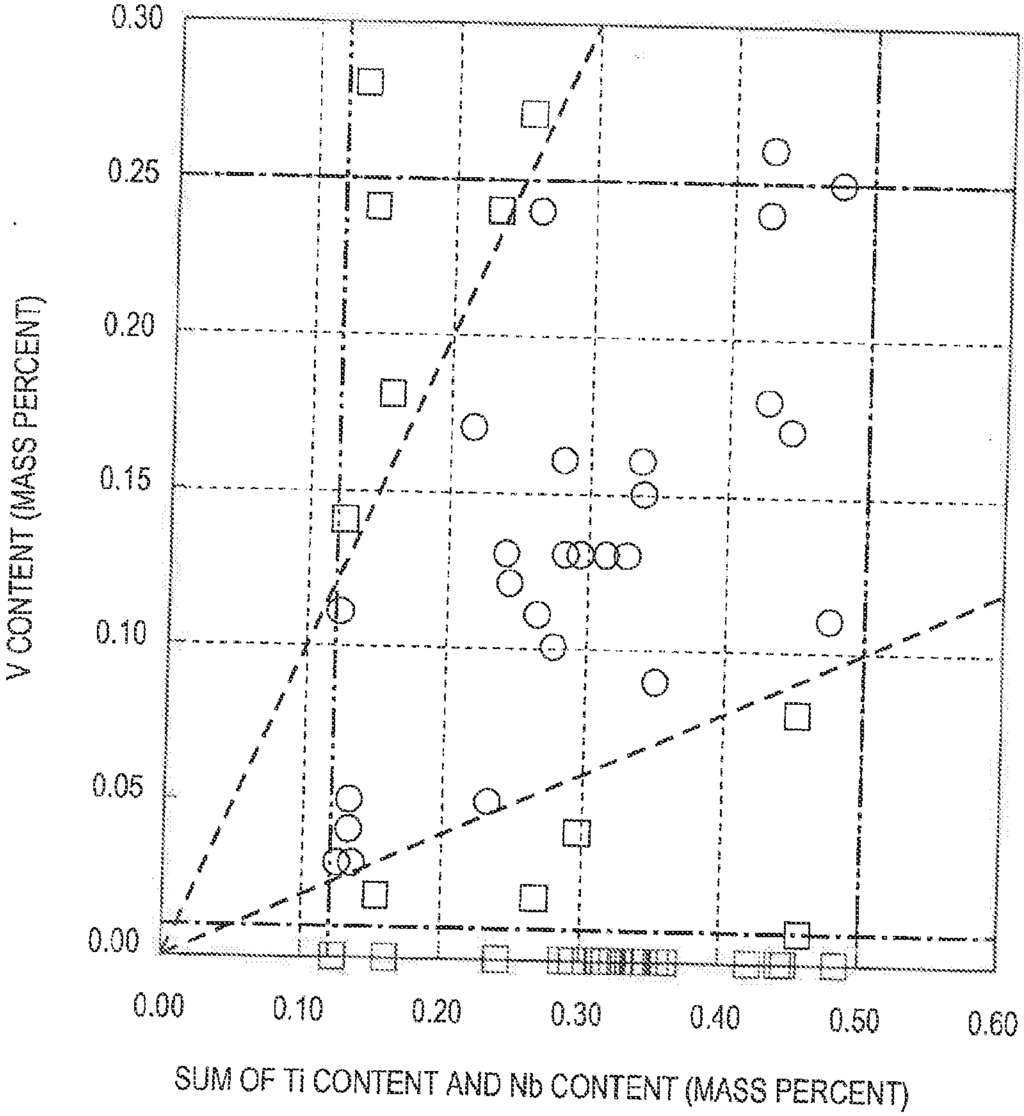

0.120
0.100
0.080
0.060
0.040
0.020
0.000
Nb CONTENT (MASS PERCENT)
0.00
0.10
0.20
0.30
0.40
0.50
Ti CONTENT (MASS PERCENT)

FIG. 2


0.30
0.25
0.20
0.15
0.10
0.05
0.00
V CONTENT (MASS PERCENT)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
SUM OF Ti CONTENT AND Nb CONTENT (MASS PERCENT)

FERRITIC STAINLESS STEEL SHEET

TECHNICAL FIELD

[0001] This application relates to a ferritic stainless steel sheet having excellent workability equal to or better than SUH409L and excellent corrosion resistance.

BACKGROUND

[0002] Ferritic stainless steels have excellent corrosion resistance, are resource-saving, and therefore are used for various applications such as automotive exhaust parts, building materials, kitchen equipment, and home appliance parts. The most important alloy element contained in the ferritic stainless steels is Cr. In general, an increase in Cr content increases the corrosion resistance and deteriorates the workability. Because of this feature, the following steels are often separately used depending on applications: low-Cr steels (a typical steel type is SUH409L (Japanese Industrial Standards JIS G 4312:2011, 11 mass percent Cr-0.3 mass percent Ti)) which have excellent workability and inferior corrosion resistance and medium-Cr steels (a typical steel type is SUS430 (Japanese Industrial Standards JIS G 4305:2012, 16 mass percent Cr)) which have inferior workability and excellent corrosion resistance.

[0003] In recent years, as the design of home appliances has been diversified, parts with a complicated shape have been developed. Among these, if a ferritic stainless steel is applied to parts particularly required to have corrosion resistance, maintenance is not necessary over a long period and life-cycle costs can be reduced. From the viewpoint of forming a complicated shape, the use of SUH409L, which has excellent workability, is probably adequate. However, SUH409L is insufficient in corrosion resistance and therefore it is difficult to apply SUH409L to the above parts. Hence, a ferritic stainless steel having excellent workability equal to or better than SUH409L and excellent corrosion resistance.

[0004] Patent Literatures and 2 describe the improvement of corrosion resistance and workability. Patent Literature 1 discloses a high-purity ferritic stainless steel having excellent surface properties and excellent corrosion resistance. In Patent Literature 1, the improvement of corrosion resistance is achieved by controlling the morphology of Ti precipitates.

[0005] Patent Literature 2 discloses a ferritic stainless steel sheet with excellent ductility. In Patent Literature 2, the improvement of elongation is achieved by controlling the morphology of Mg inclusions or Ti carbosulfides.

CITATION LIST

Patent Literature

[0006] [PTL 1] Japanese Unexamined Patent Application Publication No. 2001-288544

[0007] [PTL 2] Japanese Unexamined Patent Application Publication No. 2001-294990

SUMMARY

Technical Problem

[0008] However, in Patent Literature 1, although the pitting potential, which is an indicator for corrosion resistance, is investigated, workability including total elongation and r-value is not investigated. In Patent Literature 2, although the product elongation (elongation after fracture), which is an indicator for workability, is investigated, corrosion resistance is not investigated. As described in these literatures, examples of studies focused on both corrosion resistance and workability are very rare among existing studies on ferritic stainless steels.

[0009] The disclosed embodiments provide a ferritic stainless steel having excellent workability equal to or better than SUH409L and excellent corrosion resistance.

Solution to Problem

[0010] In order to cope with the above problem, the inventors have performed comprehensive investigations for satisfying both corrosion resistance and workability.

[0011] First, the inventors have found that the corrosion resistance can be improved by containing Ti and Nb in combination. This effect is obtained when the content of Ti is 0.11% to 0.40% and the content of Nb is 0.010% to 0.100%. It has become clear that this allows excellent corrosion resistance to be obtained in a ferritic stainless steel containing 12.5% or more Cr. Incidentally, the unit "%" used to express the content refers to "mass percent".

[0012] Furthermore, the inventors have found that containing 0.010% to 0.100% Nb is effective in improving the workability. Containing Nb has the effect of fining its crystal gains by existing as solid solution in steel. Since {111} <001>-oriented grains are likely to be formed from the local areas near grain boundaries, the proportion of recrystallized grains in the {11} plane increases in the recrystallization process due to fining crystal grain by containing Nb. Since this increase suppresses the formation of the Goss ({110} <001>)-oriented grains, which increases in-plane anisotropy of a microstructure, the in-plane anisotropy of a microstructure is reduced and El_{min} (the minimum of El) and r_{min} (the minimum of r) are increased. It has become clear that workability equal better than SUH409L is obtained in a ferritic stainless steel containing 14.4% or less Cr by this effect.

[0013] The investigation of both corrosion resistance and workability as described above has revealed that in order to achieve a ferritic stainless steel having excellent corrosion resistance and workability equal to or better than SUH409L, it is very important that a ferritic stainless steel containing 12.5% to 14.4% Cr contains 0.11% to 0.40% Ti and 0.010% to 0.100% Nb.

[0014] The disclosed embodiments are based on the above findings and are as summarized below.

[0015] {1} A ferritic: stainless steel sheet contains 0.0250 or less C, 0.0% to 1.00% Si, 0.05% to 1.00% Mn, 0.020% to 0.040% P, 0.030% or less S, 0.001% to 0.100% Al, 12.5% to 14.4% Cr, 0.01 to 0.80fl Ni, 0.11% to 0.40% Ti, 0.010% to 0.100% Nb, and 0.020% or less N by mass %, the remainder being Fe and inevitable impurities

[0016] {2} In the ferritic stainless steel sheet specified in item {1}, the content of Ti and the content of Nb satisfy the following inequality (1)

$$0.10 \leq Nb/Ti \leq 0.30 \quad (1)$$

where the symbol for each of elements in Inequality (1) represents the content of a corresponding one of the elements.

[0017] {3} The ferritic stainless steel sheet specified in Item {1} or {2} further contains one or more selected from

0.01% to 0.30% Mo, 0.01% to 0.50% Cu, 0.01% to 0.50% Co, and 0.01% to 0.50% W by mass %.

[0018] {4} The ferritic stainless steel sheet specified in Items (1) to (3) further contains one or more selected from 0.01% to 0.25% V, 0.01% to 0.30% Zr, 0.0003% to 0.0030% B, 0.0005% to 0.0030% Mg, 0.0003% to 0.0030% Ca, 0.001% to 0.20% Y, and 0.001% to 0.10% of a REM (rare-earth element) by mass %.

[0019] {5} The ferritic stainless steel sheet specified in Items {1} to {4} further contains one or more selected from 0.001% to 0.50% Sn and 0.001% to 0.50% Sb by mass %.

[0020] {6} The ferritic stainless steel sheet specified in Items {1} to {5} containing 0.01% to 0. 25% V by mass %. The content of Ti and the content of Nb satisfy the following inequality (1) and the content of Ti, the content of Nb, and the content of V satisfy the following inequality (2):

$$0.10 \leq Nb/Ti \leq 0.30 \quad (1)$$

$$0.20 \leq V/(Ti+Nb) \leq 1.00 \quad (2)$$

where the symbol for each of elements in Inequalities (1) and (2) represents the content of a corresponding one of the elements.

Advantageous Effects

[0021] A ferritic stainless steel sheet according to the disclosed embodiments is excellent in corrosion resistance and workability. In particular, according to the disclosed embodiments, a ferritic stainless steel having excellent workability equal to or better than SUH409L and excellent corrosion resistance is obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. **1** is a graph showing the influence of the content of Ti and the content of Nb on corrosion resistance.

[0023] FIG. **2** is a graph showing the influence of the content of Ti, the content of Nb, and the content of V on corrosion resistance.

DETAILED DESCRIPTION

[0024] Disclosed embodiments are described below. The disclosed embodiments are not limited to the embodiments below.

[0025] A ferritic stainless steel sheet according to the disclosed embodiments contains 0.025% or less C, 0.01% to 1.00% Si, 0.05% to 1.00% Mn, 0.020% to 0.040% P, 0.030% or less S, 001% to 0.100% Al, 12.5% to 14 4% Cr, 0.01% to 0.80% Ni, 0.11% to 0.40% Ti, 0.010% to 0.100% Nb, and 0.020% or less N by mass %.

[0026] In descriptions below, the unit "%" used to express components of the ferritic stainless steel sheet refers to mass percent unless otherwise specified.

[0027] C: 0.025% or less

[0028] C is an element effective in increasing the strength of steel. From the viewpoint of obtaining this effect, the content of C is preferably set to 0.001% or more. However, when the content of C is more than 0.025%, the corrosion resistance and the workability are significantly deteriorated. Thus, the content of C is preferably set to 0.025% or less, more preferably 0.015% or less, and further more preferably 0.010% or less.

[0029] Si: 0.01% to 1.00%

[0030] Si is an element useful as a deoxidizing agent. This effect is obtained when the content of Si is 0.01% or more. However, when the content of Si is more than 1.00%,the workability deteriorated because steel is hardened. Thus, the content of Si is limited to the range of 0.01% to 1.00%. The content of Si preferably ranges from 0.03% to 0.50% and more preferably 0.06% to 0.20%.

[0031] Mn: 0.05% to 1.00%

[0032] Mn has a deoxidizing effect. From the viewpoint of obtaining this effect, the content of Mn is set to 0.05% more. However, when the content of Mn is more than 1.00%, the corrosion resistance is deteriorated because the precipitation and coarsening of MnS are progressed. Thus, the content of Mn is limited to the range of 0.05% to 1.00%. The content of Mn preferably ranges from 0.10% to 0.40% and more preferably 0.20% to 0.30%.

[0033] P: 0.020% to 0.040%

[0034] P is an element deteriorating the corrosion resistance. Therefore, the content of P is preferably as low as possible and is set to 0.040% or less. However, excessively reducing the content of P to less than 0.020% causes an increase in steelmaking cost. Thus, the content of P is limited to the range of 0.020% to 0.040%. The content of P preferably ranges from 0.020% to 0.030%.

[0035] S: 0.030% or less

[0036] S forms a precipitate, MnS, with Mn. The interfaces between MnS and a stainless steel base material serves as the origin of pitting, and it leads to deterioration of the corrosion resistance of a ferritic stainless steel. Thus, the content of S is preferably low and is set to 0.030% or less. The content of S is preferably 0.020% or less and more preferably 0.010% or less.

[0037] Al: 0.001% to 0.100%

[0038] Al is an element effective for deoxidizing. This effect is obtained when the content of Al is 0.001% or more. However, when the content of Al is more than 0.100%, surface quality is deteriorated by the increase in number of surface scratches due to aluminium non-metal inclusions. Thus, the content of Al is limited to the range of 0.001% to 0.100%. The content of Al preferably ranges from 0.01% to 0.08% and more preferably 0.02% to 0.06%.

[0039] Cr: 12.5% to 14.4%

[0040] Cr is an important element deciding the corrosion resistance and workability of a ferritic stainless steel. The corrosion resistance of the ferritic stainless steel obtained because Cr forms a passive film on the surface of steel. Therefore, increasing the content of Cr improves the corrosion resistance. In the disclosed embodiments, the content of Cr is adjusted to a specific range and the content of Ti and the content of Nb are also adjusted to a specific range as described below, whereby the corrosion resistance of steel is improved. In the disclosed embodiments, in order to obtain excellent corrosion resistance, the content of Cr needs to be 12.5% or more. However, easing the content of Cr deteriorates the workability of the ferritic stainless steel. In the disclosed embodiments, the workability is improved by containing Nb as described below. In the disclosed embodiments, in order to obtain workability equal to or better than SUH409L, 14.4% or less Cr may be contained. Thus, the content of Cr is limited to the range of 12.5% to 14.4%. The content of Cr preferably ranges from 13.0% to 13.8%.

[0041] Ni: 0.01% to 0.80%

[0042] Ni is an element which enables passive state to be maintained even at a lower pH by suppressing an anodic reaction caused by acid. That is, Ni has the effect of improving the crevice corrosion resistance and significantly suppressing the progress of corrosion in an active dissolution state. This effect improves the corrosion resistance of the ferritic stainless steel.

[0043] This effect is obtained when the content of Ni is 0.01% or more. However, when the content of Ni is more aan 0.80%, the workability is deteriorated because steel is hardened. Thus, the content of Ni is limited to the range of 0.01% to 0.80%. The content of Ni preferably ranges from 0.10% to 0.40%.

[0044] Ti: 0.11% to 0.40%

[0045] Ti is an element which improves the corrosion resistance, since it prevents the occurrence of sensitization by fixing C and N as Cr carbonitrides. Furthermore, Ti further improves the corrosion resistance by a combined effect with Nb as described below.

[0046] This effect is obtained when the content of Ti is 0.11% or more. However, when the content of Ti is more than 0.40%, the workability is deteriorated because a stainless steel sheet is hardened. Furthermore, the quality of the surface is deteriorated by the formation of Ti inclusions on a surface. Thus, the content of Ti ranges preferably from 0.11% to 0.40% and more preferably 0.20% to 0.35%.

[0047] Nb: 0.010% to 0.100%

[0048] Nb has the effect of fining its crystal gains by existing as solid solution in steel, {111}-oriented grains are likely to be formed from the local areas near grain boundaries, the proportion of recrystallized grains in the {111} plane increases in the recrystallization process due to fining crystal grain by containing Nb. Since this suppresses the formation of the Goss ({110} <001>-oriented grains, which deteriorates the workability by increasing in-plane anisotropy, the in-plane anisotropy of a microstructure is reduced. As a result, El_{min} (the minimum among the elongation in an L-direction that is a rolling direction, the elongation in a D-direction that is a 45-degree direction to the rolling direction, and the elongation in a C-direction that is a direction perpendicular to the rolling direction) and r_{min} (the minimum among the r-value in the L-direction, the r-value in the D-direction, and the r-value in the r-direction) are increased and, as a result, the workability is improved. Furthermore, Nb further improves the corrosion resistance by a combined effect with Ti as described below. This effect is obtained when the content of Nb is 0.010% or more. However, when the content of Nb is more than 0.100%, the workability is deteriorated because the ferritic stainless steel is hardened. Thus, the content of Nb preferably ranges from 0.010% to 0.100% and more preferably 0.030% to 0.070%.

[0049] Upon completing the disclosed embodiments, it was found that the corrosion resistance can be improved by containing Ti and Nb in combination. The mechanism is probably as described below. It is known that the corrosion of stainless steels is caused by the local fracture of passive film, which is called pitting. A cause of pitting is local crevice corrosion in crevices formed near surfaces of interfaces between inclusions and a steel base material because of the difference between the strain applied to the inclusions and the strain applied to the steel base material during working including rolling. MnS and Ti carbonitrides are typical examples of inclusions forming such crevices. Among these, Ti carbonitrides are relatively coarse, and the shape of the interfaces between Ti carbonitrides and steel base material are relatively linear. Therefore, an anodic reaction occurs intensively in crevices formed at the interfaces. As a result of that, the corrosion resistance of steel is deteriorated. However, it has become clear that containing Ti and Nb in combination makes Nb carbonitrides to adhere to the peripheries of the Ti carbonitrides, thereby precipitating Ti—Nb composite carbonitrides. Unlike the Ti carbonitrides, interfaces between the Ti—Nb composite carbonitrides obtained thereby and a stainless steel base material are not linear. That is, the interfaces have an increased length and therefore the anodic reaction occurs dispersively. Hence, the corrosion resistance is improved because pitting is unlikely to occur.

[0050] In order to obtain this effect and in order to achieve good workability, the content of each of Ti and Nb needs to be within the above range. The ratio (Nb/Ti) of the content of Nb to the content of Ti preferably ranges from 0.10 to 0.30, This allows the corrosion resistance to be further improved. When the ratio (Nb/Ti) is 0.10 or more, the precipitation of the Nb carbonitrides near the Ti carbonitrides is sufficient. When the ratio (Nb/Ti) is 0.30 or less, the Nb carbonitrides alone are unlikely to precipitate and the Ti—Nb composite carbonitrides are likely to be formed.

[0051] N: 0.020% or less

[0052] N is an element inevitably trapped in steel. When the content of N is more than 0.020%, the corrosion resistance and the workability are significantly deteriorated. Thus, the content of N is set to 0.020% or less. The content of N is preferably 0.015% or less.

[0053] Essential components have been described above the disclosed embodiments, other elements below may be appropriately contained.

[0054] Mo: 0.01% to 0.30%

[0055] Mo has the effect of improving the crevice corrosion resistance of the ferritic stainless steel. This effect is obtained when the content of Mo is 0.01% or more. However, when the content of Mo is more than 0.30%, this effect is saturated and the workability is deteriorated. Therefore, in the case of containing Mo, the content of Mo is set to 0.01% to 0.30%. The content of Mo is preferably 0.03% to 0.10%.

[0056] Cu: 0.01% to 0.50%

[0057] Cu has the effect of improving the toughness of steel. This effect is obtained when the content of Cu is 0.01% or more. However, when the content of Cu is more than 0.50%, the workability is deteriorated because the toughness of steel is deteriorated. Therefore, in the case of containing Cu, the content of Cu is set to 0.01% to 50%. The content of Cu is preferably 0.01% to less than 0.10% and more preferably 0.03% to 0.06%.

[0058] Co: 0.01% to 0.50%

[0059] Co is an element which improves the crevice corrosion resistance of stainless steels. This effect is obtained when the content of Co 0.01% or more. However, when the content of Co is more than 0.50%, this effect is saturated and the workability is deteriorated. Therefore, in the case of containing Co, the content of Co is set to 0.01% to 0.50%. The content of Co preferably ranges from 0.03% to 0.30% and more preferably 0.05% to 0.10%.

[0060] W: 0.01% to 0.50%

[0061] W is an element which improves the crevice corrosion resistance of the ferritic stainless steel. In order to obtain this effect, the content of W is preferably 0.01% or more. However, when the content is more than 0.50%, this effect is saturated and the workability is deteriorated. Therefore, in the case of containing W, the content of W is set to

0.01% to 0.50%. The content of W preferably ranges from 0.03% to 0.30% and more preferably 0.05% to 0.10%.

[0062] V: 0.01% to 0.25%

[0063] V is an element which mproves the crevice corrosion resistance of the ferritic stainless steel. This effect is obtained when the content of V is 0.01% or more. However, when the content of more than 0.25%, this effect is saturated and the workability is deteriorated. Therefore, the content of V is limited to the range of 0.01% to 0.25%. The content of V preferably ranges from 0.03% to 0.20% and more preferably 0.05% to 0.10%.

[0064] Upon completing the disclosed embodiments, it was found that, in the case of adding V, the effect of improving the corrosion resistance by containing Ti and Nb in combination is enhanced by adjusting the content of V with respect to the sum of the content of Ti and the content of Nb. The mechanism is not clear but is probably as described below.

[0065] When V is contained in steel, carbonitrides of Ti and Nb contain V; hence, composite carbonitrides ((Ti, V)(C, N)) of Ti and V, composite carbonitrides ((Nb, V) (C, N)) of Nb and V, and composite carbonitrides ((Ti, Nb, V) (C, N)) that are the above Ti—Nb composite carbonitrides doped with V are formed. Since these composite carbonitrides are formed, the peak precipitation temperature, that is the temperature at which precipitation is most promoted, decreases as compared to the case where V is not contained. As a result, the grain growth of these composite carbonitrides occurs at lower temperatures. Since diffusion is low in a temperature range, the coarsening of the carbonitrides is suppressed; hence, V-containing carbonitrides (that can be collectively referred to as Ti—Nb—V composite carbonitrides) have a small size relative to V-free Ti or Nb carbonitrides and composite carbonitrides of Ti and Nb (that can be collectively referred to as Ti—Nb composite carbonitrides) and form more dispersed precipitates. Since the composite carbonitrides are small in size, crevices formed between carbonitrides and a steel base material, during working including rolling are small. Therefore, local crevice corrosion is unlikely to occur and the occurrence of pitting is suppressed. As a result, the corrosion resistance is improved.

[0066] In order to obtain this effect to achieve excellent corrosion resistance and good workability, the content of each of Ti, Nb, and V is adjusted to the above range, the ratio (Nb/Ti) of the content of Nb o the content of Ti is set to range from 0.10 to 0.30, and the ratio (V/(Ti+Nb)) of the content of V to the sum of the content of Nb and the content of Ti is set to range from 0.20 to 1.00. This allows the corrosion resistance to be further improved. When the ratio (V/(Ti+Nb)) is 0.20 or more, the reduction in precipitation temperature of (Ti, V) (C, V) and (Nb, V) (C, V) significant. When the ratio (V/(Ti+Nb)) is 1.00 or less, V carbonitrides alone are unlikely to precipitate and the Ti—Nb—V composite carbonitrides are likely to be formed.

[0067] Zr: 0.01% to 0.30%

[0068] Zr, as well as Ti and Nb, has the effect of improving the corrosion resistance, since it prevents the occurrence of sensitization by fixing C and N as Cr carbonitrides. This effect is obtained when the content of is 0.01% or more. However, when the content of Zr is more than 0.30%, surface scratches are generated by the formation f ZrO_2 and the like. Therefore, in the case of containing Zr, the content of Zr is set to 0.01% to 0.30%. The content of Zr is preferably 0.01% to 0.20%.

[0069] B: 0.0003% to 0.0030%

[0070] B is an element improving the hot workability and the secondary workability. It is known that containing B is effective in Ti-added steel. This effect is obtained when the content of B is 0.0003% or more. However, when the content of B is more than 0.0030%, the workability is deteriorated. Thus, in the case of containing B, the content of B set to range from 0.0003% to 0.0030%. The content of B preferably ranges from 0.0010% to 0.0025% and more preferably 0.0015% to 0.0020%.

[0071] Mg: 0.0005% to 0.0030%

[0072] Mg, as well as Al, acts as a deoxidizing agent by forming Mg oxides in molten steel. This effect is obtained when the content of Mg is 0.0005% or more. However, when the content of Mg is more than 0.0030%, the productivity is reduced because the toughness of steel is deteriorated. Thus, in the case of containing Mg, the content of Mg is limited to the range of 0.0005% to 0.0030%.

[0073] Ca: 0.0003% to 0.0030%

[0074] Ca is an element effective in preventing nozzles from being blocked by the precipitation of Ti inclusions likely to be caused during continuous casting. This effect is obtained when the content of Ca is 0.0003% or more. However, when the content of Ca is more than 0.0030%, the productivity is reduced because the toughness of steel is deteriorated. Furthermore, when the content of Ca is more than 0.0030%, the corrosion resistance is deteriorated by the precipitation of CaS. Thus, in the case of containing Ca, the content of Ca is limited to the range of 0.0003% to 0.0030%. The content of Ca preferably ranges from 0.0010% to 0.0020%.

[0075] Y: 0.001% to 0.20%

[0076] Y is an element which improves the cleanliness of steel by reducing the viscosity of molten steel. This effect is obtained when the content of Y is 0.001% or more. However, when the content of Y is more than 0.20%, this effect is saturated and the workability is deteriorated. Therefore, in the case of containing Y, the content of Y limited to the range of 0.001% to 0.20%. The content of Y preferably ranges from 0.001% to 0.10%.

[0077] REM (rare-earth metal): 0.001% to 0.10%

[0078] REMs (rare-earth metals: elements, such as La, Ce, and Nd, having atomic numbers 57 to 71) are elements which improve the high-temperature oxidation resistance. This effect is obtained when the content of a REM is 0.001% or more. However, when the content of the REM is more than 0.10%, this effect is saturated and surface scratches are caused during hot rolling. Therefore, in the case of containing the REM, the content of the REM is limited to the range of 0.001% to 0.10%. The content of the REM preferably ranges from 0.005% to 0.05%.

[0079] Sn, Sb: 0.001% to 0.50%

[0080] These elements are effective in improving the ridging resistance by promoting the formation of deformed zones during rolling. This effect is obtained when the content of either of these elements is 0.001% or more. However, when the content of each of these elements more than 0.50%, this effect is saturated and the workability is deteriorated. Therefore, in the case of containing Sn and Sb, the content of each of Sn and Sb is set to 0.001% to 0.50%. The content of each of Sn and Sb preferably ranges from 0.003% to 0.20%.

[0081] The remainder other than the above components are inevitable impurities.

[0082] A preferable method for manufacturing the ferritic stainless steel sheet according to the disclosed embodiments is described below. Steel having the above composition is produced in a steel converter, an electric furnace, a vacuum melting furnace, or the like by a known process and is then formed into a steel material (slab) by a continuous casting process or an ingot casting-blooming process. After being heated to 1,000° C. to 1,200° C., the steel material is hot-rolled at a finish temperature of 700° C. to 1,000° C. such that the thickness is 2.0 mm to 5.0 mm. A hot-rolled steel plate prepared as described above is annealed at a temperature of 800° C. to 1,100° C., is pickled, and is then cold-rolled. A cold-rolled steel sheet is annealed at a temperature of 700° C.' to 1,000° C. The annealed cold-rolled steel sheet is descaled by pickling. The descaled cold-rolled steel sheet may be subjected to skin-pass rolling.

EXAMPLES

[0083] Each of stainless steels having a composition shown in Nos. 1 to 82 in Table 1 (Tables 1-1, 1-2, and 1-3 are collectively referred to as Table 1) was produced in a vacuum melting furnace and was then cast into a 30 kg steel ingot. After the steel ingot was heated to a temperature of 1,050° C., the steel ingot was hot-rolled at a finish temperature of 900° C., whereby a hot-rolled steel plate with a thickness of 5 mm was obtained. Thereafter, the hot-rolled steel plate was annealed at 1,000° C. to 1,050° C. for 1 minute in an Ar atmosphere, was pickled in sulfuric acid, and was then cold-rolled into a cold-rolled steel sheet with a thickness of 1.0 mm. The obtained cold-rolled steel sheet was annealed at 900° C. for 1 minute in an Ar atmosphere and was then pickled by neutral-salt electrolysis, nitric hydrofluoric acid immersion, and nitrate electrolysis, whereby a cold-rolled, annealed, and pickled steel sheet was obtained.

[0084] Each of ferritic stainless steels having a composition shown in Nos. 83 and 84 in Table 1 was produced in a vacuum melt furnace and was then cast into a 30 kg steel ingot. After the steel ingot was heated to a temperature of 1,050° C., the steel ingot was hot-rolled at a finish temperature of 900° C., whereby a hot-rolled steel plate with a thickness of 5 mm was obtained. Thereafter, the hot-rolled steel plate was annealed at 800° C. to 850° C. for 12 hours in air, was pickled in sulfuric acid, and was then cold-rolled into a cold-rolled steel sheet with a thickness of 1.0 mm. The obtained cold-rolled steel sheet was annealed at 800° C. for 1 minute in an Ar atmosphere and was then pickled by neutral-salt electrolysis, nitric hydrofluoric acid immersion, and nitrate electrolysis, whereby a cold-rolled, annealed, and pickled steel sheet was obtained.

[0085] Test Nos. 82 and 83 in Table 1 are steel corresponding to SUH4091, and steel corresponding to SUS430, respectively.

[0086] The cold-rolled, annealed, and pickled steel sheets, which were obtained from the ferritic stainless steels under the above manufacturing conditions, were cut to 80 mm×60 mm by shearing. After cutting, polishing was performed using emery paper up to 320 grade and degreasing was performed using acetone. End portions and the back surface of each obtained steel sheet were sealed, followed by placing the steel sheet in a corrosion testing device at an inclination of 60°. In the corrosion testing device, a corrosion test was performed for 240 cycles in such a manner that spraying an aqueous solution containing 0.1% by mass NaCl and 0.5% by mass H_2O_2 (30 minutes, 35° C., 98% RH (humidity)), drying (1 hour, 60° C., 30% RH), and wetting (1 hour, 40° C., 95% RH) were performed in each cycle. This is a corrosion acceleration test method for evaluating the corrosion resistance of low- to medium-Cr steels. After the test, corrosion products were removed using a 10% di-ammonium hydrogen citrate solution and the corrosion weight loss was measured. One with a corrosion weight loss of 1.0 g/m^2 or less was rated "A:◎" (acceptable, very excellent), one with a corrosion weight loss of more than 1.0 g/m^2 to 5.0 g/m^2 was rated "B:○" (acceptable, particularly excellent), one with a corrosion weight loss of more than 5.0 g/m^2 to 8.0 g/m^2 was rated "C:□" (acceptable, excellent), one with a corrosion weight loss of more than 8.0 g/m^2 to 16.0 g/m^2 was rated "D:Δ" (acceptable), and one with a corrosion weight loss of more than 16.0 g/m^2 was rated "E:▲" (unacceptable).

[0087] Furthermore, No. 13D test specimens specified in JIS 2201 were sampled in a rolling direction, a 45-degree direction to the rolling direction, and a direction perpendicular to the rolling direction and were subjected to a tensile test at room temperature, whereby the workability was evaluated. One with an El_{min} of 33% or more and an r_{min} of 1.1 or more was rated "A:○" (acceptable) and one with an El_{min} of less than 33% or an r_{min} of less than 1.1 was rated "B:▲" (unacceptable).

[0088] Obtained results are shown in Table 1. Test Nos. 1 to 65, which are steels according to the disclosed embodiments, have a rating of "B:○", "C:"", or "D:Δ" for corrosion resistance and a rating of "A:○" for workability. It is clear that Test Nos. 1 to 65 are excellent in corrosion resistance and workability. In particular, Test Nos. 34 to 47 and 55 to 65, in which the ratio (V/(Ti+Nb)) satisfies the range of 0.20 to 1.00 and which are steels according to the disclosed embodiments, have a rating of "B: ○" for corrosion resistance and a rating of "A:○" for workability.

[0089] FIG. **1** is a graph summarizing results of examples according to the disclosed embodiments, results of comparative examples in which the content of Ti is outside the scope of the disclosed embodiments, and results of comparative examples in which the content of Nb is outside the scope of the disclosed embodiments. As is clear from FIG. **1**, in the case where the content of Ti and the content of Nb satisfy Inequality (1), better corrosion resistance is exhibited.

[0090] FIG. **2** is a graph summarizing results of corrosion resistance in terms of the content of V and the sum of the content of Ti and the content of Nb for the examples according to the disclosed embodiments, in which the content of Ti and the content of Nb satisfy Inequality (1). As is clear from FIG. **2**, in the case where the content of Ti, the content of Nb, and the content of V satisfy Inequality (2), further better corrosion resistance is exhibited.

[0091] Test Nos. 34 to 47 and 55 to 65, in which the ratio (V/(Ti+Nb)) satisfies the range of 0.20 to 1.00 and which are steels according to the disclosed embodiments, have a rating of "B:○" for corrosion resistance and a rating of "A:○" for workability.

[0092] Test Nos. 66, 68, 70, and 71, which are comparative examples, have a Cr content, Ni content, and Ti content lower than the scope of the disclosed embodiments and therefore are deteriorated in corrosion resistance. Test Nos. 67, 69, 72, 73, 76, 77, 78, 79, and 80, which are comparative examples, have a Cr content, Ni content, Ti content, Nb content, and V content higher than the scope of the disclosed embodiments and therefore are deteriorated in workability. Test Nos. 74 and 75, which are comparative examples, have a Nb content lower than the scope of the disclosed embodiments and therefore are deteriorated in corrosion resistance and workability. Test No. 81, which is a comparative example, has a C content higher than the scope of the disclosed embodiments and therefore is deteriorated in corrosion resistance and workability. Test No. 82, which is a comparative example, contains no Nb, has a Cr content lower than the scope of the disclosed embodiments, and therefore is deteriorated in corrosion resistance. Test Nos. 83 and 84, which are comparative examples, contain no Nb; have a C content, N content, and Cr content higher than the scope of the disclosed embodiments and therefore are deteriorated in workability.

TABLE 1-1

	Composition (mass percent)										
Test No.	C	Si	Mn	P	S	Al	Cr	Ni	Ti	Nb	N
1	0.007	0.08	0.24	0.024	0.010	0.034	12.6	0.44	0.26	0.044	0.011
2	0.008	0.07	0.25	0.025	0.008	0.026	13.2	0.36	0.25	0.068	0.010
3	0.010	0.10	0.22	0.025	0.012	0.031	13.8	0.44	0.28	0.060	0.010
4	0.008	0.10	0.22	0.023	0.011	0.031	14.4	0.35	0.29	0.049	0.013
5	0.011	0.12	0.25	0.026	0.011	0.034	13.6	0.04	0.29	0.064	0.012
6	0.007	0.09	0.25	0.028	0.009	0.033	13.5	0.78	0.23	0.065	0.012
7	0.011	0.09	0.21	0.024	0.010	0.026	13.5	0.43	0.11	0.051	0.008
8	0.012	0.11	0.23	0.027	0.008	0.032	13.5	0.35	0.38	0.062	0.012
9	0.008	0.10	0.25	0.020	0.009	0.031	13.3	0.40	0.25	0.012	0.008
10	0.009	0.12	0.24	0.028	0.008	0.032	13.2	0.36	0.28	0.097	0.009
11	0.007	0.07	0.20	0.027	0.008	0.026	13.3	0.38	0.39	0.094	0.012
12	0.007	0.13	0.22	0.022	0.008	0.032	13.6	0.39	0.35	0.096	0.008
13	0.011	0.08	0.24	0.023	0.011	0.032	13.1	0.42	0.13	0.029	0.008
14	0.010	0.13	0.23	0.023	0.010	0.031	13.7	0.36	0.11	0.012	0.012
15	0.012	0.08	0.25	0.023	0.011	0.028	13.4	0.36	0.38	0.040	0.007
16	0.008	0.08	0.21	0.028	0.011	0.033	13.6	0.37	0.13	0.086	0.013
17	0.008	0.07	0.22	0.023	0.011	0.029	13.4	0.38	0.38	0.013	0.012
18	0.010	0.13	0.23	0.027	0.012	0.031	13.6	0.37	0.13	0.011	0.008
19	0.007	0.11	0.21	0.024	0.012	0.028	13.3	0.41	0.39	0.035	0.007
20	0.010	0.27	0.23	0.031	0.008	0.029	13.1	0.43	0.18	0.061	0.010
21	0.007	0.34	0.23	0.028	0.011	0.033	13.4	0.35	0.25	0.080	0.010
22	0.009	0.27	0.20	0.033	0.011	0.026	13.7	0.43	0.28	0.025	0.009
23	0.009	0.12	0.24	0.022	0.012	0.028	13.3	0.39	0.14	0.016	0.008
24	0.008	0.12	0.24	0.021	0.009	0.030	13.6	0.36	0.25	0.036	0.010
25	0.011	0.09	0.20	0.022	0.010	0.032	13.7	0.43	0.27	0.052	0.011
26	0.007	0.14	0.22	0.027	0.008	0.035	13.5	0.39	0.29	0.056	0.008
27	0.008	0.06	0.21	0.026	0.008	0.034	13.3	0.37	0.28	0.031	0.011
28	0.011	0.06	0.20	0.023	0.010	0.030	13.1	0.40	0.23	0.037	0.009
29	0.009	0.14	0.20	0.023	0.011	0.029	13.8	0.41	0.20	0.041	0.013
30	0.009	0.13	0.25	0.024	0.009	0.033	13.3	0.40	0.29	0.069	0.008
31	0.013	0.08	0.24	0.025	0.010	0.030	13.5	0.36	0.27	0.044	0.011
32	0.009	0.08	0.24	0.022	0.008	0.035	13.2	0.39	0.29	0.050	0.007
33	0.010	0.11	0.23	0.028	0.011	0.034	13.2	0.39	0.25	0.056	0.010

				Properties		
Test No.	Composition (mass percent) Other elements	Nb/Ti	V/(Ti + Nb)	Corrosion resistance	Workability	
1		0.17	—	C: □	A: ○	Example
2		0.27	—	C: □	A: ○	Example
3		0.21	—	C: □	A: ○	Example
4		0.17	—	C: □	A: ○	Example
5		0.22	—	C: □	A: ○	Example
6		0.28	—	C: □	A: ○	Example
7		0.46	—	D: Δ	A: ○	Example
8		0.16	—	C: □	A: ○	Example
9		0.05	—	D: Δ	A: ○	Example
10		0.35	—	D: Δ	A: ○	Example
11		0.24	—	C: □	A: ○	Example
12		0.27	—	C: □	A: ○	Example
13		0.22	—	C: □	A: ○	Example
14		0.11	—	C: □	A: ○	Example
15		0.11	—	C: □	A: ○	Example
16		0.66	—	D: Δ	A: ○	Example
17		0.03	—	D: Δ	A: ○	Example
18		0.08	—	D: Δ	A: ○	Example
19		0.09	—	D: Δ	A: ○	Example
20		0.34	—	D: Δ	A: ○	Example
21		0.32	—	D: Δ	A: ○	Example

TABLE 1-1-continued

22		0.09	—	D: Δ	A: ○	Example
23	V: 0.18, Co: 0.03, Cu: 0.04, Zr: 0.04, Mo: 0.05, W: 0.03	0.11	1.15	C: □	A: ○	Example
24	B: 0.0016, Mg: 0.002, Ca: 0.002	0.14	—	C: □	A: ○	Example
25	Y: 0.06, La: 0.04	0.19	—	C: □	A: ○	Example
26	Sn: 0.05	0.19	—	C: □	A: ○	Example
27	Sb: 0.03	0.11	—	C: □	A: ○	Example
28	V: 0.02, B: 0.0013	0.16	0.07	C: □	A: ○	Example
29	Cu: 0.06, Y: 0.08	0.21	—	C: □	A: ○	Example
30	Zr: 0.08, Sn: 0.15	0.24	—	C: □	A: ○	Example
31	Co: 0.10, Nd: 0.03, Sb: 0.11	0.16	—	C: □	A: ○	Example
32	Mo: 0.07, Ca: 0.001	0.17	—	C: □	A: ○	Example
33	W: 0.06, Co: 0.21, Ce: 0.004, Sn: 0.34	0.22	—	C: □	A: ○	Example

* [Corrosion resistance] After 240 cycles of a corrosion test, one with a corrosion weight loss of 1.0 g/m^2 or less was rated "A: ◎" (acceptable, very excellent), one with a corrosion weight loss of more than 1.0 g/m^2 to 5.0 g/m^2 was rated "B: ○" (acceptable, particularly excellent), one with a corrosion weight loss of more than 5.0 g/m^2 to 8.0 g/m^2 was rated "C: □" (acceptable, excellent), one with a corrosion weight loss of more than 8.0 g/m^2 to 16.0 g/m^2 was rated "D: Δ" (acceptable), and one with a corrosion weight loss of more than 16.0 g/m^2 was rated "E" (unacceptable).
* [Workability] By a room-temperature tensile test, one with an El_{min} of 33% or more and an r_{min} of 1.1 or more was rated "A: ○" (acceptable) and one with an El_{min} of less than 33% or an r_{min} of less than 1.1 was rated "B: ▲" (unacceptable).
* Underlined values are outside the scope of the disclosed embodiments.

TABLE 1-2

	Composition (mass percent)										
Test No.	C	Si	Mn	P	S	Al	Cr	Ni	Ti	Nb	N
34	0.010	0.06	0.24	0.027	0.011	0.032	13.7	0.37	0.11	0.022	0.009
35	0.008	0.07	0.23	0.023	0.009	0.029	13.2	0.37	0.38	0.063	0.011
36	0.013	0.11	0.21	0.025	0.010	0.028	13.7	0.39	0.12	0.012	0.009
37	0.012	0.09	0.23	0.025	0.010	0.030	13.5	0.45	0.33	0.096	0.010
38	0.007	0.07	0.23	0.021	0.012	0.035	13.2	0.40	0.12	0.014	0.013
39	0.010	0.12	0.23	0.024	0.012	0.029	13.6	0.44	0.35	0.075	0.013
40	0.007	0.08	0.21	0.022	0.012	0.030	13.3	0.43	0.23	0.032	0.009
41	0.009	0.06	0.21	0.024	0.008	0.028	13.3	0.43	0.11	0.012	0.009
42	0.011	0.10	0.24	0.023	0.010	0.033	13.0	0.38	0.11	0.014	0.007
43	0.010	0.08	0.23	0.021	0.011	0.031	13.3	0.37	0.39	0.084	0.012
44	0.012	0.12	0.26	0.025	0.010	0.034	13.6	0.44	0.38	0.096	0.007
45	0.011	0.25	0.22	0.032	0.011	0.034	13.6	0.37	0.19	0.026	0.008
46	0.012	0.32	0.22	0.031	0.009	0.028	13.2	0.37	0.18	0.051	0.013
47	0.009	0.27	0.26	0.031	0.009	0.026	13.0	0.42	0.28	0.068	0.012
48	0.013	0.10	0.26	0.028	0.010	0.034	13.3	0.43	0.12	0.023	0.009
49	0.011	0.08	0.26	0.025	0.008	0.031	13.3	0.42	0.11	0.014	0.010
50	0.010	0.08	0.25	0.026	0.010	0.026	13.0	0.45	0.19	0.042	0.007
51	0.012	0.12	0.22	0.024	0.009	0.026	13.1	0.39	0.13	0.022	0.011
52	0.008	0.12	0.22	0.026	0.009	0.026	13.1	0.36	0.36	0.093	0.007
53	0.008	0.12	0.24	0.026	0.009	0.026	13.5	0.38	0.37	0.086	0.012
54	0.009	0.28	0.25	0.028	0.008	0.029	13.0	0.38	0.26	0.036	0.009
55	0.012	0.06	0.24	0.026	0.011	0.031	13.3	0.45	0.22	0.064	0.012
56	0.011	0.10	0.23	0.027	0.011	0.029	13.2	0.38	0.28	0.047	0.010
57	0.010	0.09	0.24	0.026	0.012	0.028	13.2	0.42	0.28	0.058	0.011
58	0.010	0.09	0.20	0.023	0.010	0.035	13.1	0.35	0.25	0.031	0.012
59	0.010	0.12	0.23	0.020	0.011	0.027	13.2	0.39	0.20	0.045	0.007
60	0.009	0.09	0.23	0.024	0.011	0.030	13.1	0.43	0.21	0.031	0.008
61	0.011	0.14	0.26	0.028	0.011	0.029	13.1	0.42	0.23	0.046	0.007
62	0.010	0.07	0.24	0.021	0.009	0.027	13.3	0.45	0.28	0.031	0.010
63	0.010	0.12	0.21	0.027	0.012	0.026	13.1	0.38	0.27	0.066	0.011
64	0.012	0.11	0.21	0.023	0.010	0.034	13.6	0.42	0.23	0.034	0.011
65	0.012	0.08	0.23	0.021	0.008	0.031	13.3	0.42	0.26	0.035	0.009

				Properties		
Test No.	Composition (mass percent) Other elements	Nb/Ti	V/(Ti + Nb)	Corrosion resistance	Workability	
34	V: 0.04	0.20	0.30	B: ○	A: ○	Example
35	V: 0.17	0.17	0.38	B: ○	A: ○	Example
36	V: 0.05	0.10	0.38	B: ○	A: ○	Example
37	V: 0.18	0.29	0.42	B: ○	A: ○	Example
38	V: 0.03	0.12	0.22	B: ○	A: ○	Example
39	V: 0.24	0.21	0.56	B: ○	A: ○	Example
40	V: 0.24	0.14	0.92	B: ○	A: ○	Example
41	V: 0.11	0.11	0.90	B: ○	A: ○	Example
42	V: 0.03	0.13	0.24	B: ○	A: ○	Example
43	V: 0.11	0.22	0.23	B: ○	A: ○	Example

TABLE 1-2-continued

44	V: 0.25	0.25	0.53	B: ○	A: ○	Example
45	V: 0.17	0.14	0.79	B: ○	A: ○	Example
46	V: 0.05	0.28	0.22	B: ○	A: ○	Example
47	V: 0.09	0.24	0.26	B: ○	A: ○	Example
48	V: 0.24	0.19	1.68	C: □	A: ○	Example
49	V: 0.14	0.13	1.13	C: □	A: ○	Example
50	V: 0.24	0.22	1.03	C: □	A: ○	Example
51	V: 0.02	0.17	0.13	C: □	A: ○	Example
52	V: 0.08	0.26	0.18	C: □	A: ○	Example
53	V: 0.01	0.23	0.02	C: □	A: ○	Example
54	V: 0.04	0.14	0.14	C: □	A: ○	Example
55	V: 0.13, Co: 0.04, Cu: 0.03, Zr: 0.04, Mo: 0.09, W: 0.09	0.29	0.46	B: ○	A: ○	Example
56	V: 0.13, B: 0.0015, Mg: 0.001, Ca: 0.002	0.17	0.40	B: ○	A: ○	Example
57	V: 0.15, Y: 0.03, La: 0.04	0.21	0.44	B: ○	A: ○	Example
58	V: 0.16, Sn: 0.12	0.12	0.57	B: ○	A: ○	Example
59	V: 0.12, Sb: 0.14	0.23	0.49	B: ○	A: ○	Example
60	V: 0.13, Cu: 0.05, Co: 0.06	0.15	0.54	B: ○	A: ○	Example
61	V: 0.10, Zr: 0.02, Nd: 0.03	0.20	0.36	B: ○	A: ○	Example
62	V: 0.13, Mo: 0.07, Sn: 0.03	0.11	0.42	B: ○	A: ○	Example
63	V: 0.16, B: 0.0012, Y: 0.015, Sb: 0.10	0.24	0.48	B: ○	A: ○	Example
64	V: 0.11, Cu: 0.06, Ca: 0.003, Sn: 0.07	0.15	0.42	B: ○	A: ○	Example
65	V: 0.13, Zr: 0.03, Mg: 0.0009, Ce: 0.04	0.13	0.44	B: ○	A: ○	Example

* [Corrosion resistance] After 240 cycles of a corrosion test, one with a corrosion weight loss of 1.0 g/m^2 or less was rated "A: ◎" (acceptable, very excellent), one with a corrosion weight loss of more than 1.0 g/m^2 to 5.0 g/m^2 was rated "B: ○" (acceptable, particularly excellent), one with a corrosion weight loss of more than 5.0 g/m^2 to 8.0 g/m^2 was rated "C: □" (acceptable, excellent), one with a corrosion weight loss of more than 8.0 g/m^2 to 16.0 g/m^2 was rated "D: Δ" (acceptable), and one with a corrosion weight loss of more than 16.0 g/m^2 was rated "E: ▲" (unacceptable).
* [Workability] By a room-temperature tensile test, one with an El_{min} of 33% or more and an r_{min} of 1.1 or more was rated "A: ○" (acceptable) and one with an El_{min} of less than 33% or an r_{min} of less than 1.1 was rated "B: ▲" (unacceptable).
* Underlined values are outside the scope of the disclosed embodiments.

TABLE 1-3

	Composition (mass percent)														Properties		
Test No.	C	Si	Mn	P	S	Al	Cr	Ni	Ti	Nb	N	Other elements	Nb/Ti	V/(Ti + Nb)	Corrosion resistance	Workability	
66	0.007	0.07	0.22	0.026	0.011	0.031	12.2	0.36	0.29	0.049	0.008		0.17	—	E: ▲	A: ○	Comparative example
67	0.008	0.07	0.21	0.023	0.009	0.029	14.7	0.40	0.27	0.068	0.009		0.25	—	B: ○	B: ▲	Comparative example
68	0.010	0.10	0.23	0.025	0.009	0.033	13.4	—	0.27	0.048	0.011		0.18	—	E: ▲	A: ○	Comparative example
69	0.009	0.06	0.23	0.028	0.012	0.028	13.3	0.84	0.29	0.050	0.013		0.17	—	B: ○	B: ▲	Comparative example
70	0.009	0.12	0.20	0.021	0.009	0.030	13.4	0.36	0.09	0.012	0.010		0.13	—	E: ▲	A: ○	Comparative example
71	0.008	0.09	0.21	0.024	0.009	0.025	13.0	0.42	0.08	0.098	0.010		1.23	—	E: ▲	A: ○	Comparative example
72	0.011	0.12	0.23	0.021	0.012	0.035	13.7	0.45	0.42	0.014	0.008		0.03	—	D: Δ	B: ▲	Comparative example
73	0.007	0.11	0.21	0.022	0.008	0.031	13.4	0.41	0.44	0.093	0.012		0.21	—	C: □	B: ▲	Comparative example
74	0.010	0.06	0.24	0.027	0.011	0.028	13.4	0.35	0.13	0.005	0.007		0.04	—	E: ▲	B: ▲	Comparative example
75	0.009	0.13	0.23	0.021	0.009	0.029	13.6	0.39	0.38	0.008	0.010		0.02	—	E: ▲	B: ▲	Comparative example
76	0.012	0.11	0.24	0.026	0.009	0.028	13.2	0.44	0.24	0.112	0.012		0.80	—	D: Δ	B: ▲	Comparative example
77	0.010	0.13	0.24	0.027	0.011	0.031	13.5	0.38	0.35	0.103	0.011		0.29	—	C: □	B: ▲	Comparative example
78	0.009	0.07	0.23	0.020	0.009	0.026	13.4	0.41	0.12	0.015	0.009	V: 0.28	0.13	2.07	C: □	B: ▲	Comparative example
79	0.011	0.13	0.24	0.021	0.010	0.031	13.0	0.39	0.21	0.044	0.009	V: 0.27	0.21	1.06	C: □	B: ▲	Comparative example
80	0.011	0.10	0.21	0.021	0.009	0.033	13.7	0.36	0.34	0.086	0.008	V: 0.26	0.25	0.61	B: ○	B: ▲	Comparative example
81	0.030	0.10	0.23	0.026	0.008	0.034	13.2	0.36	0.26	0.057	0.008		0.22	—	E: ▲	B: ▲	Comparative example
82	0.006	0.25	0.39	0.022	0.002	0.029	10.9	0.13	0.26	—	0.006		—	—	E: ▲	A: ○	Comparative example
83	0.039	0.23	0.58	0.026	0.005	0.001	16.2	0.24	—	—	0.046		—	—	A: ◎	B: ▲	Comparative example

TABLE 1-3-continued

	Composition (mass percent)													Properties		
Test No.	C	Si	Mn	P	S	Al	Cr	Ni	Ti	Nb	N	Other elements	Nb/Ti	V/(Ti + Nb)	Corrosion resistance	Work-ability	
84	0.041	0.25	0.38	0.026	0.004	0.001	15.1	0.16	—	—	0.048		—	—	D: Δ	B: ▲	Comparative example

* [Corrosion resistance] After 240 cycles of a corrosion test, one with a corrosion weight loss of 1.0 g/m^2 or less was rated "A: ◎" (acceptable, very excellent), one with a corrosion weight loss of more than 1.0 g/m^2 to 5.0 g/m^2 was rated "B: ○" (acceptable, particularly excellent), one with a corrosion weight loss of more than 5.0 g/m^2 to 8.0 g/m^2 was rated "C: □" (acceptable, excellent), one with a corrosion weight loss of more than 8.0 g/m^2 to 16.0 g/m^2 was rated "D: Δ" (acceptable), and one with a corrosion weight loss of more than 16.0 g/m^2 was rated "E: ▲" (unacceptable).
* [Workability] By a room-temperature tensile test, one with an El_{min} of 33% or more and an r_{min} of 1.1 or more was rated "A: ○" (acceptable) and one with an El_{min} of less than 33% or an r_{min} of less than 1.1 was rated "B: ▲" (unacceptable).
* Underlined values are outside the scope of the disclosed embodiments.

INDUSTRIAL APPLICABILITY

[0093] The disclosed embodiments have excellent corrosion resistance and workability and therefore can be preferably used for applications such as inner panels for elevators, interiors, duct hoods, muffler cutters, lockers, home appliance parts, office equipment parts, automotive interior parts, automotive exhaust pipes, building materials, and covers for drains.

1. A ferritic stainless steel sheet Comprising, by mass %:
0.025% or less C;
0.01% to 1.00% Si;
0.05% to 1.00% Mn;
0.020% to 0.040% P;
0.030% or less S;
0.001% to 0.100% Al;
12.5% to 14.4% Cr;
0.01% to 0.80% Ni;
0.11% to to 0.40% Ti;
0.010% to 0.100% Nb;
0.020% or less N; and
the remainder being Fe and inevitable impurities.

2. The ferritic stainless steel sheet according to claim **1**, wherein the content of Ti and the content of Nb satisfy the following Inequality (1):

$$0.10 \le Nb/Ti \le 0.30 \quad (1)$$

where Nb and Ti represent the content of each respective element.

3. The ferritic stainless steel sheet according to further comprising at least one group selected from the following groups:

Group A: one or more element selected from the group consisting of, by mass %, 0.01% to 0.30% Mo, 0.01% to 0.50% Cu, 0.01% to 0.50% Co, and 0.01% to 0.50% W,

Group B: one or more element selected from the group consisting of, by mass %, 0.01% to (125% V, 0.01% to 0.30% Zr, 0.0003% to 0.0030% B, 0.0005% to 0.0030% Mg, 0.0003% to 0.0030% Ca, 0.001% to 0.20% Y, and 0.001% to 0.10% of a REM, and

Group C: one or more element selected from the group consisting of, by mass %, 0.001.% to 0.50% Sn and 0.001% to 0.530% Sb.

4. The ferritic stainless steel sheet according claim **2**, further comprising at lest one group selected from the following groups:

Group A: one or more element selected from the group consisting of, by mass % 0.01% to 0.30% Mo, 0.01% to 0.50% Cu, 0.01% to 0.50% Co, and 0.01% to 0.50% W,

Group B: one or more element selected from the group consisting of, by mass %, 0.01% to (125% V, 0.01% to 0.30% Zr, 0.0003% to 0.0030% B, 0.0005% to 0.0030% Mg, 0.0003% to 0.0030% Ca, 0.001% to 0.20% Y. and 0.001% to 0.10% of a REM, and

Group C: one or more element selected from the group consisting of, by mass %. 0.001.% to 0.50% Sn and 0.001% to 0.530% Sb.

5. (canceled)

6. The ferritic stainless steel sheet according to claim **1**, further comprising, by mass %, 0.01% to 0.25% V,

wherein the content of Ti, the content of Nb, and the content of V satisfy the following Inequality (1) and Inequality (2):

$$0.10 \le Nb/Ti \le 0.30 \quad (1)$$

$$0.20 \le V/(Ti+Nb) \le 1.00 \quad (2)$$

where Ti, Nb and V represent the content of each respective element.

7. The ferritic stainless steel sheet according to claim **2**, further comprising, by mass %, 0.01% to 0.25% V,

wherein the content of Ti, the content of Nb, and the content of V satisfy the following Inequality (2):

$$0.20 \le V/(Ti+Nb) \le 1.00 \quad (2)$$

where Ti, Nb and V represent the content of each respective element.

8. The ferritic stainless steel sheet according to claim **3**, further comprising, by mass %, 0.01% to 0.25% V,

wherein the content of Ti, the content of Nb, and the content of V satisfy the following Inequality (1) and Inequality (2):

$$0.10 \le Nb/Ti \le 0.30 \quad (1)$$

$$0.20 \le V/(Ti+Nb) \le 1.00 \quad (2)$$

where Ti, Nb and V represent the content of each respective element.

9. The ferritic stainless steel sheet according to claim **4**, further comprising, by mass %, 0.01% to 0.25% V,

wherein the content of Ti, the content of Nb, and the content of V satisfy the following Inequality (2):

$$0.20 \le V/(Ti+Nb) \le 1.00 \quad (2)$$

where Ti, Nb and V represent the content of each respective element.

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