

April 17, 1956

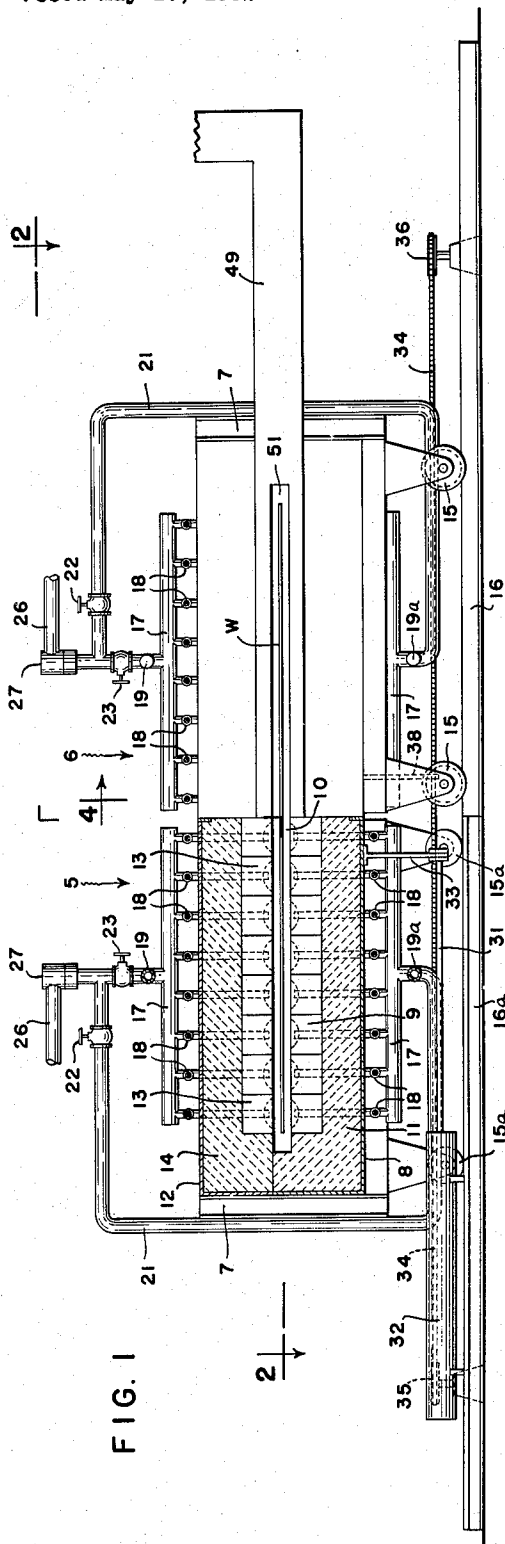
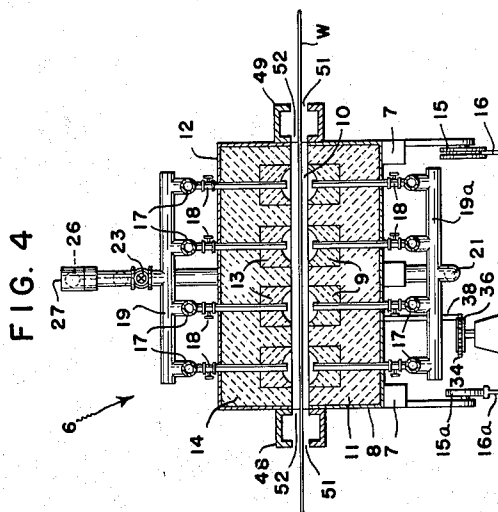
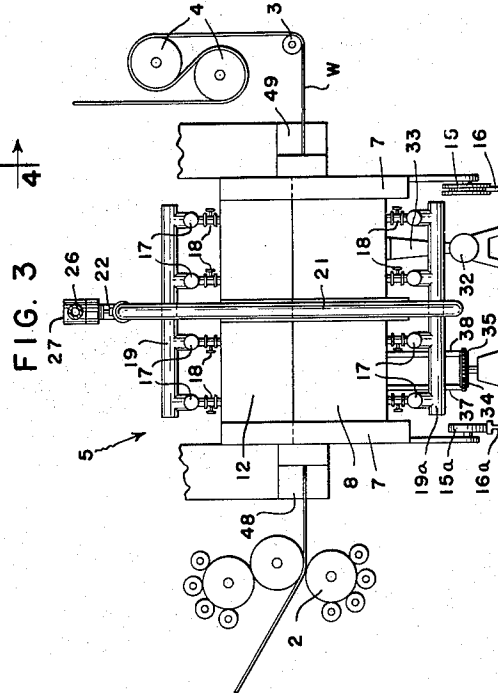
T. F. A. EDVAR

2,742,274

WEB DRYER

Filed May 10, 1952

2 Sheets-Sheet 1



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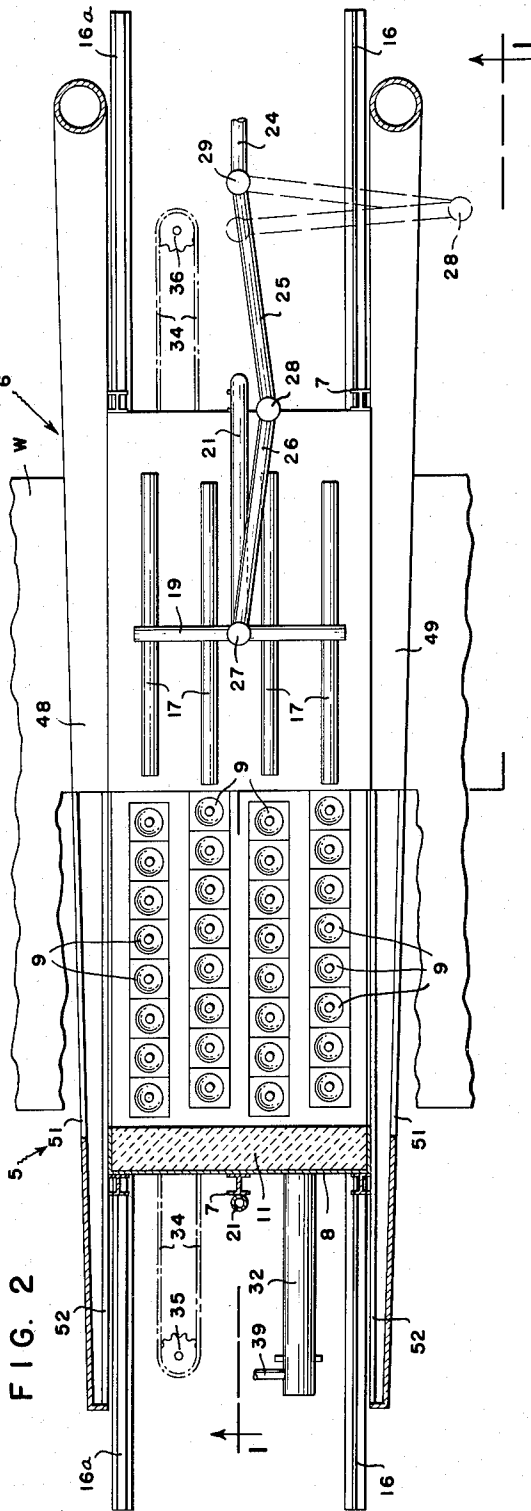
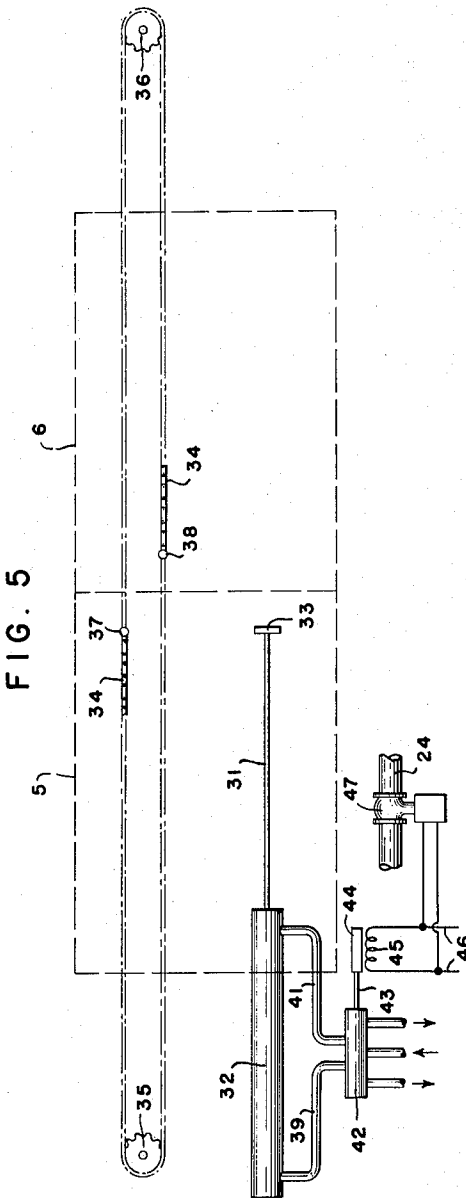
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2,742,274

WEB DRYER

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10 Claims. (Cl. 263—3)

The present invention relates to ovens, and more particularly to an oven which is used to dry a web, or material placed on a web, such as drying ink on a web of paper as it is moving through a printing press.

There are available many devices to dry ink on a printed web, for example, as it is moving from one point to another in a press during the printing operation. All of these devices, however, whether they depend for their drying action upon hot air or direct radiant heat, have the objection that they cannot move away from the web. In times of emergency when the press is stopped, the heat must be quickly cut off to prevent damage to the web. Even though the heat may be reduced quickly, the residual heat in the device is often sufficient to damage the web. Furthermore, when there is a web break, it is difficult to thread the web through a dryer when it is hot.

It is an object of the invention to provide a web drying device in which the heated parts of the device are moved away from the web when the press is stopped or the web breaks.

It is a further object of the invention to provide a compact web dryer that can be built into a printing press in such a manner that the web will pass through the dryer as the web moves along its path through the press.

It is a further object of the invention to provide a web dryer that does not touch the web at any time, and one that can be used to dry either or both sides of the web as desired.

The dryer of the present invention includes a pair of U-shaped oven sections that are mounted on rails in a press structure in such a manner that a rectangular passage is formed through which the web travels. Burners are located in the legs of each section and facing the web so that both sides of the web are heated as it is moving through the passage. The oven sections are mounted for movement transversely to the path of travel of the web. Therefore, they can be separated and moved away from the web when such action is required.

The dryer of the present invention is particularly designed to be used with a printing press for drying the ink that has been placed on a web of paper. It will be apparent, however, that it can be used to advantage at any place where heat is to be applied to a moving web or strip.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

Figure 1 is an elevation view partly in section taken on line 1—1 of Figure 2;

Figure 2 is a plan view partly in section taken on line 2—2 of Figure 1;

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Figure 3 is an end view of the dryer;

Figure 4 is a section view taken on line 4—4 of Figure 1; and

Figure 5 is a diagram showing mechanism for controlling the movement of the dryer sections.

Referring to Figure 3, the impression rolls of a printing press are shown at 2. The web is passed toward the right from these rolls, through the dryer, to and around a guide roll 3 which directs the web to a pair of water cooled rolls 4 prior to the time it is forwarded to some other portion of the press. The dryer is located between the impression rolls and the guide roll and is mounted on a suitable portion of the press frame in such a position that the web can pass through it in an unsupported length.

The dryer is composed of two sections 5 and 6 that are substantially U-shaped as shown best in Figure 1 of the drawing. When the legs of the sections engage each other, as shown, they form an oven chamber 10 that is open at both ends and through which the web is moved. The oven sections 5 and 6 are mirror images of each other, so a description of one will be sufficient. Each section comprises a rigid supporting frame 7 upon the lower portion of which is mounted the lower half 8 of the section. This half is constructed in accordance with ordinary furnace practice and includes as a part of the chamber wall a number of rows of burners 9, shown herein as four, that are backed up by a suitable insulating refractory 11. The burners 9 are shown herein as being and are preferably of the type disclosed in Hess Patent 2,215,079 issued September 17, 1940. Burners of this type, as disclosed in detail in the patent, are provided with a cup-shaped depression into which a mixture of fuel and air is supplied in a series of substantially radially directed jets. The jets of fuel mixture are burned in the cups to heat them to incandescence without flames extending beyond the cup. Therefore, radiant heat of high intensity is supplied from the cups to the web. In addition, heat is obtained from the hot products of combustion released as the fuel is burned. The upper half 12 of the section is indicated at 12. This section also includes four rows of burners 13 of the same type as burners 9 and backed up by a suitable insulating refractory 14. These burners are mounted in what is in effect the roof of the section in accordance with ordinary furnace practice. The upper half 12 of section 5 is rigidly bolted to the supporting frame 7, and may be removed when occasion demands by removing the bolts and lifting it by suitable crane.

The entire section is mounted on wheels 15 that travel along tracks which are located in the press frame and transverse to the direction of web travel. Referring to the Figures 3 and 4, it will be seen that the wheels 15 on the right are provided with a groove that rides along a vertical web on the track 16. This arrangement guides the section for movement perpendicular to the web and maintains the parts at all time in alignment. The wheel 15a on the left of the dryer in Figures 3 and 4 has a flat tread which rolls along the flange of a track member 16a in the shape of an H-beam. This arrangement permits slight expansion and contraction of the dryer due to the heat without causing buckling of the section parts.

Each row of burners in both the upper and lower halves of the section is supplied by a manifold 17. Extending from the manifolds to the individual burners are pipes which have in them valves 18. The manifolds 17 in the top and bottom portions are in turn supplied by manifolds 19 and 19a, respectively, extending lengthwise of the furnace chamber. The manifold 19a for the lower half of the section is supplied by a pipe 21 extending around the end of the section, while the manifold 19 for the upper half of the section is supplied directly from the main fuel

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supply pipe. It is noted that pipe 21 has a valve 22 in it and a valve 23 is provided up-stream of upper manifold 19. These valves permit the fuel to either the upper or lower burners to be cut off if desired. The main fuel supply is so arranged that the burners will get fuel in any position of the section. To this end, fuel is supplied from a main pipe 24 through pipes 25 and 26 to the pipes leading to manifolds 19 and 19a. Swivel joints 27, 28 and 29 are provided, as shown, between the pipes. Therefore, when the sections are moved from their closed position as shown to their open position, the angles between the pipes will be changed at the swivel joints as shown in dotted lines on the right side of Figure 2.

When the press is threaded, or when the press is stopped from time to time for various reasons, it is desirable to move the sections 5 and 6 of the structure forming the oven away from the web. Means to accomplish this function is shown in Figure 5 and includes a piston rod 31 which has a piston on its end that is received in a cylinder 32. The outer end of rod 31 is connected by an arm 33 with the lower portion of section 5 of the dryer oven. The piston moves section 5 directly and the movement of that section is used to move section 6. To this end there is provided a chain or other suitable flexible member 34 which passes around pulleys 35 and 36. The chain is fastened to section 5 by means of an arm 37 extending downwardly therefrom and is fastened to section 6 by means of a similar arm 38. The cylinder, which may be either hydraulic or pneumatic, has fluid supplied to one end of it by a pipe 39 and to the other end by a pipe 41. A valve 42, having a valve stem 43, is used to direct the fluid to the proper one of the pipes. This valve may be operated manually, or it may be operated automatically in accordance with the operation of the press. For this purpose, the valve rod 43 has attached to its end a core 44 of solenoid 45. Power is supplied to the solenoid in accordance with the operation of the press. The arrangement is such that fluid is normally supplied to the cylinder through pipe 39. When, however, the press is stopped, solenoid 45 will be de-energized and the valve will be moved under a suitable spring bias to direct the fluid supply through pipe 41. Therefore the piston rod 31 will be moved to the left to move, in turn, the section 5 of the oven away from the web. As this section is moved, it operates through the chain 34 and arms 37 and 38 to move the section 6 of the oven away from the right side of the web. The operation of the press can also be used to control the supply of fuel to the burners. To this end, there is provided an automatic valve 47 in the fuel line. When the press is running, the valve 47 will be open to supply fuel. When, however, the press is stopped valve 47 will be energized for operation in a direction to reduce the supply of fuel to either a minimum or to cut it off entirely. The electrical connections by means of which the valve 47 is opened or closed are conventional and are shown herein diagrammatically.

The hot products of combustion, which are produced as a result of burning fuel in the burners 9 and 13; must be removed from the oven chamber. Ducts are provided for this purpose, and they are shown best in Figures 2 and 4 on opposite ends of the oven at 48 and 49 respectively. Each of the ducts is provided on its outside with a slot 51 and on its inside with a slot 52. These slots are aligned with the oven chamber, so that the web may move directly into and from the oven by passing through the ducts. It is noted that the inside slots 52 of each duct are extended beyond the ends of the oven sections when they are in their closed positions. This is for the purpose of withdrawing products of combustion from the oven chamber when the oven is in its open position. The ducts can be extended beyond one side of the press as shown in Figures 1 and 2 where they are connected to a suitable exhaust system not shown.

In the operation of the device, the sections are opened in order to facilitate threading the web through the press.

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Thereafter, when the press is started, the oven sections move together to the position shown in the drawings. The burners are lit, and heat produced by these burners will dry the web as it is moving from the impression cylinders through the oven and to another portion of the press. If, for some reason, the press stops, the sections of the oven may be opened either manually or automatically as explained above in order to remove the heat from the web so that the web will not be burned. Ordinarily, it takes a short period of time for a press to stop after the power has been disconnected. The arrangement of the piston rod 31 and cylinder 32 will be such that the speed of opening of the oven sections will be correlated with the speed of stopping of the press, so that the oven will be completely open by the time the press is stopped. In a like manner, the speed of operation of the moving parts for the oven will be such that the sections of the oven are moved together by the time the press has picked up speed after it has been started.

In an oven of the type disclosed herein for a web 4 feet wide, it is only necessary that each section of the oven be moved slightly over 2 feet. This small movement of the oven sections can easily be accommodated within the framework of the average press. When the burners are being operated, the temperature of the cups in the burners will be between 1800° and 2000° F. This will produce an over-all oven temperature of approximately 1500°. With the temperature at this value, it is possible to dry the ink on a web moving at a speed of 1000 feet a minute with an oven having a length of approximately 2½ feet. An oven of this short length can easily be placed within the framework of the average press, even when the necessary ducts are located on each side thereof.

A drying oven of the type shown herein is particularly useful in connection with an offset printing press where ink is placed simultaneously on both sides of the web of paper. The dryer can be used, however, with any kind of press. If the web has been printed on only one side, either the top or the bottom, the fuel supply to the burners on either the top or the bottom portions of the oven sections can be shut off by proper manipulation of valves 23 and 22 respectively. As shown herein, the web is of a width that extends from one side to the other of the oven. From time to time, it may be desirable to supply the press with a web that is only a fraction of the maximum width normally used. When this is the case, the burners which are not above or below the web can be cut off by closing valves 18. Thus, only those burners which are necessary for the type of printing and the width of the web are required to be in operation.

From the above description, it will be seen that I have provided a web dryer which is short in length and may, therefore, be mounted readily within the frame of the average printing press. The dryer is so designed that the web passes through it in an unsupported length directly from the impression cylinders. The dryer is also designed so that it can be removed from proximity to the web whenever this is necessary or desirable.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. In a web dryer, the combination of a pair of oppositely disposed U-shaped oven members arranged to form a substantially rectangular passage open at the ends through which a web to be dried is moved in a path, means located in the legs of the U of said oven members to supply heat to opposite sides of said passage, means to mount said oven members for movement toward and

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from each other in a direction perpendicular to the path of travel of the web and parallel to the surface thereof, and means to move said oven members toward and from each other whereby heat can be applied to or removed from the web.

2. In a dryer for a web moving through a path, the combination of tracks extending perpendicular to and adjacent to a portion of said path and parallel to the surface of the web, oven structure including a pair of opposed complementary parts, means for mounting said parts on said tracks for movement from a position in which they surround the web to positions in which said parts are removed from and beyond opposite edges of the web, means to move said parts between said two positions, burner means in said parts, and means to locate said burner means adjacent to the surface of the web traveling through said oven structure to heat the web as it is being moved through the same.

3. In a device for heat treating a web, the combination of structure forming a rectangular chamber open at both ends and through which a web travels along a predetermined path, means forming part of said structure to supply radiant heat from a side of said chamber against the surface of a web traveling through said chamber, said structure being divided into individual sections lengthwise of said chamber, means to mount each of said sections for movement in a direction perpendicular to the path of travel of said web and parallel to the surface thereof, and means to move said sections toward and from each other.

4. In a device for heat treating a web, the combination of structure forming a pair of U-shaped sections mounted with the ends of the U adapted to engage each other to form a substantially rectangular furnace chamber open at its ends and through which a web travels, means to mount said sections for movement perpendicular to the path of web travel from a position in which said sections engage each other to form said chamber to a position in which said sections are removed from and beyond the edges of said web, burners in said sections to heat the web as it moves through said chamber, means to supply fuel to said burners in any position of said sections, means to move said sections between the above mentioned positions, and a duct separate from said sections at the end of said furnace chamber to withdraw the products of combustion from said burners.

5. The combination of claim 4 in which the burners are located in both legs of each U-shaped section whereby heat may be supplied to each side of the web, and means to control the supply of fuel separately to the burners of each leg of each section.

6. In a dryer for a web moving in a path, a pair of cooperating structures each extending partly across the surfaces of the web on both sides thereof, said structures cooperating to form a rectangular chamber open at both ends through which the web travels, burners in said structures directed toward both sides of said web, means to move said structures transversely to the web between a first position in which said rectangular chamber is formed and a second position in which said structures are removed from said web beyond opposite edges thereof, means to supply fuel to said burners in any position of said struc-

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ture, and ducts through which the web passes at each end of said chamber.

7. The combination of claim 6 including means to shut off the supply of fuel in each structure to the burners on one side of the web.

8. In a device for heating a web as it is traveling through a path, the combination of apparatus including a pair of substantially U-shaped sections adapted when their ends are in engagement to form a passage open at its ends through which the web travels, means to move said sections from their position in which said passage is formed transversely to a position in which each section is beyond one edge of the web, burners located in each section to heat the surface of said web as it is moving through said passage, and duct means adjacent to each end of said passage through which products of combustion from said burners are withdrawn, each of said duct means being provided with slots aligned with the ends of said passage through which the web passes as it enters and leaves said passage.

9. In a device for drying a web moving through a path, the combination of a pair of tracks extending transversely to said path, a pair of U-shaped oven sections traveling on said tracks on opposite sides of said path from a position in which they engage each other and surround the web to positions retracted from said web, burner means in said sections to supply heat to said web, fuel supply means operable to supply fuel to said burners in any position of said sections, ducts extending transversely of said web at each end of said sections operative to withdraw the products of combustion from said sections, said ducts being formed with slots on each side thereof through which the web passes on its way to and from said sections.

10. Apparatus for heating a strip of material traveling in a path having a straight portion therein, the combination of heating means in the form of a U, means to support said heating means so that the legs of the U project inwardly from an edge of the strip adjacent to the opposite surfaces of the strip as it moves through said portion of said path, burners in the legs of the U to direct heat toward the opposite surfaces of said strip, mechanism operative to move said heating means in a straight path from a position in which the legs thereof extend across the surfaces of the strip to a position in which the legs thereof are withdrawn beyond the edges of the strip, and means to supply fuel to the burners in any position of the heating means.

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