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(57) **ABSTRACT**

The invention relates to a condenser in stacked-plate design, wherein a heat exchanger block is formed by a plurality of plate elements, which form channels adjacent to each other between the plate elements when the plate elements are stacked on top of each other, wherein a first number of the channels is associated with a first flow channel and a second number of the channels is associated with a second flow channel, and a refrigerant can flow through the first flow channel and a coolant can flow through the second flow channel, wherein the first flow channel has a first region for desuperheating and condensing the vaporous refrigerant and a second region for subcooling the condensed refrigerant.

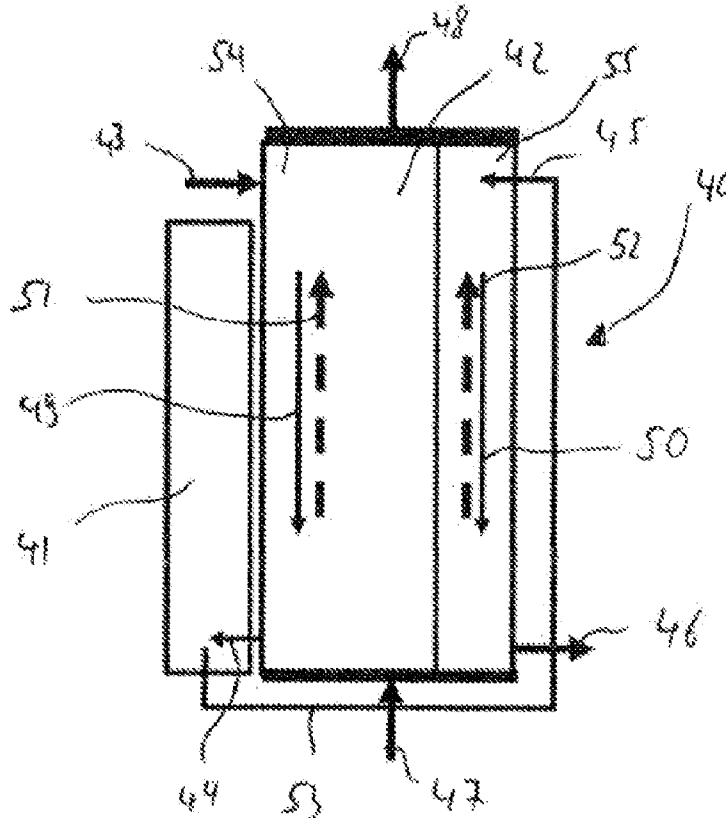


Fig. 1

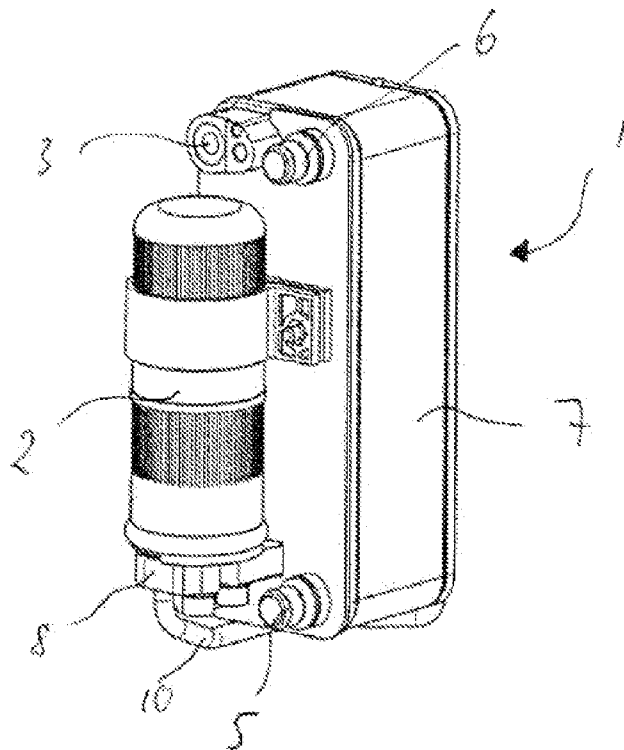


Fig. 2

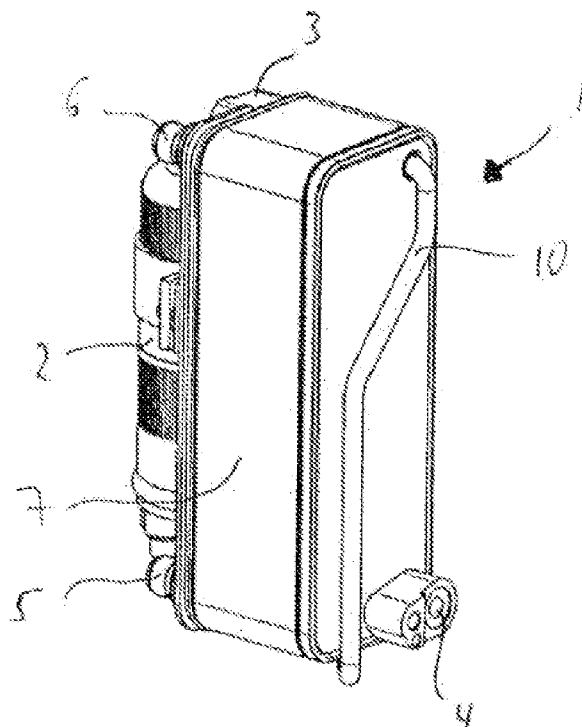


Fig. 3

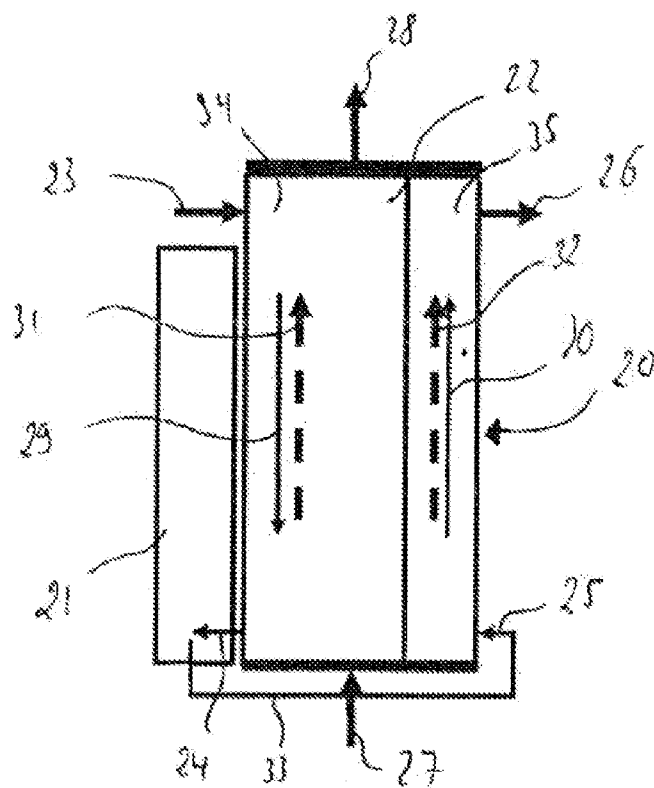
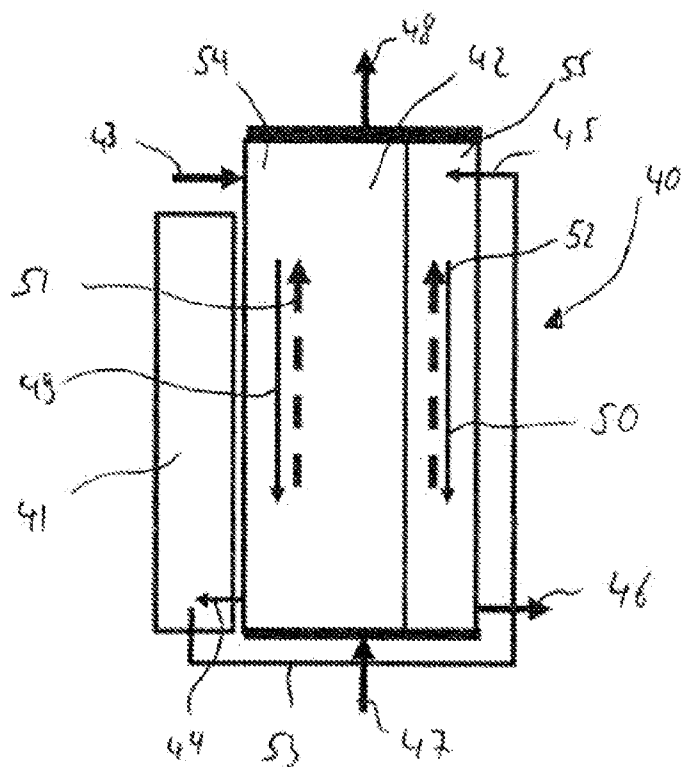


Fig. 4



CONDENSER

TECHNICAL FIELD

[0001] The invention relates to a condenser in stacked-plate construction, wherein a heat exchanger block is formed of a plurality of plate elements, which, stacked one on top of another, form mutually adjacent channels between the plate elements, wherein a first number of the channels is assigned to a first flow channel and a second number of the channels is assigned to a second flow channel, and a refrigerant is flowable through the first flow channel and a coolant is flowable through the second flow channel, wherein the first flow channel has a first region for the desuperheating and condensation of the vaporous refrigerant and a second region for the supercooling of the condensed refrigerant.

PRIOR ART

[0002] In refrigerant circuits of air conditioning systems for motor vehicles, condensers are used to cool the refrigerant to the condensation temperature and subsequently condense the refrigerant. Condensers regularly have a receiver in which a refrigerant volume is held to compensate volume fluctuations in the refrigerant circuit. Moreover, as a result of the holding of the refrigerant in the receiver, a stable supercooling of the refrigerant is achieved.

[0003] Often, additional means for drying and/or filtering the refrigerant are provided in the receiver. The receiver is generally disposed on the condenser. It is flowed through by the refrigerant, which has already flowed through a portion of the condenser. After having flowed through the receiver, the refrigerant is led back into the condenser and supercooled in a supercooling section to below the condensation temperature.

[0004] In conventional condensers in fin-tube construction, the refrigerant for these is led out of the condenser from one of the collecting tubes disposed at the side of a tube-fin block, and led into the receiver.

[0005] In condensers which are built in stacked-plate construction, possibilities for adding the receiver to the condenser as an additional layer of plate elements are known in the prior art.

[0006] It is additionally known to lead the refrigerant via a special distributor plate out of the condenser built in stacked-plate construction and feed it to an external receiver, and to return the refrigerant after the receiver back into the condenser.

[0007] Furthermore, US 20090071189 A1 discloses a condenser in stacked-plate construction, in which a first stack of plate elements constitutes a first cooling and condensation region and a second stack of plate elements constitutes a supercooling region. The first stack is separated from the second stack by a housing, which contains a receiver and a dryer.

[0008] A drawback with the devices of the prior art is that the integration of condensers in stacked-plate construction, receivers and supercoolers is hitherto achieved in a very elaborate manner. In addition to a complex structure, the condensers from the prior art are distinguished by an elevated production complexity. This gives rise to additional costs in terms of using the condensers, which make their use unattractive.

REPRESENTATION OF THE INVENTION, OBJECT, ACHIEVEMENT, ADVANTAGES

[0009] The object of the present invention is therefore to provide a condenser which is suitable for condensing a refrigerant, supplying it and, furthermore, supercooling it, wherein the condenser is characterized by a simple structure and a compact construction and is economical to produce.

[0010] The object of the present invention is achieved by a condenser in stacked-plate construction having the features of claim 1.

[0011] An illustrative embodiment of invention relates to a condenser in stacked-plate construction, wherein a heat exchanger block is formed of a plurality of plate elements, which, stacked one on top of another, form mutually adjacent channels between the plate elements, wherein a first number of the channels is assigned to a first flow channel and a second number of the channels is assigned to a second flow channel, and a refrigerant is flowable through the first flow channel and a coolant is flowable through the second flow channel, wherein the first flow channel has a first region for the desuperheating and condensation of the vaporous refrigerant and a second region for the supercooling of the condensed refrigerant, wherein at least a portion of the first flow channel is in thermal contact with at least a portion of the second flow channel, and the first region has a first fluid supply line and a first fluid discharge line and the second region has a second fluid supply line and a second fluid discharge line, wherein the condenser has a receiver for storing the refrigerant, and a refrigerant crossover from the first region into the second region leads through the receiver, wherein the receiver is in fluid communication with the first region via the first fluid discharge line, which also forms the fluid inlet of the receiver, and is in fluid communication with the second region via the second fluid supply line, which also forms the fluid outlet of the receiver, wherein the receiver is disposed on an outer surface of the condenser.

[0012] A condenser in stacked-plate construction is particularly compact and can therefore also be accommodated on a small installation space. A good thermal contact between the first flow channel and the second flow channel is particularly advantageous in order that the heat transfer between the fluids is as efficient as possible. The arrangement of the receiver as close as possible to the condenser or on the heat exchanger block of the condenser has the advantage that only short distances have to be negotiated by means of fluid lines. The thermal deficiencies, such as, for instance, the heating of the coolant or refrigerant by surrounding heat sources, as well as the negative effects on the pressure loss inside the condenser, can therefore be minimized.

[0013] In addition, it can be advantageous if the coolant in the second flow channel and the refrigerant in the first flow channel are flowable in cocurrent flow to each other and/or in countercurrent flow to each other.

[0014] A flowing of the coolant and of the refrigerant in countercurrent flow allows the maximally transferable heat quantity to be increased, which helps to boost the efficiency of the condenser. On the other hand, a flowing in cocurrent flow can be realized particularly easily.

[0015] It can also be expedient if the first fluid discharge line and/or the fluid supply line are/is disposed inside and/or outside the heat exchanger block.

[0016] Depending on the position of the receiver, it is expedient if the first fluid discharge line, which also simultaneously constitutes the supply line to the receiver, and the

second fluid supply line, which also simultaneously constitutes the discharge line from the receiver, run inside or outside the condenser. The running of the lines outside the condenser is easier to realize, since the installation space is less heavily restricted and the shaping limits of the individual plate elements do not have to be taken into account.

[0017] In advantageous embodiments, the lines can also run disposed on the outer plate elements. This can be done, for example, through channels integrated in the plate elements.

[0018] In addition, it can be particularly advantageous if the first fluid discharge line and/or the second fluid supply line are/is formed by a pipeline.

[0019] A pipeline offers the advantage of very great freedom of design for the routing and arrangement of the line. As a result of pipelines, even complex line routings can be realized.

[0020] It is also preferable if the first fluid supply line and the second fluid supply line, viewed along the principal direction of flow through a channel between the plate elements, are disposed at the same end region of the condenser, wherein the first fluid discharge line and the second fluid discharge line are disposed at the opposite end region of the condenser.

[0021] As a result of an arrangement of the first and the second fluid supply line at a common end region of the condenser and of the first and the second fluid discharge line at the opposite end region of the condenser, a guidance of the fluid flows in countercurrent flow inside the condenser can be realized in a particularly simple manner.

[0022] In a particularly favorable embodiment of the invention, it is provided, moreover, that the first fluid supply line and the second fluid supply line are disposed, in the final assembly position of the condenser, at the upper end region of the condenser.

[0023] The feeding of the fluid at the, in the final assembly position, upper end region of the condenser is particularly advantageous, since, in this way, the flow inside the condenser is additionally supported by the weight force of the fluid. In addition, the generated pressure loss inside the condenser is less than if the fluid has to be transported upward counter to the weight force.

[0024] In an alternative embodiment of the invention, it can be provided that the internal volume share of the second region of the first flow channel represents maximally about 40%, here preferably about 20%, here preferably between about 5% and about 15% of the internal total volume of the first flow channel.

[0025] Thermally, is advantageous if the supercooling section, which corresponds to the second region of the first flow channel, takes up as large a volume share as possible of the total volume of the first flow channel, since the fluid temperature at the condenser outlet can thereby be kept particularly low. This can lead to an improvement in the system performance.

[0026] However, as a result of the reduction of the heat transmission surface in the condensation region, which corresponds to the first region of the first flow channel, the heat transmission is worsened. This impacts negatively on the pressure on the high pressure side of the refrigerant circuit, which, all in all, leads to a poorer system performance.

[0027] A limitation of the supercooling section to the above-stated volume shares is therefore advantageous with a view to the efficiency of the condenser.

[0028] Furthermore, it is preferable if the coolant supply line and the coolant discharge line of the second flow channel,

viewed along the direction of flow through a channel between the plate elements, are disposed at opposite end regions of the condenser.

[0029] The arrangement of the coolant supply line and of the coolant discharge line at opposite end regions of the condenser is particularly advantageous if the coolant is intended to flow through the condenser without substantial diversion.

[0030] According to a particularly preferred refinement of the invention, it can be provided that the first region and/or the second region of the first flow channel inside the condenser are/is diverted one or more times in their/its principal direction of flow.

[0031] Through a single or multiple diversion of the flow direction, the effect can be achieved that the refrigerant and the coolant flow either in cocurrent flow or in countercurrent flow to each other. The heat transfer between coolant and refrigerant can thereby be influenced.

[0032] Moreover, it can be advantageous if the second flow channel inside the condenser is diverted at least once in its principal direction of flow through around 180°.

[0033] A diversion of the second flow channel can be advantageous in order to bring the flowing coolant into cocurrent flow or countercurrent flow with the refrigerant. The heat transfer between refrigerant and coolant can be influenced by a diversion of the second flow channel.

[0034] A further preferred illustrative embodiment is characterized in that the second flow channel is diverted once in its principal direction of flow through around 180°, whereby a forward flow region and a return flow region are formed, wherein the internal volume of the forward flow region of the second flow channel and the internal volume of the return flow region of the second flow channel are approximately equal in size and/or unequal in size.

[0035] The forward flow region of the second flow channel and the return flow region can advantageously be approximately equal in size in terms of their volume. This is particularly advantageous, in particular with respect to the generated pressure losses.

[0036] Where the separation into forward flow region and return flow region is geared to the division into condensation region and supercooling region, an unequal distribution can also, however, be advantageous.

[0037] It is additionally advantageous if the coolant flows through the second flow channel in such a way that, along the principal direction of flow through the second flow channel, it first enters into thermal contact with the second region of the first flow channel or it first enters into thermal contact with the second region and at least a portion of the first region of the first flow channel and, respectively after the diversion, enters substantially into thermal contact with the first region of the first flow channel.

[0038] An influx of the coolant such that essentially a thermal contact first takes place between the second region of the second flow channel and the coolant allows the output temperature of the refrigerant from the condenser to be effectively reduced. The coolant which flows freshly into the condenser has its lowest temperature directly at the fluid inlet. As a result, the heat transfer is particularly high. In order to avoid an unnecessarily high pressure loss due to the unequal volume shares between the first region and the second region of the first flow channel for the coolant, the coolant, in addition to the thermal contact with the second region, can also be brought into thermal contact with a portion of the first region

of the first flow channel. In this way, the forward flow section and the return flow section of the coolant are designed such that an approximately equal internal volume is present, whereby the internal pressure loss is reduced.

[0039] Furthermore, it is expedient if a thermal separation is present between the first region for the desuperheating and condensation of the vaporous refrigerant and the second region for the supercooling of the condensed refrigerant.

[0040] As a result of a thermal separation between the condensation region and the supercooling region of the condenser, a thermal interaction between the fluids in the supercooling region and in the condensation region can be achieved. In particular, a renewed warming of the refrigerant can be avoided, which can end up boosting the system performance of the condenser.

[0041] In an alternative embodiment of the invention, it can be provided that the thermal separation is configured as a thermally insulating plate, as an air gap, as an air-conducting channel, as a part of the second flow channel having a multiple coolant path and/or as a part of the second flow channel having a larger flow cross-sectional area than the rest of the second flow channel.

[0042] Advantageously, the thermal separation can be realized by one of the plate elements of the condenser, whereby the design complexity is kept to a minimum. On the other hand, specially produced plate elements can lead to a stronger thermal separation.

[0043] Advantageous refinements of the present invention are described in the subclaims and the following description of the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] The invention is explained in detail on the basis of illustrative embodiments with reference to the drawings, wherein:

[0045] FIG. 1 shows a perspective view of a condenser in stacked-plate arrangement, having a receiver disposed on the outside of the housing,

[0046] FIG. 2 shows a further view of the condenser of FIG. 1, wherein particularly the line from the receiver to the rear side of the condenser and the discharge line of the refrigerant from the condenser can be seen,

[0047] FIG. 3 shows a schematic representation of a condenser in stacked-plate construction having an externally arranged receiver, wherein the coolant and the refrigerant flow in countercurrent flow to each other in the condensation region and in cocurrent flow to each other in the supercooling region,

[0048] FIG. 4 shows a further schematic view of a condenser, wherein the coolant and the refrigerant flow in countercurrent flow to each other both in the condensation region and in the supercooling region,

[0049] FIG. 5 shows a further schematic view of a condenser, wherein the coolant is diverted inside the condenser and, as a result, inside the condenser are formed regions in which the coolant and the refrigerant flow both in cocurrent flow and in countercurrent flow to each other, wherein the refrigerant is transported through the supercooling region out of the condensation region into the receiver, and

[0050] FIG. 6 shows a further schematic view of a condenser, wherein a thermal separation is introduced between the condensation region and the supercooling region by a double coolant path.

PREFERRED EMBODIMENT OF THE INVENTION

[0051] FIG. 1 shows a perspective view of a condenser 1 in stacked-plate construction. The condenser 1 here consists of a plurality of individual plate elements, which, stacked one on top of another, form the heat exchanger block 7. The heat exchanger block 7 is designed in its interior such that a plurality of channels are created between the individual plate elements. A number of these channels is assigned to a first channel, which can be flowed through by a refrigerant. A further number of the channels is assigned to a second flow channel, which can be flowed through by a coolant. Inside the heat exchanger block 7, the first flow channel is at least partially in thermal contact with the second flow channel, so that a heat transfer can take place between the first flow channel and the second flow channel.

[0052] By using various embodiments of the plate elements, the effect can be achieved that, inside the heat exchanger block 7, a plurality of flow paths for the first and second flow channel respectively are formed. The fluid flowing through the first flow channel and second flow channel respectively can be diverted through the different flow paths inside the heat exchanger block 7 and can thus in total cover a longer flow path inside the condenser 1.

[0053] On an outer surface of the heat exchanger block 7 is disposed a receiver 2. This receiver serves to supply the refrigerant which flows along the first flow channel. By means of the receiver 2, a volume fluctuation of the refrigerant inside the condenser and the rest of the refrigerant circuit can be compensated. In advantageous embodiments, the receiver 2 can have means for drying and filtering the refrigerant.

[0054] The receiver 2 shown in FIG. 1 has a cylindrical housing and is disposed on the outer side of the heat exchanger block 7. In alternative embodiments, the receiver 2 can also have other configurations. The representation of the receiver 2 is exemplary.

[0055] The receiver 2 is connected by receiver connections 8 to the first flow channel inside the condenser 1 and is in fluid communication therewith.

[0056] Furthermore, the condenser 1 has a refrigerant inlet 3 at its upper left-hand end region. At the upper right-hand end region, the condenser 1 has a coolant outlet 6. At the lower right-hand end region, the condenser 1 has a coolant inlet 5.

[0057] A refrigerant can in this way flow is the refrigerant inlet 3 into the first flow channel of the heat exchanger block 7 and be distributed through the channels which are assigned to the first flow channel. From the first flow channel 1, the refrigerant then flows via the receiver connections 8 into the receiver 2. From the receiver 2, the refrigerant flows back into the heat exchanger block 7 and is distributed onward through the first flow channel of the heat exchanger block 7. Finally, the refrigerant flows via the refrigerant outlet 4, which is disposed on the rear side (facing away from the viewer) of the condenser 1, out of the heat exchanger block 7 of the condenser 1.

[0058] The coolant flows through the coolant inlet 5 into the second flow channel of the heat exchanger block 7 and is distributed along this flow channel in the heat exchanger block and eventually flows out of the condenser through the coolant outlet 6.

[0059] The first flow channel is split into a first region and a second region. The first region extends from the refrigerant inlet 3 up to the transition into the receiver 2. The second region of the first flow channel extends from the outlet of the

receiver **2** up to the refrigerant outlet **4** of the condenser **1**. The coolant which flows through the second flow channel is in thermal contact both with the first region and with the second region of the first flow channel, whereby a heat transfer comes about.

[0060] FIG. 2 shows a rear view of the condenser **1** of FIG. 1. In particular, the pipeline **10** and the fluid outlet **4** can be seen. The pipeline **10** here constitutes the fluid line, which runs back from the outlet of the receiver to the heat exchanger block **7** and leads the refrigerant back between the plate elements.

[0061] FIG. 3 shows a schematic view of a condenser **20**. A possible embodiment of the condenser of FIGS. 3 to 5 is shown in FIGS. 1 and 2. The routings of the outer pipelines and the arrangement of the receiver can here differ from the examples shown in FIGS. 1 and 2. Similarly the number of plate elements used and the arrangement of the individual fluid inlets and fluid outlets on the heat exchanger block.

[0062] The condenser **20** shown in FIG. 3 has an externally arranged receiver **21**.

[0063] The coolant supply line to the condenser **20** is represented with the reference symbol **27**. The coolant discharge line of the condenser **20** is represented with the reference symbol **28**. The coolant flows along the flow paths **31**, **32** along the already previously discussed second flow channel through the condenser **20**. In FIG. 3, the coolant flows without diversion both through the first region of the first flow channel, which constitutes a condensation region **34**, and through the second region of the first flow channel, which constitutes a supercooling region **35**.

[0064] The condensation region **34** is dimensioned larger in relation to the supercooling region **35** and, in proportion to the total volume of the first flow channel **1**, takes up a larger share.

[0065] In order to ensure optimal working of a condenser in general, every effort must be made to ensure that the ratio between the condensation region and the supercooling region is in a certain maximal mutual relationship. It is therefore advisable that the internal volume of the first flow channel assigned to the supercooling region, in relation to the internal volume of the first flow channel assigned to the condensation surface, is no greater than 40% of the total internal volume of the first flow channel. Advantageously, every effort must be made to ensure that the internal volume of the first flow channel assigned to the supercooling region even becomes no greater than 20%, a division of the total internal volume of the first flow channel into about 5% to 15% of the volume for the supercooling section and 85% to 95% of the internal volume for the condensation region being optimal.

[0066] To the condenser **20** of FIG. 3, a refrigerant is fed via the first fluid supply line **23** into the condensation region **34**. There it flows downward, distributed over the individual channels of the condensation region **34**, and passes via the first fluid discharge line **24** into the receiver **21**. From the receiver **21**, the now fully condensed refrigerant is led along the fluid line **33**, via the second fluid supply line **25**, into the supercooling region **35**. The discharge of the refrigerant from the condensation region **34**, and the feed into the supercooling region **35**, here take

[0067] Place at the lower end region of the condenser **20**. The place then flows upward in the supercooling region **35** and flows out of the condenser **20** via the second fluid discharge line **26**.

[0068] The flow path of the refrigerant inside the condenser is represented via the arrows bearing the reference symbols

29 and **30**. The arrows bearing the reference symbols **31** and constitute the flow path of the coolant inside the condenser **20**. It can be seen that the coolant flows in countercurrent flow to the refrigerant in the condensation region **34** and in cocurrent flow in the supercooling region **35**. By reversing the direction of flow of the coolant, a reversal of these relationships is also achievable.

[0069] In FIG. 3 is represented a condenser **20** in which, both inside the condenser region **34** and inside the supercooling region **35**, no separate diversion of the coolant or of the refrigerant takes place.

[0070] FIG. 4 shows an alternative embodiment of a condenser **40**. The condenser **40** has a heat exchanger block **42**, which, as described in FIGS. 1 and 2, consists of a plurality of plate elements. On the exterior of the condenser **40** is disposed a receiver **41**, which is in fluid communication with the condenser **42**. As also in FIG. 3 the coolant, is streamed substantially without diversion, along its principal direction of flow, through the condenser **40**. The coolant supply line **47** is disposed on the lower region of the condenser **40**. The coolant discharge line **48** is disposed at the upper region of the condenser **40**.

[0071] In all FIGS. 3 to 5, the positioning both of the fluid supply line and of the fluid discharge line both for the coolant and for the refrigerant, is merely indicated. The schematic representation is not capable of representing the precise positioning of the supply lines and discharge lines on the outer surfaces of the condensers. The supply lines and discharge lines can be disposed primarily on the end faces of the condenser, which are created by the respectively topmost and bottommost plate element of the heat exchanger block. A feed on the side faces of the plate elements is very complex in design terms and only conditionally possible. The feeding of the fluids into the individual channels inside the condenser can be effected in a wide variety of ways through the structural design of the individual plate elements.

[0072] The fluid can be led, for instance, directly into the first channel, which is created between the first and the second plate element. Alternatively, the fluid can be led between the plate elements, for instance, also by a closure of individual plate elements or by the insertion of an immersion cane into any other channel. The possibilities for dividing the individual channels into the first flow channel and the second flow channel inside the condenser substantially correspond to those which are already known in the prior art.

[0073] In FIG. 4, the refrigerant flows via the first fluid supply line **43** in the upper region of the condenser **40** into the condensation region **54**. It flows downward along the flow path **49** in the condensation region and flows via the first fluid discharge line **44** over into the receiver **41**. From the receiver **41**, the fully condensed refrigerant is led via the fluid line **53** to the second fluid supply line **45**, which, in contrast to FIG. 3, is now disposed in the upper region of the condenser **40** on the side of the supercooling section **55**. The refrigerant then flows downward along the flow path **50** in the supercooling region **55** of the condenser and eventually flows out of the condenser via the second fluid discharge line **46**.

[0074] As a result of the non-diverted flow of the coolant from bottom to top through the condenser **40** and the feed of the refrigerant in the upper region of the condenser **40**, the coolant is in countercurrent flow with the refrigerant both in the condensation region **54** and in the supercooling region **55**.

[0075] By reversing the flow-through direction of the coolant, the effect can be achieved that, both in the condensation

region **54** and in the supercooling region **55**, the refrigerant flows in cocurrent flow with the coolant. In order to produce a higher heat transfer between the refrigerant and the coolant, a layout according to FIG. 4 is, however, preferable.

[0076] FIG. 5 shows a further embodiment of a condenser **60**. The condenser **60** has a heat exchanger block **62**, which, as already previously described, is formed of the individual plate elements. In addition, the condenser **60** has a condensation region **81** and a supercooling region **82**. In contrast to the preceding FIGS. 3 and 4, the condensation region **81** is now divided into a plurality of flow paths **79**, **80**. In the representation of FIG. 5, the condensation region **81** is formed of the flow path **79** and the flow path **80**. The supercooling region **82** is formed of the flow path **77**. Between the flow path **80** and the flow path **79**, the refrigerant undergoes a diversion through around 180°. Each of the flow paths **77**, **79** and **80** of the condenser region **81** and of the supercooling region **82** can consist of one or more channels of the first flow channel.

[0077] In alternative embodiments, a division both of the condensation region and of the supercooling region into a differing number of flow paths is also conceivable. The division of the condensation region **81** into two flow paths **77**, **80** here serves for better representation. In order to maintain a through-flow principle analogous to FIG. 5, it is advantageous, however, if the number of the flow paths in the condensation region **81** is even and in the supercooling region **82** is odd.

[0078] Outside the condenser **60** is disposed a receiver **61**, through which the refrigerant flows. At variance with FIGS. 3 and 4, the coolant is not now led without diversion through the condenser, but undergoes inside the condenser **60** a 180° diversion, whereby a forward flow section and return flow section is formed in the condenser.

[0079] The coolant is led via the coolant supply line **67** into the upper region of the condenser **60** and diverted in the lower region of the condenser **60** so as subsequently to flow on upward and flow out of the condenser **60** via the coolant discharge line **68**. In order to realize this diversion, those channels inside the heat exchanger block **62** which are assigned to the second flow channel are mutually assigned via the structural design of the respective plate elements such that the coolant in one portion of the second flow channel can flow out of the upper region into the lower region of the condenser **60**. There it flows over into the rest of the second flow channel and along the channels of the second flow channel back into the upper region of the condenser.

[0080] In the representation shown in FIG. 5, the forward flow section of the coolant extends to the channels of the second flow channel which are in direct thermal exchange with the supercooling region **82** of the first flow channel, and to a number of channels of the second flow channel which are in thermal contact with the condensation region **81** of the first flow channel. The return flow section of the coolant is limited to those channels of the second flow channel which are in direct thermal exchange with the condensation region **81** of the first flow channel. A differing division can similarly be provided.

[0081] In order to achieve an even as possible pressure loss both in the forward flow section and in the return flow section of the coolant, it is advantageous if the channels which in total form the second flow channel are assigned approximately to same parts of the forward flow section and of the return flow section of the coolant.

[0082] The division of the second flow channel into forward flow section and return flow section thus does not have to be congruent with the division of the first flow channel into the condensation region **81** and the supercooling region **82**.

[0083] The refrigerant is fed to the condenser **60** via a first fluid supply line **63** in the upper region. The refrigerant then flows along the first flow path **80** along the flow path **69** into the lower region of the condenser **60**. There it undergoes a diversion as a result of an appropriate connection of the internal plate elements, and then flows through the flow path **79** along the flow path **71** back into the upper region of the refrigerant. Both the flow path **80** and the flow path **79** are assigned to the condensation region **81**. From the upper region of the flow path **79**, the refrigerant flows via a first fluid discharge line **64** into the upper region of the receiver **61**.

[0084] After the receiver **61** has been flowed through, the fully condensed refrigerant flows via a second fluid supply line **65** into the lower region of the condenser **60**, which is assigned to the supercooling region **82**. The refrigerant then flows in the flow path **77** along the flow path **72** back into the upper region of the condenser, where it is finally discharged from the condenser **60** via the second fluid discharge line **66**.

[0085] The effect of the described guidance of the coolant and the described guidance of the refrigerant is that the coolant and the refrigerant flow in countercurrent flow throughout the condenser **60**.

[0086] The transfer of the refrigerant from the condensation region **81** to the receiver **61** takes place through the supercooling region **82** of the condenser **60**. This is realized by an appropriate layout of the individual plate elements.

[0087] The condenser **50** shown in FIG. 5 has two flow paths **79**, **80** in the condensation region **81** of the first flow channel. The supercooling region **82** has only one flow path. In differing embodiments, also differing numbers of the flow paths can be provided. In order to maintain the same flow-through principle as in FIG. 5, it is advantageous if the number of flow paths in the condensation region is even and the number of flow paths in the supercooling region is odd.

[0088] In general, the line regions, shown here in FIGS. 3 to 5, between the heat exchanger block and the receiver are respectively realized by pipelines fastened to the outside of the condenser, but also by a suitable interconnection of the internal plate elements and an arrangement of the receiver directly on one of the outer faces of the heat exchanger block.

[0089] The individual connecting lines between heat exchanger block and receiver can either be jointly soldered directly with the heat exchanger block, or realized subsequently by internal or external pipes. Similarly, it can be provided to perform the feed or discharge between heat exchanger block and receiver through an appropriate design of the two outer plate elements. For instance, it can be provided that channels are integrated into the two outer or into just one of the outer plate elements, which channels can be used as a supply line or discharge line.

[0090] FIG. 6 shows a schematic sectional view of the condenser. In particular, the individual plate elements, between which are formed the channels belonging to the first flow channel or to the second flow channel, can be seen.

[0091] The first flow channel is flowed through by a refrigerant. The channels belonging to the first flow channel are hatched and marked with the reference symbol **93**. The channels belonging to the second flow channel are flowed through by a coolant and marked with the reference symbol **94**.

[0092] In addition, in FIG. 6 is represented the thermal separation layer 92, which is disposed between the condensation region 90 and the supercooling region 91 of the condenser. As a result of the thermal separation layer 92, an unwanted heat transfer between the fluids in the supercooling region 91 and the condensation region 90 is prevented.

[0093] The thermal separation layer can here be formed, for instance, by an air-filled channel between two plate elements, by an air gap between two adjacent plate elements, or by an arrangement of a plurality of coolant channels side by side. Said possibilities for the formation of a thermal separation layer are exemplary and are by no means limiting in nature. In particularly advantageous embodiments, in particular the heat transfer to the refrigerant, i.e. a warming of the refrigerant, is avoided.

1. A condenser in stacked-plate construction, wherein a heat exchanger block is formed of a plurality of plate elements, which, stacked one on top of another, form mutually adjacent channels between the plate elements, wherein a first number of the channels is assigned to a first flow channel and a second number of the channels is assigned to a second flow channel, and a refrigerant is flowable through the first flow channel and a coolant is flowable through the second flow channel, wherein the first flow channel has a first region for the desuperheating and condensation of the vaporous refrigerant and a second region for the supercooling of the condensed refrigerant, wherein at least a portion of the first flow channel is in thermal contact with at least a portion of the second flow channel, and the first region has a first fluid supply line and a first fluid discharge line and the second region has a second fluid supply line and a second fluid discharge line, wherein the condenser has a receiver for storing the refrigerant, and a refrigerant crossover from the first region into the second region leads through the receiver, wherein the receiver is in fluid communication with the first region via the first fluid discharge line, which also forms the fluid inlet of the receiver, and is in fluid communication with the second region via the second fluid supply line, which also forms the fluid outlet of the receiver, wherein the receiver is disposed on an outer surface of the condenser.

2. The condenser as claimed in claim 1, wherein the coolant in the second flow channel and the refrigerant in the first flow channel are flowable in cocurrent flow to each other and/or in countercurrent flow to each other.

3. The condenser as claimed in claim 1, wherein the first fluid discharge line and/or the second fluid supply line are/is disposed inside and/or outside the heat exchanger block.

4. The condenser as claimed in claim 1, wherein the first fluid discharge line and/or the second fluid supply line are/is formed by a pipeline.

5. The condenser as claimed in claim 1, wherein the first fluid supply line and the second fluid supply line viewed along the principal direction of flow through a channel between the plate elements, are disposed at the same end

region of the condenser, wherein the first fluid discharge line and the second fluid discharge line are disposed at the opposite end region of the condenser.

6. The condenser as claimed in claim 5, wherein the first fluid supply line and the second fluid supply line are disposed, in the final assembly position of the condenser, at the upper end region of the condenser.

7. The condenser as claimed in claim 1, wherein the internal volume share of the second region of the first flow channel represents maximally about 40%, here preferably about 20%, here preferably between about 5% and about 15% of the internal total volume of the first flow channel.

8. The condenser as claimed in claim 1, wherein the coolant supply line and the coolant discharge line of the second flow channel, viewed along the direction of flow through a channel between the plate elements, are disposed at opposite end regions of the condenser.

9. The condenser as claimed in claim 1, wherein the first region and/or the second region of the first flow channel inside the condenser are/is diverted one or more times in their/its principal direction of flow.

10. The condenser as claimed in claim 1, wherein the second flow channel inside the condenser is diverted at least once in its principal direction of flow through around 180°.

11. The condenser as claimed in claim 1, wherein the second flow channel is diverted once in its principal direction of flow through around 180°, whereby a forward flow region and a return flow region are formed, wherein the internal volume of the forward flow region of the second flow channel and the internal volume of the return flow region of the second flow channel are approximately equal in size and/or unequal in size.

12. The condenser as claimed in claim 11, wherein the coolant flows through the second flow channel in such a way that, along the principal direction of flow through the second flow channel, it first enters into thermal contact with the second region of the first flow channel or it first enters into thermal contact with the second region and at least a portion of the first region of the first flow channel and, respectively after the diversion, enters substantially into thermal contact with the first region of the first flow channel.

13. The condenser as claimed in claim 1, wherein a thermal separation is present between the first region for the desuperheating and condensation of the vaporous refrigerant and the second region for the supercooling of the condensed refrigerant.

14. The condenser as claimed in claim 13, wherein the thermal separation is configured as a thermally insulating plate, as an air gap, as an air-conducting channel, as a part of the second flow channel having a multiple coolant path and/or as a part of the second flow channel having a larger flow cross-sectional area than the rest of the second flow channel.

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