HOT-ROLLED H-SHAPED STEEL AND PRODUCTION METHOD THEREFOR

FIELD

[0001] This application relates to the technical field of H section steel, and in particular to a hot-rolled H section steel and a production method therefor.

BACKGROUND

[0002] Currently, a hot-rolled H section steel is produced by universal rolling, and the rolling workpiece is rolled bisymmetrically (in a height and width directions) in an "H" shape at the universal rolling stage. The upper and lower horizontal rollers roll and compress the web in a thickness direction, and vertical rollers at two sides roll and compress the flanges on two sides in the thickness direction, respectively.

[0003] If the thickness or width of the flange on each side is not controlled in the rolling process, it will generate a difference between the metal mass flow of the flanges on two sides, thereby leading to different rolling extensions on two sides, and thus the rolling workpiece will inevitably bend laterally, which will affect the rolling bite of the subsequent pass. If the difference between the metal mass flows of the flanges on two sides is too large, serious lateral bending will cause rolling accidents. Therefore, for the mass-produced hot-rolled H section products, each product has same width and thickness of the flanges on two sides. However, there is a practical demand for hot-rolled H section steel with different thicknesses of flanges on two sides in different structures.

[0004] The patent document of Publication NO. CN103557426A discloses a hot-rolled H section steel with different thickness of flanges, in which the H section steel is designed in type of cogging-down pass with the thickness difference of the two flanges on two sides less than 8mm, and the difference between the compression amounts of the flanges caused by the vertical rollers on two sides is controlled to be from 4 mm to 9 mm during universal rolling, so that a hot-rolled H section steel can be produced with a ratio of thicknesses of the flanges on two sides ranging from 0.7 to 0.9, and with a thickness difference between the flange and the web ranging from 2 mm to 4 mm. The patent applies strict restrictions on the ratio of the thickness of the flanges on two sides as well as the thickness difference between the flange and the web

of the hot-rolled H section steel. If the dimension exceeds the range, serious lateral bending will occur during rolling process, or obvious flange surface waves or web surface wave defects will appear, which affects practical use. In addition, the method can only produce H450*150 series of specifications. For the larger specifications or smaller specifications, this method is not applicable because the ratio of the area of the flange and the area of the web is different from this specification.

[0005] Currently, there is no method disclosed in the prior art that is capable of producing hot-rolled H section steels of various specifications with different thicknesses of flanges on two sides.

SUMMARY

[0006] The present application is intended to solve at least one of the technical problems existing in the prior art. To this end, the present application provides a hot-rolled H section steel, with the purpose of satisfying the production requirements of different thicknesses of flanges of various specifications on two sides and also preventing lateral bending in a rolling process.

[0007] In order to achieve the above object, the present application adopts the following technical solutions. A hot-rolled H section steel includes a web, a first flange and a second flange plate, a thickness difference |T1-T2| between the first flange and the second flange is greater than 0, wherein the ratio of an area difference |S1-S2| between the first flange and the second flange to an area S1 of the first flange is not greater than 1, or the ratio of the area difference |S1-S2| between the first flange and the second flange to an area S2 of the second flange is not greater than 1.

[0008] The thickness difference |T1-T2| between the first flange and the second flange ranges from 2 mm to 40 mm.

[0009] The web has a height H ranging from 100 mm to 1250 mm.

[0010] The width B1 of the first flange and the width B2 of the second flange both range from 39 mm to 500 mm.

[0011] The thickness T1 of the first flange and the thickness T2 of the second flange both range from 7 mm to 150 mm.

[0012] The ratio of the width B1 of the first flange to the thickness T1 of the first flange is not less than 1.70.

[0013] The ratio of the width B2 of the second flange to the thickness T2 of the second flange is not less than 1.70.

[0014] The web has a thickness Tw that is not greater than the minimum value of the thickness T1 of the first flange and the thickness T2 of the second flange plate.

[0015] The present application also provides a production method for the hot-rolled H section steel including the following steps of: converter smelting, argon blowing refining, beam blank continuous casting, blank heating, blank cogging and rolling, and universal rolling. In the step of cogging and rolling, an area of the first cogging-down pass is defined as: the thickness T1 of the first flange * the width B1 of the first flange * a total compression ratio, an area of the second cogging-down pass is defined as the thickness T2 of the second flange * the width B2 of the second flange * a total compression ratio.

[0016] In the step of universal rolling, a T1/T2 value or a T2/T1 value of the two flange plates of a rolling workpiece equals to a T1/T2 value or a T2/T1 value of an H section steel finished product.

[0017] The hot-rolled H section steel of the present application can satisfy the production requirements of different thicknesses of flanges on two sides in various specifications, and can also prevent lateral bending in a rolling process, and the difference between metal mass flows of the flanges on two sides in the rolling process is controlled to be within a certain range, so that the hot-rolled H section steel with different thicknesses of the flanges on two sides is stably produced. The specifications of the produced hot-rolled H section steel products cover a wide range, which can satisfy a wide range of application requirements. Meanwhile the conventional production process of the hot-rolled H section steel can be adopted only by modifying the cogging-down pass and the cogging-down pass of edging rolling mill, and it can be stably produced by adjusting the regulation for the vertical roller in the conventional universal rolling mill.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] This description includes the following accompanying drawings, shown respectively:

[0019] FIG. 1 is a structural schematic view of the hot-rolled H section steel according to the present application.

[0020] Reference numerals are as follows:

1. first flange plate; 2. second flange plate; 3. web plate.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0021] The specific embodiments of the present application will be described in further detail by means of the description of the embodiments with reference to the accompanying drawings, with the purpose of helping those skilled in the art to have a more complete, accurate and in-depth understanding of the inventive concepts and technical solutions of the present application, and contributing to its implementation.

[0022] It should be noted that in the following embodiments, the words "first" and "second" mentioned do not represent an absolute distinction in structure and/or function, nor do they represent a sequential execution order, but are merely for the convenience of description.

[0023] As shown in FIG. 1, the present application provides a hot-rolled H section steel, which includes a web 3, a first flange1 and a second flange2, wherein a thickness difference |T1-T2| between the first flange1 and the second flange2 is greater than 0, the ratio of an area difference |S1-S2| between the first flange1 and the second flange2 to an area S1 of the first flange1 is not greater than 1, or the ratio of the area difference |S1-S2| between the first flange1 and the second flange2 to an area S2 of the second flange2 is not greater than 1. The area S1 of the first flange1 is defined as S1 = T1*B1, and the area S2 of the second flange2 is defined as S2 = T2*B2.

[0024] Specifically, as shown in FIG. 1, the web 3 is arranged between the first flange1 and the second flange2, and the web 3 is fixedly connected to the first flange1 and the second flange2. The width direction of the first flange1 is parallel to the width direction of the second flange2 and parallel to the thickness direction of the web 3. The thickness direction of the first flange1 is parallel to the thickness direction of the second flange2 and parallel to the height direction of the web 3. The thickness direction of the first flange1 is perpendicular to the width direction of the first flange1, and the thickness direction of the second flange2 is perpendicular to the width direction of the second flange2. The distance between an outer side surface of the

first flange1 and an outer side surface of the second flange2 is the height H of the web 3, the width of the first flange1 is B1, the width of the second flange2 is B2, the thickness of the first flange1 is T1, the thickness of the second flange2 is T2, and the thickness of the web 3 is Tw. The first flange1, the second flange2, and the web 3 are formed into an integral structure by hot-rolling.

[0025] Due to the difference between the metal mass flows of the flanges on two sides in the rolling process, the hot-rolled H section steel will have lateral bending, and too large lateral bending will affect rolling bite of the subsequent pass, and even an accident of steel-heaping will happen, which affects the normal production. However, a slight lateral bending is allowed.

[0026] The concept of the present application is as follows: when designing the specifications of the hot-rolled H section steel finished products, the thickness and width of the flanges on two sides are varied coordinately according to the requirements of the application in order to ensure that the area difference between the flanges on two sides is controlled to be within a certain range.

[0027] The last pass and regulation are designed based on controlling the dimensions of the flanges on two sides of the rolled part, and the difference of metal mass flow of the flanges on two sides in the rolling process is controlled within a certain range, so that the hot-rolled H section steel with different thicknesses of flanges on two sides is stably produced.

[0028] In this embodiment, the thickness difference |T1-T2| between the first flange1 and the second flange2 ranges from 2 mm to 40 mm.

[0029] In this embodiment, the web 3 has a height H ranging from 100 mm to 1250 mm.

[0030] In this embodiment, the width B1 of the first flange1 and the width B2 of the second flange2 range from 39 mm to 500 mm.

[0031] In this embodiment, the thickness T1 of the first flange1 and the thickness T2 of the second flange 2 range from 7 mm to 150 mm.

[0032] In this embodiment, the ratio B1/T1 of the width B1 of the first flange1 to the thickness T1 of the first flange1 is not less than 1.70. The ratio B2/T2 of the width B2 of the second flange2 to the thickness T2 of the second flange2 is not less than 1.70.

[0033] In this embodiment, the web 3 has a thickness Tw that is not greater than the minimum value of the thickness T1 of the first flange1 and the thickness T2 of the second flange2.

[0034] In this embodiment, the dimensions of the hot-rolled H section steel are set as follows:

[0035] if the height H of the web is less than 100 mm, the thickness of the flange is usually small. Therefore, based on the area-equivalence principle, the room for adjusting the thicknesses of the flanges on two sides is limited, and thus there will be no obvious difference in terms of cross-sectional property between the hot-rolled H section product with different thickness of the flanges on two sides and the hot-rolled H section product with same thickness of the flanges on two sides. In that case, it is unnecessary to adjust the dimensions of the flange. Therefore, the lower limit of the height H of the web is set to 100 mm. If the height H of the web is greater than 1250 mm, due to the fact that a certain amount of compression in the height direction is required in the universal rolling process, it is necessary to use an ultra-high-type blank, which cannot be obtained based on the current continuous casting device and technical level. Therefore, the upper limit of the height H of the web is set to 1250 mm;

[0036] if the width B1 or B2 of the flange is less than 39 mm, the specification has no practical application value, so the lower limit of the width of the flange is set to 39 mm. If the width B1 or B2 of the flange is greater than 500 mm, it needs to use an ultra-wide blank, which cannot be obtained based on the current of continuous casting device and technical level. Therefore, the upper limit of the width of the flange is set to 500 mm.

[0037] If the thickness T1 or T2 of the flange is less than 7 mm, the web is thinner, and its resistance to tension is reduced, and the web is susceptible to wave defects after rolling, and in that case the lower limit of the thickness of the flange is set to 7 mm. If the thickness T1 or T2 of the flange is greater than 150 mm, it needs to use an ultra-thick blank in order to ensure a certain compression ratio, which cannot be obtained based on the current of continuous casting device and technical level. Therefore, the upper limit of the thickness of the flange is set to 150 mm;

[0038] if the thickness difference |T1-T2| between the flange plates on two sides is less than 2 mm, the difference of the cross-section properties of the flange plates on two sides is small, the application performance of this type of hot-rolled H section steel is nearly the same with that of the hot-rolled H section steel with equal thickness of the flange plates on two sides, and thus it is unnecessary to adjust the dimensions of the flange from the economic point of view, and the lower limit of the thickness difference between the flange plates on two sides is set to 2 mm. If the thickness difference |T1-T2| between the flange plates on two sides is greater than

40 mm, the amounts of compression by the vertical rollers on two sides at the universal rolling stage are quite different during the rolling process, which affects the stability of the rolling mill, the width difference between the flange plates on two sides increases, and the modification amount of the universal cogging-down pass and the edge rolling mill cogging-down pass is significantly large, which affects the economy. Therefore, the upper limit of the thickness difference between the flange plates on two sides is set to 40mm.

[0039] If the ratio |T1*B1-T2*B2|/T1*B1 or |T1*B1-T2*B2|/T2*B2 of the area difference between the two flange plates to the area of the flange on one side is greater than 1.00%, due to the difference of metal mass flow of the flanges on two sides exceeds a certain limit, the rolled part will form lateral bending that exceeds the allowable value for normal rolling bite, thereby affecting the surface quality and even affecting the production. Therefore, the lower limit of the ratio of the area difference between the two flange plates to the area of the flange on one side is set to 1.00%.

[0040] If the ratio B1/T1 or B2/T2 of the width to the thickness of the flange on the same side is less than 1.70, the flange deformation zone is concentrated on the side that is in contact with the vertical roller in the universal rolling process, and the deformation penetration of the flange on the thicker side is restricted, resulting in a sharp drop in terms of the final mechanical properties of the flange on this side and affecting the practical application of the product. Therefore, the lower limit of the ratio of the width to the thickness of the flange on one side is set to 1.70.

[0041] If the web thickness Tw is greater than the T1 or T2, the deformation of the web and the flange may not be in coordination with each other during universal rolling, which will easily lead to poor rolling bite and in turn affects the surface quality. In addition, the specification required in practical application is that the thickness of the web is not greater than the thickness of the flange plate. Therefore, the thickness Tw of the web is set to be not greater than the minimum value of T1 and T2.

[0042] The present application also provides a production method for the hot-rolled H section steel, which includes the following steps: converter smelting, argon blowing refining, beam blank continuous casting, blank heating, blank cogging and rolling, universal rolling and air cooling. In the step of cogging and rolling, an area of the first cogging-down pass of the cogging rolling mill is defined as: the thickness T1 of the first flange1 * the width B1 of the first flange1

of the finished product of the H section steel * a total compression ratio. An area of the second cogging-down pass of the cogging rolling mill is defined as: the thickness T2 of the second flange 2 of the finished product of the H section steel * the width B2 of the second flange 2 of the finished product of the H section steel * a total compression ratio. The rolling workpiece has an H section structure, and the rolling workpiece includes a web and two flange plates, the web is located between the two flange plates, and the web is fixedly connected to the two flange plates. In the rolling process, a beam blank is used for rolling, and the dimensions of the flanges on two sides of the cogging-down pass are designed based on the dimensions of the flanges on two sides of the finished product, and the two flange plates of the rolling workpiece are brought into the first cogging-down pass and the second cogging-down pass, respectively.

[0043] If the above method is not used in the dimension design of the flanges on two side of cogging-down pass, the areas of the flanges on two sides of the cogging-down pass are different, and thus a lateral bending will occur after one pass in cogging rolling, and the next pass will not be able to directly bite into the cogging-down pass. Due to the rolling action of the rollers on the metal on the inner side of the flanges, the amount of metal flowing into the web plates from the flanges on two sides of is different, which will result in pulling or folding defects. In addition, the cross-sectional areas of the flanges on two sides are increased, so that the difference between the metal flows of the flanges on two sides is increase, and when the amount of lateral bending will be accumulated to a certain extent, the stability of the production will be affected.

[0044] The production method for the hot-rolled H section steel according to the present application may further comprise the following steps of: hot metal pre-treatment, furnace external refining and vacuum refining. The hot metal pre-treatment step is provided before the converter smelting step, and the furnace external refining step is provided between the argon blowing refining step and the vacuum refining step, and the vacuum refining step is provided between the furnace external refining step and the beam blank continuous casting step. The steps of hot metal pre-treatment, furnace external refining and vacuum refining may be selected according to different requirements for the mechanical properties and service performance of the finished product, and the remaining steps are necessary for the production method for the hot-rolled H section steel.

[0045] In the universal rolling step, the cogging-down pass should be set by an edge rolling

mill according to the height of the flanges on two sides of the finished product and said edge rolling mill should be involved in the whole rolling process so as to ensure the stability of the height of the flanges on two sides. Furthermore, in the step of universal rolling, the T1/T2 value or T2/T1 value of the two flange plates of the rolling workpiece should be the same with that of the H section steel finished product, which are selected according to the corresponding relationship between the flanges of the rolling workpiece and the finished product, and the rest of the design of the specification can be made in accordance with the conventional method.

[0046] If the edge rolling mill is not involved in the rolling of a certain pass, or does not modify the cogging-down pass in the universal rolling stage, a height difference between the flanges on two sides of the rolling workpiece in this pass will change. Rolling according to the regulation for setting the thickness of the flanges will lead to the difference between metal mass flows of the flanges on two sides exceeding the limited value, causing the lateral bending of the rolling workpiece. The thicker the flanges are, the more serious the problem will be.

[0047] Similarly, if the above method is not used to set the thickness of the flanges on two sides of the rolling workpiece in each pass at the universal rolling stage, it will lead to an excessive difference between metal mass flows of the rolling workpiece on both sides, causing the lateral bending of the rolling workpiece.

[0048] Example 1

[0049] As shown in Table 1, the height H of the web is 102 mm, the width B1 of the first flange1 is 50 mm, the width B2 of the second flange2 is 39 mm, the thickness T1 of the first flange1 is 7 mm, the thickness T2 of the second flange2 is 9 mm, the thickness Tw of the web is 5 mm, |T1 -T2| = 2 mm, and the maximum value between |T1*B1 -T2*B2|/T1*B1 and |T1 *B1-T2*B2|/T2*B2 is 0.29%.

[0050] Example 2

[0051] As shown in Table 1, the height H of the web is 104 mm, the width B1 of the first flange1 is 50 mm, the width B2 of the second flange2 is 32 mm, the thickness T1 of the first flange1 is 7 mm, the thickness T2 of the second flange2 is 11 mm, the thickness Tw of the web is 5 mm, |T1 - T2| = 4 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.57%.

[0052] Example 3

[0053] As shown in Table 1, the height H of the web is 106 mm, the width B1 of the first flange1 is 50 mm, the width B2 of the second flange2 is 27 mm, the thickness T1 of the first flange1 is 7 mm, the thickness T2 of the second flange2 is 13 mm, the thickness Tw of the web is 5 mm, |T1 - T2| = 6 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.29%.

[0054] Example 4

[0055] As shown in Table 1, the height H of the web is 605 mm, the width B1 of the first flange1 is 200 mm, the width B2 of the second flange2 is 155 mm, the thickness T1 of the first flange1 is 17 mm, the thickness T2 of the second flange2 is 22 mm, the thickness Tw of the web is 11 mm, |T1 - T2| = 5 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.29%.

[0056] Example 5

[0057] As shown in Table 1, the height H of the web is 610 mm, the width B1 of the first flange1 is 200 mm, the width B2 of the second flange2 is 126 mm, the thickness T1 of the first flange1 is 17 mm, the thickness T2 of the second flange2 is 27 mm, the thickness Tw of the web is 11 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.06%.

[0058] Example 6

[0059] As shown in Table 1, the height H of the web is 615 mm, the width B1 of the first flange1 is 200 mm, the width B2 of the second flange2 is 106 mm, the thickness T1 of the first flange1 is 17 mm, the thickness T2 of the second flange2 is 32 mm, the thickness Tw of the web is 11 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.24%.

[0060] Example 7

[0061] As shown in Table 1, the height H of the web is 805 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 252 mm, the thickness T1 of the first flange1 is 26 mm, the thickness T2 of the second flange2 is 31 mm, the thickness Tw of the web is 14 mm, |T1 - T2| = 5 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.15%.

[0062] Example 8

[0063] As shown in Table 1, the height H of the web is 810 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 217 mm, the thickness T1 of the first flange1 is 26 mm, the thickness T2 of the second flange2 is 36 mm, the thickness Tw of the web is 14 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.15%.

[0064] Example 9

[0065] As shown in Table 1, the height H of the web is 815 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 190 mm, the thickness T1 of the first flange1 is 26 mm, the thickness T2 of the second flange2 is 41 mm, the thickness Tw of the web is 14 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.13%.

[0066] Example 10

[0067] As shown in Table 1, the height H of the web is 1005 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 263 mm, the thickness T1 of the first flange1 is 36 mm, the thickness T2 of the second flange2 is 41 mm, the thickness Tw of the web is 19 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.16%.

[0068] Example 11

[0069] As shown in Table 1, the height H of the web is 1010 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 235 mm, the thickness T1 of the first flange1 is 36 mm, the thickness T2 of the second flange2 is 46 mm, and the thickness Tw of the web is 19 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.09%.

[0070] Example 12

[0071] As shown in Table 1, the height H of the web is 1015 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 212 mm, the thickness T1 of the first flange1 is 36 mm, the thickness T2 of the second flange2 is 51 mm, the thickness Tw of the web is 19 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.11%.

[0072] Example 13

[0073] As shown in Table1, the height H of the web is 1215 mm, the width B1 of the first flange1 is 422 mm, the width B2 of the second flange2 is 397 mm, the thickness T1 of the first flange1 is 80 mm, the thickness T2 of the second flange2 is 85 mm, the thickness Tw of the web is 40 mm, |T1 - T2| = 5 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.04%.

[0074] Example 14

[0075] As shown in Table 1, the height H of the web is 1225 mm, the width B1 of the first flange1 is 422 mm, the width B2 of the second flange2 is 355 mm, the thickness T1 of the first flange1 is 80 mm, the thickness T2 of the second flange2 is 95 mm, the thickness Tw of the web is 40 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.10%.

[0076] Example 15

[0077] As shown in Table 1, the height H of the web is 1235 mm, the width B1 of the first flange1 is 422 mm, the width B2 of the second flange2 is 321 mm, the thickness T1 of the first flange1 is 80 mm, the thickness T2 of the second flange2 is 105 mm, the thickness Tw of the web is 40 mm, |T1 - T2| = 25 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.16%.

[0078] Example 16

[0079] As shown in Table 1, the height H of the web is 102 mm, the width B1 of the first flange1 is 100 mm, the width B2 of the second flange2 is 80 mm, the thickness T1 of the first flange1 is 8 mm, the thickness T2 of the second flange2 is 10 mm, the thickness Tw of the web is 6 mm, |T1 - T2| = 2 mm, |T1*B1 - T2*B2|/T1* B1 and |T1*B1 - T2*B2|/T2*B2 both are 0.

[0080] Example 17

[0081] As shown in Table 1, the height H of the web is 105 mm, the width B1 of the first flange1 is 100 mm, the width B2 of the second flange2 is 62 mm, the thickness T1 of the first flange1 is 8 mm, the thickness T2 of the second flange2 is 13 mm, the thickness Tw of the web is 6 mm, |T1 - T2| = 5 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.75%.

[0082] Example 18

[0083] As shown in Table 1, the height H of the web is 111 mm, the width B1 of the first flange1 is 100 mm, the width B2 of the second flange2 is 42 mm, the thickness T1 of the first flange1 is 8 mm, the thickness T2 of the second flange2 is 19 mm, the thickness Tw of the web is 6 mm, |T1 - T2| = 11 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.25%.

[0084] Example 19

[0085] As shown in Table 1, the height H of the web is 305 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 225 mm, the thickness T1 of the first flange1 is 15 mm, the thickness T2 of the second flange2 is 20 mm, the thickness Tw of the web is 10 mm, |T1 - T2| = 5 mm, |T1*B1 - T2*B2|/ T1*B1 and |T1*B1 - T2*B2|/T2*B2 both are 0.

[0086] Example 20

[0087] As shown in Table 1, the height H of the web is 310 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 180 mm, the thickness T1 of the first flange1 is 15 mm, the thickness T2 of the second flange2 is 25 mm, the thickness Tw of the web is 10 mm, |T1 - T2| = 10 mm, |T1*B1 - T2*B2|/ T1*B1 and |T1*B1 - T2*B2|/T2*B2 both are 0.

[0088] Example 21

[0089] As shown in Table 1, the height H of the web is 315 mm, the width B1 of the first flange1 is 300 mm, the width B2 of the second flange2 is 150 mm, the thickness T1 of the first flange1 is 15 mm, the thickness T2 of the second flange2 is 30 mm, the thickness Tw of the web is 30 mm, |T1 - T2| = 15 mm, |T1*B1 - T2*B2|/ T1*B1 and |T1*B1 - T2*B2|/T2*B2 both are 0.

[0090] Example 22

[0091] As shown in Table 1, the height H of the web is 521 mm, the width B1 of the first flange1 is 500 mm, the width B2 of the second flange2 is 432 mm, the thickness T1 of the first flange1 is 32 mm, the thickness T2 of the second flange2 is 37 mm, and the thickness Tw of the web is 20 mm, |T1 - T2| = 5 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.10%.

[0092] Example 23

[0093] As shown in Table 1, the height H of the web is 526 mm, the width B1 of the first flange1 is 500 mm, the width B2 of the second flange2 is 381 mm, the thickness T1 of the first flange1 is 32 mm, the thickness T2 of the second flange2 is 42 mm, the thickness Tw of the web is 20 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.01%.

[0094] Example 24

[0095] As shown in Table 1, the height H of the web is 531 mm, the width B1 of the first flange1 is 500 mm, the width B2 of the second flange2 is 340 mm, the thickness T1 of the first flange1 is 32 mm, the thickness T2 of the second flange2 is 47 mm, the thickness Tw of the web is 20 mm, |T1 - T2| = 15 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.03%.

[0096] Example 25

[0097] As shown in Table 1, the height H of the web is 575 mm, the width B1 of the first flange1 is 374 mm, the width B2 of the second flange2 is 343 mm, the thickness T1 of the first flange1 is 110 mm, the thickness T2 of the second flange2 is 120 mm, the thickness Tw of the web is 70 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.05%.

[0098] Example 26

[0099] As shown in Table 1, the height H of the web is 585 mm, the width B1 of the first flange1 is 374 mm, the width B2 of the second flange2 is 316 mm, the thickness T1 of the first flange1 is 110 mm, the thickness T2 of the second flange2 is 130 mm, the thickness Tw of the web is 70 mm, |T1 - T2| = 20 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.15%.

[00100] Example 27

[00101] As shown in Table 1, the height H of the web is 605 mm, the width B1 of the first flange1 is 374 mm, the width B2 of the second flange2 is 274 mm, the thickness T1 of the first flange1 is 110 mm, the thickness T2 of the second flange2 is 150 mm, the thickness Tw of the web is 70 mm, |T1 - T2| = 40 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.10%.

[00102] Example 28

[00103] As shown in Table 1, the height H of the web is 983 mm, the width B1 of the first flange1 is 470 mm, the width B2 of the second flange2 is 422 mm, the thickness T1 of the first flange1 is 88 mm, the thickness T2 of the second flange2 is 98 mm, the thickness Tw of the web is 50 mm, |T1 - T2| = 10 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.01%.

[00104] Example 29

[00105] As shown in Table 1, the height H of the web is 993 mm, the width B1 of the first flange1 is 470 mm, the width B2 of the second flange2 is 382 mm, the thickness T1 of the first flange1 is 88 mm, the thickness T2 of the second flange2 is 108 mm, the thickness Tw of the web is 50 mm, |T1 - T2| = 20 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.25%.

[00106] Example 30

[00107] As shown in Table 1, the height H of the web is 1003 mm, the width B1 of the first flange1 is 470 mm, the width B2 of the second flange2 is 350 mm, the thickness T1 of the first flange1 is 88 mm, the thickness T2 of the second flange2 is 118 mm, the thickness Tw of the web is 50 mm, |T1 - T2| = 30 mm, and the maximum value between |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2 is 0.15%.

Table 1 Examples

Examples	Sectional Dimensions (mm)						Min Value of B1/T1 and B2/T2	|T1 - T2|	Max Value of |T1*B1 - T2*B2|/T1*B1 and |T1*B1 - T2*B2|/T2*B2
	H	B1	B2	T1	T2	Tw			
1	102	50	39	7	9	5	4. 33	2	0. 29%
2	104	50	32	7	11	5	2.91	4	0. 57%
3	106	50	27	7	13	5	2. 08	6	0. 29%
4	605	200	155	17	22	11	7. 05	5	0. 29%
5	610	200	126	17	27	11	4. 67	10	0. 06%
6	615	200	106	17	32	11	3.31	15	0. 24%
7	805	300	252	26	31	14	8.13	5	0. 15%
8	810	300	217	26	36	14	6. 03	10	0. 15%
9	815	300	190	26	41	14	4. 63	15	0. 13%
10	1005	300	263	36	41	19	6.41	5	0. 16%
11	1010	300	235	36	46	19	5.11	10	0. 09%
12	1015	300	212	36	51	19	4.16	15	0. 11%
13	1215	422	397	80	85	40	4. 67	5	0. 04%
14	1225	422	355	80	95	40	3. 74	15	0. 10%
15	1235	422	321	80	105	40	3. 06	25	0. 16%
16	102	100	80	8	10	6	8. 00	2	0. 00%
17	105	100	62	8	13	6	4. 77	5	0. 75%
18	111	100	42	8	19	6	2.21	11	0. 25%
19	305	300	225	15	20	10	11.25	5	0. 00%
20	310	300	180	15	25	10	7. 20	10	0. 00%
21	315	300	150	15	30	10	5. 00	15	0. 00%
22	521	500	432	32	37	20	11.68	5	0. 10%
23	526	500	381	32	42	20	9. 07	10	0.01%
24	531	500	340	32	47	20	7. 23	15	0. 13%
25	575	374	343	110	120	70	2. 86	10	0. 05%
26	585	374	316	110	130	70	2. 43	20	0. 15%
27	605	374	274	110	150	70	1.83	40	0. 10%
28	983	470	422	88	98	50	4.31	10	0.01%
29	993	470	382	88	108	50	3. 54	20	0. 25%
30	1003	470	350	88	118	50	2. 97	30	0. 15%
Range	100～1250	39～500	39～500	7～150	7～150	-	⩾ 1.70	2～40	⩽1.00%

[00108] The application is exemplarily described above in conjunction with the accompanying drawings. Obviously, the specific implementation of the present application is not limited by the manner described above. As long as various non-substantial improvements are made by adopting the method concepts and technical solutions of the present application; or if the above concepts and technical solutions of the present application are directly applied to other fields without improvement, they are all within the scope of protection of the present application.

CLAIMS

1. A hot-rolled H section steel, comprising a web plate, a first flange and a second flange plate, wherein a thickness difference |T1-T2| between the first flange and the second flange is greater than 0,

wherein a ratio of an area difference |S1-S2| between the first flange and the second flange to an area S1 of the first flange is not greater than 1, or a ratio of the area difference |S1-S2| between the first flange and the second flange to an area S2 of the second flange is not greater than 1.

2. The hot-rolled H section steel according to claim 1, wherein a thickness difference |T1-T2| between the first flange and the second flange ranges from 2 mm to 40 mm.

3. The hot-rolled H section steel according to claim 1, wherein the web has a height H ranging from 100 mm to 1250 mm.

4. The hot-rolled H section steel according to claim 1, wherein a width B1 of the first flange and a width B2 of the second flange both range from 39 mm to 500 mm.

5. The hot-rolled H section steel according to claim 1, wherein a thickness T1 of the first flange and a thickness T2 of the second flange both range from 7 mm to 150 mm.

6. The hot-rolled H section steel according to any one of claims 1 to 5, wherein a ratio of the width B1 of the first flange to the thickness T1 of the first flange is not less than 1.70.

7. The hot-rolled H section steel according to any one of claims 1 to 6, wherein a ratio of the width B2 of the second flange to the thickness T2 of the second flange is not less than 1.70.

8. The hot-rolled H section according to any one of claims 1 to 7, wherein the web has a thickness Tw that is not greater than the minimum value between the thickness T1 of the first flange and the thickness T2 of the second flange plate.

9. A production method for the hot-rolled H section steel according to any one of claims 1 to 8, comprising the steps of:

converter smelting;

argon blowing refining;

beam blank continuous casting;

blank heating;

blank cogging and rolling; and

universal rolling,

wherein in the step of blank cogging and rolling, an area of a first cogging-down pass is defined as：the thickness T1 of the first flange * the width B1 of the first flange * a total compression ratio, and an area of a second cogging-down pass is defined as：the thickness T2 of the second flange * the width B2 of the second flange * a total compression ratio.

10. The production method for the hot-rolled H section steel according to claims 9, wherein, in the step of universal rolling, a T1/T2 value or a T2/T1 value of a first flange and a second flange of a rolling workpiece equals to a T1/T2 value or a T2/T1 value of an H section steel finished product.