

[54] RIVETING DEVICE

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[22] Filed: Jan. 6, 1971

[21] Appl. No.: 104,270

[52] U.S. Cl. .... 227/60

[51] Int. Cl. .... B21j 15/34

[58] Field of Search .... 227/60, 61, 62

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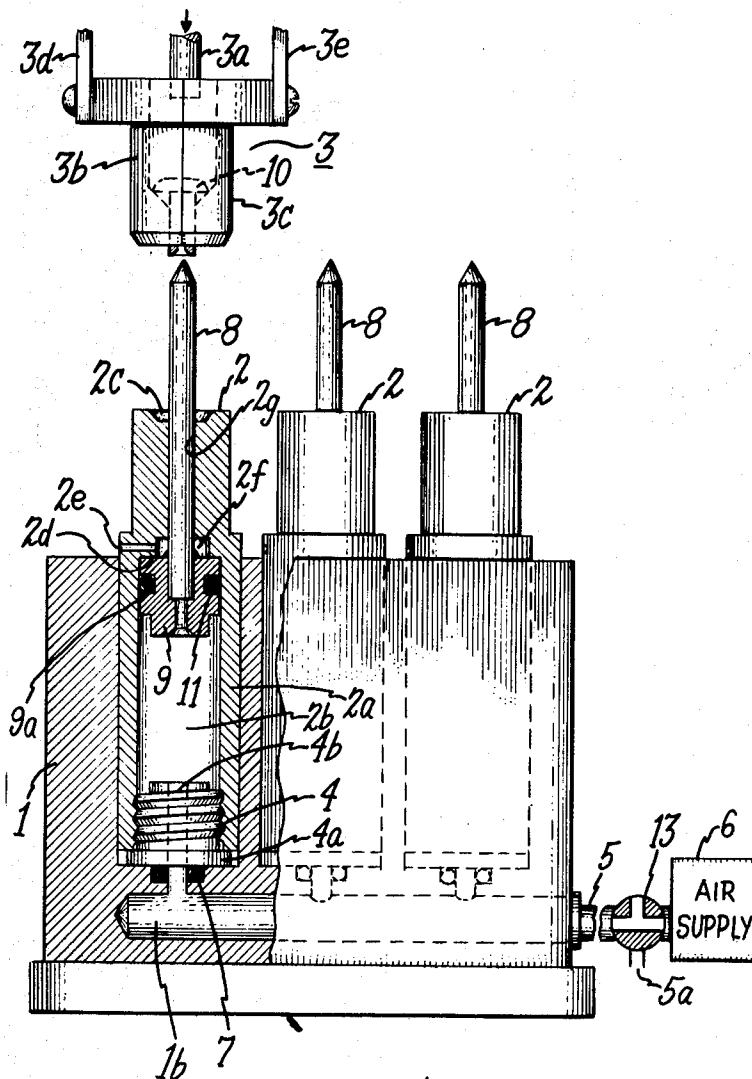
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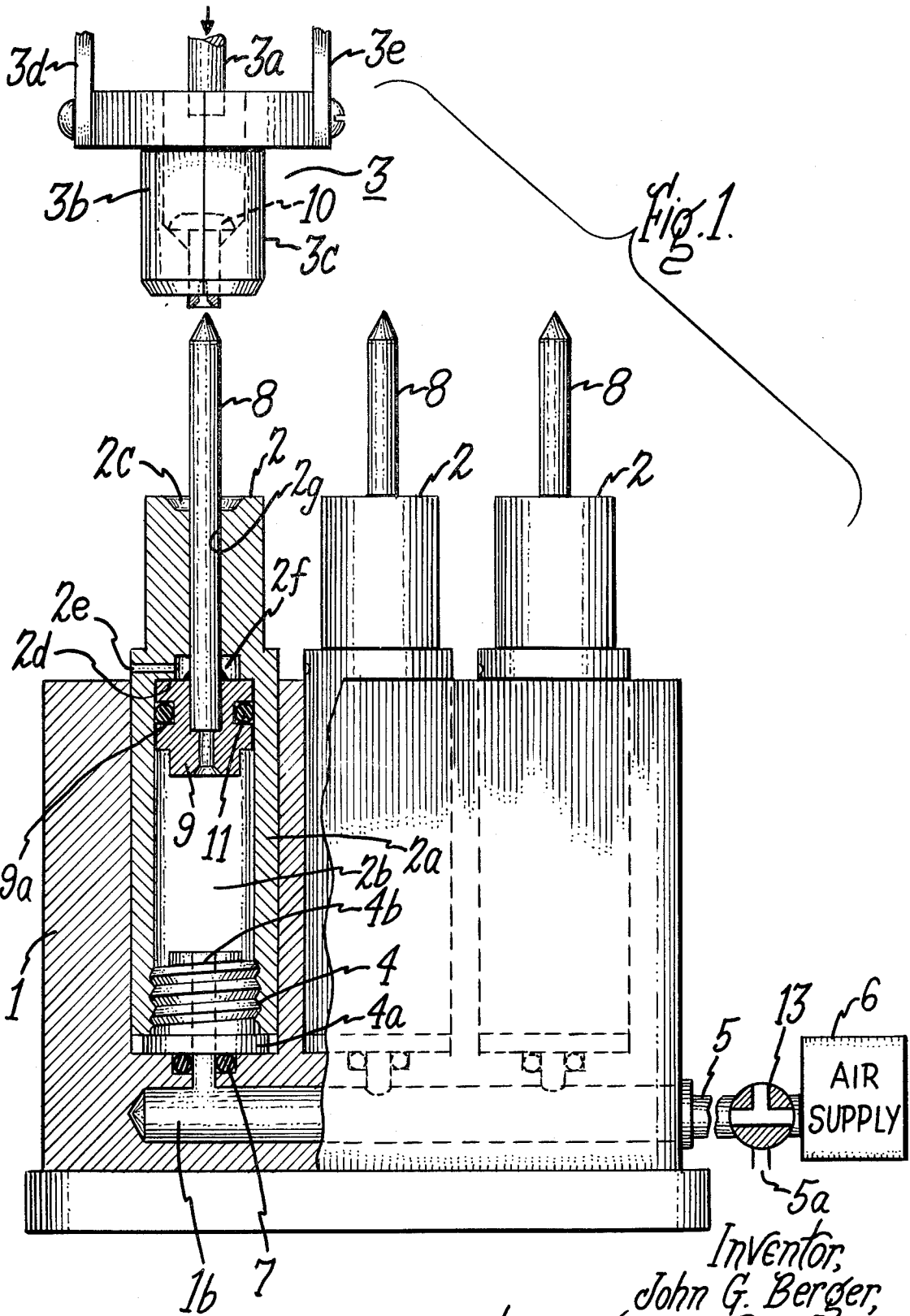
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[57] ABSTRACT

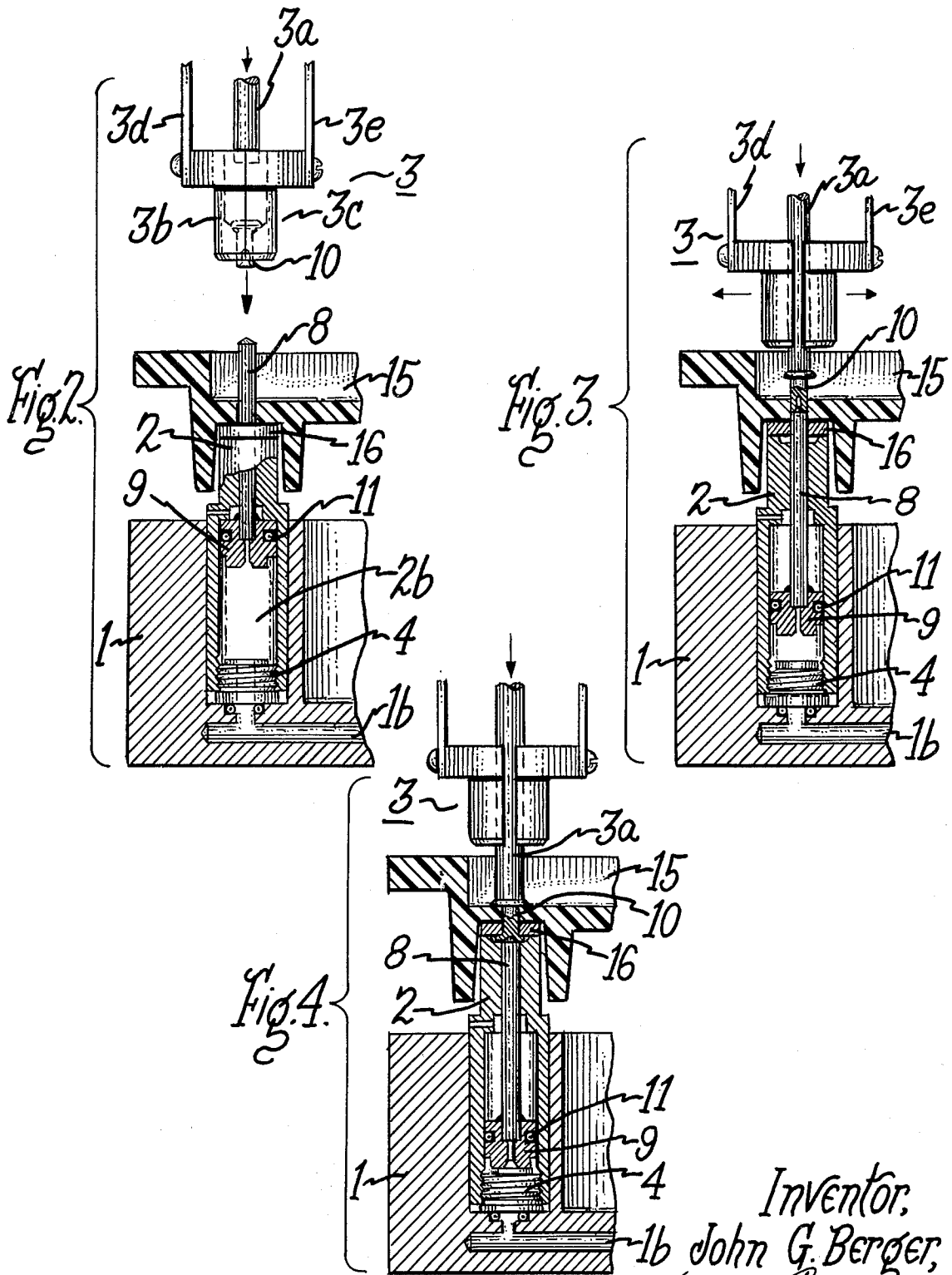
Riveting device includes an anvil structure having a movable piston and attached pin for guiding a rivet to riveting position. The piston is movable by air under pressure and has an O-ring gasket which frictionally engages the walls of a bore in the base member below the anvil in which the piston moves. The O-ring enables the guide pin to retain the rivet in position prior to reaching the anvil, and holds the pin in retracted position to enable the riveted parts to be readily removed.

9 Claims, 4 Drawing Figures





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## RIVETING DEVICE

The present invention relates to riveting apparatus and more particularly concerns an improved anvil device for such apparatus.

In known types of riveting apparatus the apparatus has an upper driving rod which pushes the rivet downwardly against an anvil, and the latter has a spring-loaded plunger which guides the rivet in its downward movement through the parts to be riveted. When the rivet is clinched, the plunger spring will throw the riveted work out of the fixture unless it is clamped down to overcome the spring pressure. For this purpose, clamping devices and unclamping mechanisms with associated control components must be used on such known types of riveting machines.

It is an object of the present invention to provide a riveting machine, and more particularly an improved rivet anvil device therefor, which overcomes the need for the described clamping arrangements as in known riveting machines and thereby provides for reduced expense, simplified riveter structure, and faster riveting operations.

Another object of the invention is to provide a rivet anvil device of the above type which facilitates removal of the work piece after the riveting operation.

Still another object of the invention is to provide a rivet anvil device of the above type having a movable rivet guide means wherein the position of the latter means may be independently controlled.

Other objects and advantages will become apparent from the following description and the appended claims.

With the above objects in view, the present invention in one of its aspects relates to riveting apparatus comprising, in combination, work support means having channel means therein opening exteriorly thereof, elongated rivet guide means arranged in the channel means for axial movement therein, the rivet guide means being movable between an extended position projecting outwardly of the opening and a retracted position withdrawn within the channel means, resilient means arranged on the rivet guide means for movement therewith in frictional contact with the channel means and being adapted to frictionally hold the rivet guide means in stationary position, and fluid supply means connected to the channel means for supplying fluid under pressure thereto for moving the rivet guide means from retracted to extended position.

The invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an elevational view, partly in section, of riveting apparatus embodying the present invention;

FIG. 2 is a similar view showing a portion of the FIG. 1 apparatus with work arranged thereon preparatory to the riveting operation;

FIG. 3 shows the parts of the apparatus of FIG. 2 in an intermediate stage of the riveting operation; and

FIG. 4 shows the arrangement of the parts of the apparatus upon completion of the riveting operation.

Referring now to the drawings, and particularly to FIG. 1, there is shown a portion of a riveting machine having an anvil and rivet guide mechanism in which the present invention is embodied. The apparatus illustrated includes a base member 1 serving as a work support and having a plurality of anvils 2 mounted on its top, and being laterally movable by suitable means (not shown) relative to a rivet feeding and driving mechanism 3 for applying and clinching rivets in sequence on the several anvils on which the work (see FIGS. 2-4) is arranged, as well understood in the art. Beneath each anvil 2, base member 1 is formed with a cylindrical recess in which fits a cylindrical sleeve 2a formed integral with and extending below anvil 2 so as to form a cylindrical bore 2b. Sleeve 2a is secured in base member 1 by any suitable means such as a set screw (not shown). At its bottom end, sleeve 2a is threaded for receiving a stop nut 4, also referred to as a roll set nut, which is screwed into the open bottom of sleeve 2a. Stop nut 4 has a head 4a which abuts the bottom edge of sleeve 2a and

rests on the bottom of the recess formed in base member 1. Stop nut 4 has an aperture 4b passing axially therethrough which communicates with an air supply conduit 1b extending along the lower portion of base member 1 and connected by a pipe 5 to a suitable supply 6 of air under pressure. An annular gasket 7 provides a suitable seal at the junction of stop nut head 4a and the adjacent portion of base member 1.

Rivet anvil 2, which projects substantially above base member 1, has at its top surface a rivet-deforming recessed portion 2c and is formed with a passage 2g extending axially therethrough in which a rivet guide pin or plunger 8 is slidably arranged. Pin 8 is secured at its bottom end to piston 9 which is slidably positioned in bore 2b below anvil 2, and at its upper end pin 8 has a conical shape for receiving the open bottom of a rivet 10. Guide pin 8, with piston 9 attached, is slidable in anvil passage 2g to an upper extended position wherein pin 8 projects a substantial distance above the anvil surface when piston 9 abuts annular stop surface 2d, as seen in FIG. 1, and to a lower position wherein pin 8 is retracted into anvil passage 2g and piston 9 abuts stop nut 4, as seen in FIG. 4. An air passage 2e is formed in the side of anvil 2 to enable entry of air into the space 2f above piston 9 when the latter is moved downward and to allow air to be exhausted therefrom when piston 9 is moved upward.

Rivet applying and driving mechanism 3, which may be of any known or suitable type and is shown only in fragmentary form in FIG. 1, comprises rivet driver 3a and separable rivet-holding jaws 3b, 3c yieldably held in closed position for retaining a rivet 10 as shown in FIG. 1 by spring members 3d, 3e, as conventional in the art. Such a mechanism is shown, for example, in U.S. Pat. No. 1,180,028. As will be understood, when rivet driver 3a is moved downwardly against rivet 10, the rivet spreads jaws 3b, 3c apart and is thereby released, as more fully explained below in connection with FIG. 3.

In accordance with the invention a resilient annular gasket 11, such as a rubber O-ring, is seated in an annular groove 9a formed in the periphery of piston 9 so that gasket 11 frictionally engages the inner surface of bore sleeve 2a and thereby frictionally holds piston 9 stationary in whatever position it is moved to within bore 2b.

Valve 13 in air conduit 5 is adjustable to transmit air under pressure from air supply 6 to bore 2b in base member 1 and may alternatively be turned to allow air in bore 2b to be exhausted through outlet 5a upon downward movement of piston 9.

In the operation of the described apparatus, guide pin 8 is moved to extended position as shown in FIG. 1 by introducing air under pressure to bore 2b which pushes piston 9 upwardly, and the latter is held in this position by the frictional engagement of O-ring 11 with sleeve 2a. Pin 8 is thereby in position to receive the work to be riveted as well as the rivet to be applied.

FIG. 2 shows the work, in this case a terminal board 15 with metal strip 16 to be riveted thereto, placed on anvil 2 with guide pin 8 inserted through aligned holes in terminal board 15 and metal strip 16 through which the pin 8 freely passes. At this stage, the work is ready to receive the rivet 10 from the rivet driving mechanism 3, and valve 13 is arranged to allow air to be exhausted from bore 2b.

As seen in FIG. 3, rivet driving mechanism 3 is then moved downwardly with the bottom of rivet 10 resting on the top of pin 8 so as to be guided by the latter into the proper position for riveting. At this stage, rivet 10 passes outwardly from between holding jaws 3b, 3c upon continued downward movement of rivet driver 3a, and at the same time pin 8 along with attached piston 9 is pushed downwardly.

When the parts reach the position shown in FIG. 4, piston 9 abuts roll set nut 4 and the bottom of rivet 10 reaches anvil recess 2c, so that further downward movement of rivet driver 3a causes the bottom of rivet 10 to be deformed and clinched against the adjacent surface of metal strip 16, thereby securely riveting the latter to terminal board 15.

Following this operation, rivet driving mechanism 3a (along with rivet carriers 3b, 3c) is moved upward away from the work, while piston 9 and guide pin 8 remain in the lower retracted position shown in FIG. 4 due to the frictional engagement of O-ring 11 with sleeve 2a. At this stage, base member 1 may be moved laterally so as to place another anvil (with the work in place) beneath rivet driving mechanism 3 for another riveting operation, or the riveted work may be removed from base member 1 without hindrance from guide pin 8 which is in retracted position.

To prepare the anvil device for another riveting operation, valve 13 is then adjusted to supply air under pressure to bore 2b for moving piston 9 and guide pin 8 upwardly into the extended position, as shown in FIG. 1, and the procedure described above is repeated.

While the present invention has been described with reference to particular embodiments thereof, it will be understood that numerous modifications may be made by those skilled in the art without actually departing from the scope of the invention. Therefore, the appended claims are intended to cover all such equivalent variations as come within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Riveting apparatus comprising, in combination, work support means having channel means therein opening exteriorly thereof, elongated rivet guide means arranged in said channel means for axial movement therein, said rivet guide means being movable between an extended position projecting outwardly of said opening and a retracted position withdrawn within said channel means, retaining means arranged on said rivet guide means for movement therewith in frictional contact with said channel means and being adapted to frictionally hold said rivet guide means in stationary position, and fluid supply means connected to said channel means for supplying fluid under pressure thereto for moving said rivet guide means from retracted to extended position.

2. Apparatus as defined in claim 1, said work support means

comprising a base member and an anvil mounted thereon, said channel means comprising a bore in said base member and a passage in said anvil communicating with each other, said rivet guide means comprising a rivet guide pin slidably arranged in said anvil passage and a piston secured to said guide pin arranged in said bore for axial movement therein.

3. Apparatus as defined in claim 2, said retaining means comprising resilient means arranged between said piston and the wall of said bore.

4. Apparatus as defined in claim 3, said piston having an annular recess extending around its periphery, said resilient means comprising an annular gasket member seated in said recess.

5. Apparatus as defined in claim 2, said anvil arranged at one end of said bore, stop means at the opposite end of said bore for limiting the movement of said piston towards said opposite end, said stop means having an aperture extending therethrough, said fluid supply means comprising conduit means in said base member communicating with said bore therein through said stop means aperture.

6. Apparatus as defined in claim 5, said fluid supply means comprising valve means for exhausting fluid from said bore.

7. Apparatus as defined in claim 5, said anvil having tubular sleeve means extending into said base member and defining said bore therein, said stop means comprising a nut threaded into said sleeve means at said opposite end of said bore.

8. Apparatus as defined in claim 1, said work support means having a plurality of adjacent channel means, each having elongated rivet guide means and retaining means as defined in claim 1, said fluid supply means being connected to each of said channel means.

9. Apparatus as defined in claim 1, and rivet applying and driving means arranged adjacent said work support means for depositing a rivet on said rivet guide means, for moving the same in conjunction with the latter means through work adapted to be positioned on said work support means, and for co-acting with said work support means to fasten the rivet on the work.

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