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SEMICIRCULAR EVAPORATOR COIL COMBINED WITH A FAN

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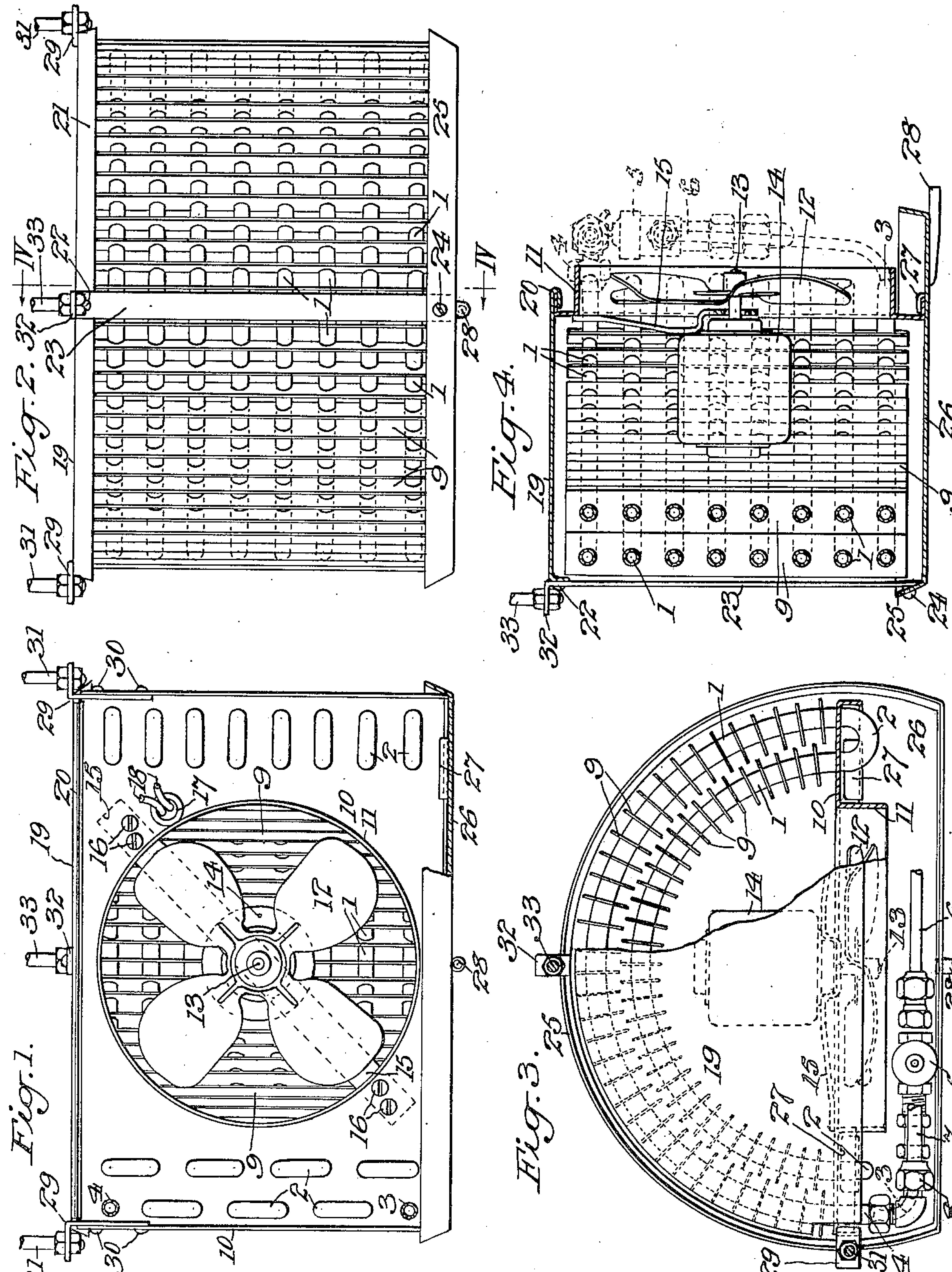

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SEMICIRCULAR EVAPORATOR COIL COMBINED WITH A FAN

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7 Claims. (Cl. 62—129)

1

This invention relates to an evaporating unit for heat exchange apparatus and, more particularly, to a unit of the forced draft type which includes an evaporating coil and a fan for forcing air between the coil tubes and fins.

An object of the invention is to provide such a unit which, in operation, effects substantially uniform distribution of air throughout the chamber or enclosure in which the unit is operatively located, without the use of additional air deflecting means such, for instance, as an external framework or baffles.

Another object is to provide such a unit which is so shaped that the forcing of air therethrough causes a substantially uniform circulation of the air throughout the chamber or enclosure in which the unit is operatively located.

Another object is to provide such a unit which is so shaped that the forcing of air therethrough by the fan causes the air to escape from the unit in substantially radially projected streams.

Another object is to provide such a unit in which the fan motor may be located between the coil and the fan housing, whereby compactness and structural efficiency are promoted.

Another object is to provide such a unit in which the coil is of such shape and size as substantially to embrace the fan motor and, if desired, the fan.

Another object is to provide such a unit in which the fan motor is so disposed that the expansion valve may be located in close proximity to the coil, whereby compactness and efficiency in structure are obtained and both the coil and expansion valve can drain into a single pan during defrosting periods.

Another object is to provide such a unit in which the structural parts are reduced to a minimum, while the form and interarrangement of the parts are such as emphatically to promote economy in construction, compactness, and efficiency in operation.

A further object is to provide certain improvements in the form, construction, and arrangement of the parts, whereby the above named and other objects may effectively be attained.

A practical embodiment of the invention is shown in the accompanying drawing, in which

Fig. 1 represents a rear elevation of the unit partly broken away;

Fig. 2 represents a front elevation thereof;

Fig. 3 represents a top plan view, partly broken away; and

Fig. 4 represents a vertical section taken in the plane of the line IV—IV of Fig. 2, looking in the direction of the arrows, the expansion valve of some connections being shown in dotted lines.

2

In heat exchange units of this type it is important that the air be forced between the runs of the coil and fins thereon in such a way as to cause efficient functional contact of the air current with the coil; and it is likewise important that the air, after passing through the unit, be uniformly distributed throughout the chamber or enclosure in which the unit is located in order to achieve uniform temperature effects therein; and heretofore, in seeking to obtain these desirable results, resort has been had to relatively complicated and expensive structural forms and arrangements which, furthermore, lacked compactness. This invention not only attains the desirable objectives just mentioned while eliminating the undesirable manufacturing features also named, but it likewise serves to provide a structure that is exceptionally efficient, durable, and handy to install, and possesses other inherent features of substantial practical desirability from the point of view of the manufacturer as well as the user.

The structure includes a coil 1 which consists of a plurality of runs or lengths of tubing which are arranged in vertical superposition, as well indicated in Fig. 4, and have their ends connected by U-shaped curved portions or bends 2, which are secured to the runs by sweating with solder or in any other appropriate manner. The bends or curved portions 2 are horizontally arranged at one end of the coil runs 1 and vertically arranged at the other end, as illustrated in Fig. 1, so that the coil as a whole constitutes a continuous tube having an inlet end as indicated at 3 and an outlet end as indicated at 4, whereby fluid supplied thereto may circulate throughout the coil. A pressure reducing device, such as an expansion valve 5, of any well known or approved form, is secured to and supported by the inlet 3, and has connected therewith a pipe 6 which may lead from a condenser or receiver, or other suitable source of supply, as is well understood in this art. A pipe 7 is connected to the outlet 4 by a suitable coupling 8, and is fitted to carry the fluid, such as superheated gas, away from the coil and return it to a compressor (not shown) as is also familiar to operatives in this art. Fins 9 are secured at desired intervals throughout the length of the coil, and may be fixed in position thereon by expanding the coil within the fins, or by sweating the parts together with solder, or in any other appropriate way. The coil 1, 2 and the fins 9 are preferably composed of some material

having a high temperature conductivity such, for instance, as copper, brass or aluminum.

A header plate 10 is perforated to receive the runs of the coil 1 which pass therethrough and are united with the bends 2 so that the main body of the coil is on one side of the header plate and the bends of the coil are on the opposite side, which arrangement causes the header plate to serve as a support for the coil which may be rigidly secured to the header plate by solder applied at the apertures where the coil passes through the header plate or by any other suitable means. The header plate 10 has a large central aperture which is formed with a laterally extending flange 11 that constitutes a housing for a fan 12 which is fixed on the shaft 13 of a suitable motor 14; the fan and motor assembly being mounted in and supported by a bracket 15 which is fastened to the header plate 10 by screws 16 or the like. The portion of the header plate embodying the fan housing may, if desired, be a separate piece suitably fastened to the portion that is perforated to receive the runs of the coil, but it is convenient to form the plate in one piece. The header plate 10 is also provided with an opening 17 for the passage of current wires 18 that lead to the motor.

As clearly shown in the drawings (see particularly Fig. 3) the coil is shaped in the form of a semicircle, which may be accomplished either by constructing the same straight and then bending it, or by bending the individual runs before the bends 2 are secured in position. I prefer to follow the former procedure as it somewhat facilitates manufacturing operations; and it may be mentioned that suitable precautions, well known to those skilled in this art, are taken to prevent the bending operation from kinking or denting or creasing the tubular runs 1 such, for instance, as filling the whole tube with sand or any other appropriate material before the bending operation. This semicircular form of coil enables the motor 14 to be located between the coil and the header plate 10 and, indeed, permits the fan and motor assembly to be substantially embraced by the coil, which leads to compactness and rigidity. The said shape furthermore causes the air which is forced through between the runs of the coil to pass from the unit in radial streams or flows, thereby greatly promoting uniformity of circulation throughout the chamber in which the unit is operating. It should be noted, however, that the direction of fan rotation and, hence, the flow of the air, may be reversed, if circumstances call for such a mode of operation.

A cover 19 semicircular in form, is secured to the upper edge of the header plate 10 by being folded thereover, as shown at 20, and has a depending flange 21 which embraces and conceals the upper extremities of the fins 9. The central point of the said flange 21 is fixed, as by a screw 22, to a vertical tie strap 23, which latter extends from the top to the bottom of the unit and has its lower end fastened by a screw 24 to the upstanding wall 25 of a drip pan 26 which also serves as a bottom closure for the unit and has a pair of clips, one being shown and marked 27, fixed thereto as by soldering or brazing and folded into locking engagement with the lower edge of header plate 10. The said drip pan 26 projects laterally beyond the fan housing 11 a sufficient distance to underlie the expansion valve 5, inlet 3 and coupling 8, whereby the said pan will, during defrosting periods, not only receive the drip from the coil and fins, but will also receive the drip from the said valve, inlet and coupling. A drain pipe 28 is connected to the drip pan 26 for leading the water to a suitable means of disposal. As it is customary to install a unit of this type by suspending it from overhead supports, suitable brackets for this purpose, denoted by 29, 29, are secured as by rivets 30, 30 to the side edges of header plate 10, which brackets 29, 29 are perforated to cooperate with depending bolts or the like 31, 31. A third bracket for the same purpose is formed by the bent-over upper end 32 of the tie strap 23, which said bracket is perforated for cooperation with a bolt or the like 33.

As the evaporating unit embodying this invention is of quite general applicability in heat exchange systems, and as the remaining parts of such systems are known to those skilled in this art in various forms and their arrangement and cooperation with the evaporating unit are equally well understood, none of the remaining parts of such a system are shown or described herein except the expansion valve which is connected with the inlet of the coil and the coupling that is connected with the outlet thereof. In a well known application of an evaporating unit of this type, such as refrigerating apparatus, expansion valve 5 will be connected to a source of fluid supply such as a receiver or condenser fed by a compressor; while the outlet pipe 7 will be connected to the intake of the compressor for the purpose of returning the fluid, which has been evaporated by its passage through the coil, to the compressor. As already indicated, many kinds of such refrigerating systems are known in this art; one to which, for instance, reference may be made, is disclosed in my co-pending application for United States Patent Serial No. 581,804, filed March 9, 1945, now Patent No. 2,463,027, granted March 1, 1949, while another is disclosed in United States Patent to H. J. Krackowizer, No. 2,124,981, dated July 26, 1938.

It will be clear from the foregoing description that this evaporator is very simple and compact in construction in that its elements consist substantially of merely the coil, header plate, top and bottom, with the fan and motor assembly practically located within and embraced by the structure. This greatly facilitates economy and simplicity in manufacture, shipping, and installation, while the shape of the parts, especially the coil, insures a uniform and thorough air circulation due principally to the projection in radial directions of a large number of air streams as the fan forces the air between the runs and fins of the coil. The preferred material of the coil and fins has heretofore been mentioned, and it may be added that the header plate 10, cover 19, and drip pan 26 may be composed of any suitable material such, for instance, as sheet steel or iron; while the tie strap 23, hanging brackets 29, 29, 32, and other detail elements may consist of any suitable material, preferably metallic.

It will be understood that various changes may be resorted to in the form, construction, arrangement, and material of the several parts, without departing from the spirit and scope of this invention; and hence I do not intend to be limited to details herein shown or described except as the same may be included in the claims or required by disclosures of the prior art.

What I claim is:

1. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semicircular coil having its ends mounted in said apertures, a fan motor mounted

on said plate and located between the plate and the coil, and a fan mounted on the motor shaft and positioned adjacent said fan opening whereby the header plate serves to support the coil, the motor and the fan, and the motor is positioned within the semicircle formed by the coil.

2. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semicircular coil having its ends mounted in said apertures, a bottom member secured to said plate, a fan motor mounted on said plate and located between the plate and the coil and above the bottom member, and a fan mounted on the motor shaft and positioned adjacent said fan opening, whereby the header plate serves to support the coil, the bottom member, the motor and fan, and the motor is positioned within the semi-circle formed by the coil.

3. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semi-circular coil having its ends mounted in said apertures, a bottom member secured to said plate, a cover member secured to said plate, a fan motor mounted on said plate and located between the plate and the coil and between the bottom and cover members, and a fan mounted on the motor shaft and positioned adjacent said fan opening, whereby the header plate serves to support the coil, the bottom member, the cover member, the motor and fan, and the motor is positioned within the semi-circle formed by the coil.

4. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semi-circular coil having its ends mounted in said apertures, a bottom member secured to said plate, a cover member secured to said plate, means connecting said bottom and cover members at points spaced from said plate, a fan motor mounted on said plate and located between the plate and the coil and between the bottom and cover members, and a fan mounted on the motor shaft and positioned adjacent said fan opening, whereby the header plate serves to support the coil, the bottom member, the cover member, the connecting means, the motor and fan, and the motor is positioned within the semi-circle formed by the coil.

5. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semi-circular coil having its ends mounted in said apertures, a bottom member secured to said plate, a cover member secured to said plate, means connecting said bottom and cover members at points spaced from said plate, means for suspending the unit connected with the plate and with the means which connects the bottom and cover, a fan motor mounted on said plate and located between the plate and the coil and between the bottom and cover members, and a fan mounted on the motor shaft and positioned adjacent said fan opening, whereby the header plate serves to support the coil, the bottom member, the cover member, the connecting means, the motor and fan, and the motor is positioned within the semi-circle formed by the coil.

6. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semi-circular coil having its ends mounted in said apertures, a fan motor mounted on said plate and located between the plate and the coil, a fan mounted on the motor shaft and positioned adjacent said fan opening, and a pressure reducing device connected to said coil and located at the side of said plate opposite said motor, whereby the header plate serves to support the coil, the motor, the fan and the pressure reducing device, and the motor is positioned within the semi-circle formed by the coil.

7. A unit of the character described comprising, a header plate provided with a fan opening and with apertures at opposite sides thereof, a substantially semi-circular coil having its ends mounted in said apertures, a fan motor mounted on said plate and located between the plate and the coil, a fan mounted on the motor shaft and positioned adjacent said fan opening, a pressure reducing device connected to said coil and located at the side of said plate opposite said motor, and a bottom member secured to said plate formed to constitute a drip pan and extending beneath the pressure reducing device, whereby the header plate serves to support the coil, the motor, the fan, the pressure reducing device and the bottom member, the motor is positioned within the semi-circle formed by the coil and the bottom member serves as a drip pan for the coil and the pressure reducing device.

GEORGE FRIE.

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