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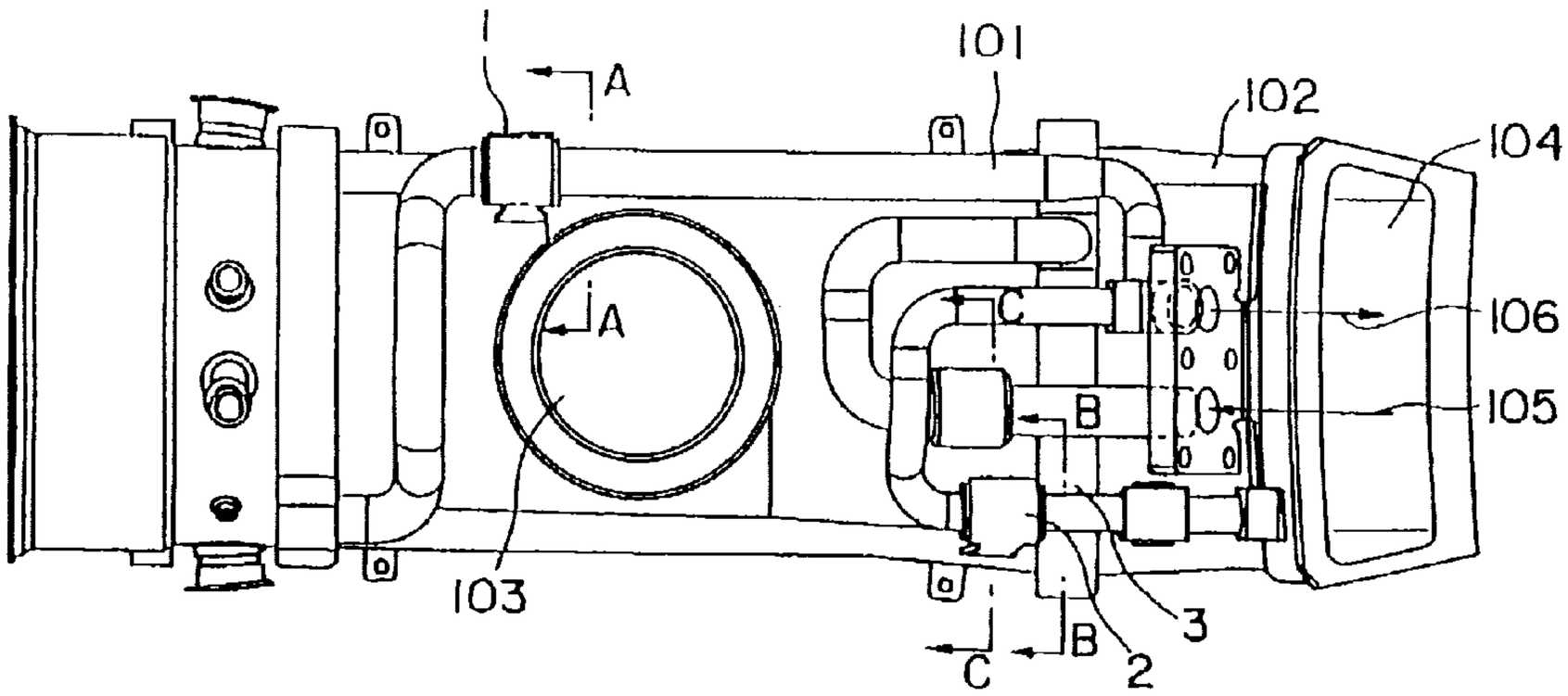
(54) **SUPPORT DE TUYAUTERIE DE CHAMBRE DE COMBUSTION REFROIDIE A LA VAPEUR DANS UNE TURBINE A GAZ**

(54) **PIPING SUPPORT OF GAS TURBINE STEAM COOLED COMBUSTOR**



(57) Piping support of gas turbine steam cooled combustor is improved such that even when the piping support is damaged by combustion vibration, dropping thereof out of piping is prevented so as to avoid intrusion of fractions into turbine portion. Outer fitting member (11) is fixed to wall surface of tail tube (102) by welding 82, 83. Ring (12) is pinched inside the outer fitting member (11) to be fixed by welding (80). The ring (12) having inner diameter slightly larger than outer diameter of steam piping (101) is fitted in around the steam piping (101) to be fixed by welding (81) at three places. The steam piping (101) is fixed to the ring (12), the ring (12) is fixed to the outer fitting member (11) and the outer fitting member (11) is fixed to the tail tube (102), thus the steam piping (101) is supported to the tail tube (102) and even when the welding 82, 83 is detached by combustion vibration, there occurs no case of the outer fitting member (11) being dropped of the steam piping (101).

ABSTRACT

Piping support of gas turbine steam cooled combustor is improved such that even when the piping support is damaged by combustion vibration, dropping thereof out of piping is prevented so as to avoid intrusion of fractions into turbine portion. Outer fitting member (11) is fixed to wall surface of tail tube (102) by welding 82, 83. Ring (12) is pinched inside the outer fitting member (11) to be fixed by welding (80). The ring (12) having inner diameter slightly larger than outer diameter of steam piping (101) is fitted in around the steam piping (101) to be fixed by welding (81) at three places. The steam piping (101) is fixed to the ring (12), the ring (12) is fixed to the outer fitting member (11) and the outer fitting member (11) is fixed to the tail tube (102), thus the steam piping (101) is supported to the tail tube (102) and even when the welding 82, 83 is detached by combustion vibration, there occurs no case of the outer fitting member (11) being dropped of the steam piping (101).

PIPING SUPPORT OF GAS TURBINE STEAM COOLED COMBUSTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a piping support of a gas turbine steam cooled combustor and more particularly to a piping support so improved that even when the piping support is damaged by combustion vibration, etc., dropping thereof is prevented so as to avoid an intrusion of fractions into a turbine portion to thereby prevent an accident of gas turbine blades, etc.

2. Description of the Prior Art

Fig. 5 shows an example of a gas turbine steam cooled combustor to which piping supports in the prior art are applied, wherein Fig. 5(a) is a plan view, and Fig. 5(b) is a side view. In Figs. 5(a) and (b), a tail tube 102 of the combustor comprises a combustion gas outlet 104, through which a high temperature combustion gas is supplied into a gas path of the gas turbine. The tail tube 102 comprises also a by-pass pipe connecting port 103 for taking air from a turbine cylinder and a steam piping 101 is disposed around the by-pass pipe connecting port 103. The steam piping 101 is a piping through which cooling steam is supplied from a steam supply port 105 into a cooling passage provided on an inner circumferential wall of the tail tube 102 of the combustor and, after having cooled the wall of the tail tube 102 and elevated of temperature, is recovered from a steam recovering port 106. The steam piping 101 is supported by piping supports 110, 111, 112 and each of the piping supports 110, 111, 112 is fixed to an outer wall of the tail

tube 102 of the combustor.

Fig. 6 shows the piping support 110, wherein Fig. 6(a) is a front view seen from arrow on line D-D of Fig. 5(a), Fig. 6(b) is a plan view and Fig. 6(c) is a side view. In Figs. 6(a) to (c), the steam piping 101 is supported such that the steam piping 101 is pinched between upper and lower clamps 121, 122 via a spacer 125 disposed around the steam piping 101, the upper and lower clamps 121, 122 are fastened together by bolts/nuts 123, 124 and the lower clamp 122 is fixed by welding to the outer wall of the tail tube 102 via a fitting member 122a. The present example is an example where the lower clamp 122 has its one end fitted with the fitting member 122a to thereby support the steam piping 101 at the one end.

Fig. 7 shows the piping support 111, wherein Fig. 7(a) is a front view seen from arrow on line E-E of Fig. 5(a), Fig. 7(b) is a plan view and Fig. 7(c) is a side view. In Figs. 7(a) to (c), like Figs. 6(a) to (c), the steam piping 101 is supported such that the steam piping 101 is pinched between upper and lower clamps 221, 222 via a spacer 225 disposed around the steam piping 101, the upper and lower clamps 221, 222 are fastened together by bolts/nuts 223, 224 and the lower clamp 222 at its central portion is fixed by welding to the outer wall of the tail tube 102 via a fitting member 222a. The present example is an example where the lower clamp 222 has its central portion fitted with the fitting member 222a to thereby support the steam piping 101 at the central portion.

Fig. 8 shows the piping support 112, wherein Fig. 8(a) is a front view seen from arrow on line F-F of Fig. 5(a), Fig. 8(b) is a plan view, Fig. 8(c) is a side view and Fig. 8(d) is a bottom view.

In Fig. 8(a) to (d), the steam piping 101 is supported such that the steam piping 101 is pinched between upper and lower clamps 321, 322 via a spacer 325 disposed around the steam piping 101, the upper and lower clamps 321, 322 are fastened together by bolts/nuts 323, 324 and the lower clamp 322 is fixed by welding to the outer wall of the tail tube via fitting members 322a, 322b joined together in an L-shape. The present example is an example where the fitting members 322a, 322b joined together in the L-shape are interposed to thereby support the steam piping 101.

As mentioned above, the conventional steam piping 101 is supported fixedly using the upper and lower clamps, spacer and bolts/nuts so as to defend against vibration, etc., wherein the lower clamp is fixed to the wall surface of the tail tube via the fitting member 122a or 222a, or the fitting members 322a, 322b, selected corresponding to a curved surface of the tail tube 102.

In the conventional gas turbine steam cooled combustor as mentioned above, the steam piping for the cooling steam is provided on the wall surface of the tail tube to be supported such that the steam piping is fixed to the piping support and the piping support is fixed by welding to the wall surface of the tail tube. The piping support comprises the upper and lower clamps, both made in a C-shape, and it is so constructed that the steam piping is pinched between the upper and lower clamps via the spacer, the upper and lower clamps are fastened together by the bolts/nuts and the piping support is fixed to the wall surface of the tail tube. While the gas turbine is operated, there is occurring a combustion vibration and in the piping support so constructed, there may be a case where

the fixation of the fitting member is loosened and should the fitting member be damaged to be detached of the wall surface of the tail tube and the bolts/nuts be loosened by vibration, for example, then the clamps may drop out of the piping so that fractions thereof may enter a turbine portion together with combustion gas and in such case, there is a large possibility that the gas turbine is seriously damaged in the blades, etc.

SUMMARY OF THE INVENTION

In view of the mentioned problem in the prior art, it is an object of the present invention to provide a piping support of a gas turbine steam cooled combustor in which the piping support supporting a steam piping has a construction so improved that even when the piping support is damaged by combustion vibration of the combustor or the like, dropping thereof out of the steam piping is prevented so as to avoid an intrusion of fractions into a turbine portion to thereby prevent an accident of gas turbine blades, etc.

In order to achieve the object, the present invention provides the following means.

A piping support of a gas turbine steam cooled combustor, characterized in that the piping support comprises a ring fitted in around a steam piping to be fixed to each other and an outer fitting member formed in a U-shape so that the ring makes contact with an inner circumferential surface portion of the outer fitting member to be fixed to each other, the outer fitting member at both ends thereof opposite to the inner circumferential surface portion being fixed to a wall surface of a tail tube.

In the piping support of the present invention, the ring is fitted in around the steam piping and the steam piping at the outer circumferential surface thereof is fixed to the ring by welding or the like. The ring at the outer circumferential surface thereof makes contact with the inner circumferential surface portion of the outer fitting member formed in the U-shape to be fixed to each other by welding or the like. Thus, the steam piping is supported to the wall surface of the tail tube via the ring and the outer fitting member. As the ring and the outer fitting member are fixed to each other, even when the outer fitting member is detached of the wall surface of the tail tube due to fatigue by combustion vibration or the like, the outer fitting member is supported to the steam piping via the ring and there occurs no case of the outer fitting member being dropped of the piping. Hence, there arises no case of dropped fractions coming into the gas path of the gas turbine and turbine blades and the like are prevented from being damaged.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an example of a gas turbine steam cooled combustor to which piping supports of embodiments of the present invention are applied, wherein Fig. 1(a) is a plan view and Fig. 1(b) is a side view.

Fig. 2 shows one piping support of the embodiments of the present invention, wherein Fig. 2(a) is a front view seen from arrow on line A-A of Fig. 1(a), Fig. 2(b) is a cross sectional view taken on line X-X of Fig. 2(a), Fig. 2(c) is a right hand side view

and Fig. 2(d) is a left hand side view.

Fig. 3 shows another piping support of the embodiments of the present invention, wherein Fig. 3(a) is a front view seen from arrow on line B-B of Fig. 1(a), Fig. 3(b) is a cross sectional view taken on line Y-Y of Fig. 3(a) and Fig. 3(c) is a side view.

Fig. 4 shows still another piping support of the embodiments of the present invention, wherein Fig. 4(a) is a front view seen from arrow on line C-C of Fig. 1(a), Fig. 4(b) is a cross sectional view taken on line Z-Z of Fig. 4(a) and Fig. 4(c) is a side view.

Fig. 5 shows an example of a gas turbine steam cooled combustor to which piping supports in the prior art are applied, wherein Fig. 5(a) is a plan view and Fig. 5(b) is a side view.

Fig. 6 shows one piping support of those shown in Fig. 5(a), wherein Fig. 6(a) is a front view seen from arrow on line D-D of Fig. 5(a), Fig. 6(b) is a plan view and Fig. 6(c) is a side view.

Fig. 7 shows another piping support of those shown in Fig. 5(a), wherein Fig. 7(a) is a front view seen from arrow on line E-E of Fig. 5(a), Fig. 7(b) is a plan view and Fig. 7(c) is a side view.

Fig. 8 shows still another piping support of those shown in Fig. 5(a), wherein Fig. 8(a) is a front view seen from arrow on line F-F of Fig. 5(a), Fig. 8(b) is a plan view, Fig. 8(c) is a side view and Fig. 8(d) is a bottom view.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Herebelow, embodiments according to the present invention will be described concretely with reference to figures. Fig. 1 shows an example of a gas turbine steam cooled combustor to which piping

supports of embodiments of the present invention are applied, wherein Fig. 1(a) is a plan view and Fig. 1(b) is a side view. In Figs. 1(a) and (b), the parts and components designated by numerals 101 to 106 are same in the function as those shown in Figs. 5(a) and (b) with description thereon being omitted, and featured portions of the present invention, which are piping supports designated by numerals 1, 2, 3, will be described in detail.

Fig. 2 shows a piping support 1, wherein Fig. 2(a) is a front view seen from arrow on line A-A of Fig. 1(a). Fig. 2(b) is a cross sectional view taken on line X-X of Fig. 2(a), Fig. 2(c) is a right hand side view and Fig. 2(d) is a left hand side view. In Figs. 2(a) to (d), numeral 1 designates the entire piping support, numeral 11 designates an outer fitting member, which is formed in a U-shape, and numeral 12 designates a ring, which inscribes an inner circumferential surface portion of the outer fitting member 11. The ring 12 has an inner diameter slightly larger than an outer diameter of the steam piping 101 so that the ring 12 may be fitted in around the steam piping 101.

The outer fitting member 11 and the ring 12 are joined together to be fixed by welding 80 at two places where both side edge portions of the outer fitting member 11 make contact with an outer circumferential surface of the ring 12. The ring 12 and the steam piping 101 are joined together to be fixed by welding 81 at three places where an inner circumferential surface of the ring 12 makes contact with an outer circumferential surface of the steam piping 101. Further, the outer fitting member 11 is joined to a curved outer wall surface of the tail tube 102 by welding 82, 83 at two

places where both end portions of the outer fitting member 11 make contact with the curved outer wall surface of the tail tube 102. Thus, the steam piping 101 is supported to the tail tube 102.

In the piping support 1 of the above construction, the steam piping 101 is fixed to the inner circumferential surface of the ring 12 by welding 81 at the three places, the ring 12 at the outer circumferential surface thereof is fixed to the both side edge portions of the outer fitting member 11 by welding 80 at the two places and the outer fitting member 11 at the both end portions thereof, which are formed to the size of the height of the piping above the curved outer wall surface of the tail tube 102, is fixed to the outer wall of the tail tube 102 by welding 82, 83.

As the result of this, the steam piping 101 is supported to the outer wall of the tail tube 102 via the ring 12 and the outer fitting member 11, wherein the ring 12 and the outer fitting member 11 are joined together by welding 80. Thus, even when both the welding 82, 83 at two places of the outer fitting member 11 are detached due to combustion vibration, etc., the outer fitting member 11 is fixed to the ring 12 and the ring 12 is fitted in around, and fixed to, the steam piping 101, hence there occurs no case of the outer fitting member 11 being dropped of the steam piping 101.

Fig. 3 shows a piping support 2, wherein Fig. 3(a) is a front view seen from arrow on line B-B of Fig. 1(a), Fig. 3(b) is a cross sectional view taken on line Y-Y of Fig. 3(a) and Fig. 3(c) is a side view. In Figs. 3(a) to (c), numeral 2 designates the piping support, of which construction is substantially same as that of the

piping support 1 shown in Fig. 2(a) to (d), and numeral 21 designates an outer fitting member and numeral 22 designates a ring. The ring 22 inscribes an inner circumferential surface portion of the outer fitting member 21 and has an inner diameter slightly larger that an outer diameter of the steam piping 101 so that the ring 22 may be fitted in around the steam piping 101.

The outer fitting member 21 and the ring 22 are joined together to be fixed by welding 80 at two places where both side edge portions of the outer fitting member 21 make contact with an outer circumferential surface of the ring 22. The ring 22 and the steam piping 101 are joined together to be fixed by welding 81 at three places where an inner circumferential surface of the ring 22 makes contact with an outer circumferential surface of the steam piping 101. Further, the outer fitting member 21 is joined to a curved outer wall surface of the tail tube 102 by welding 82, 83 at two places where both end portions of the outer fitting member 21 make contact with the curved outer wall surface of the tail tube 102. Thus, the steam piping 101 is supported to the tail tube 102.

In the piping support 2 of the above construction, the steam piping 101 is fixed to the inner circumferential surface of the ring 22 by welding 81 at the three places, the ring 22 at the outer circumferntial surface thereof is fixed to the both side edge portions of the outer fitting member 21 by welding 80 at the two places and the outer fitting member 21 at the both end portions thereof, which are formed to the size of the height of the piping above the curved outer wall surface of the tail tube 102, is fixed to the outer wall of the tail tube 102 by welding 82, 83.

As the result of this, like the piping support 1 shown in Figs. 2(a) to (d), the steam piping 101 is supported to the outer wall of the tail tube 102 via the ring 22 and the outer fitting member 21, wherein the ring 22 and the outer fitting member 21 are joined together by welding 80. Thus, even when both the welding 82, 83 at two places of the outer fitting member 21 are detached due to combustion vibration, etc., the outer fitting member 21 is fixed to the ring 22 and the ring 22 is fitted in around, and fixed to, the steam piping 101, hence there occurs no case of the outer fitting member 21 being dropped of the steam piping 101.

Fig. 4 shows a piping support 3, wherein Fig. 4(a) is a front view seen from arrow on line C-C of Fig. 1(a), Fig. 4(b) is a cross sectional view taken on line Z-Z of Fig. 4(a) and Fig. 4(c) is a side view. In Figs. 4(a) to (c), numeral 3 designates the piping support, of which construction is substantially same as those of the piping supports 1, 2 shown in Fig. 2(a) to (d) and Figs. 3(a) to (c), and numeral 31 designates an outer fitting member and numeral 32 designates a ring. The ring 32 inscribes an inner circumferential surface portion of the outer fitting member 31 and has an inner diameter slightly larger than an outer diameter of the steam piping 101 so that the ring 32 may be fitted in around the steam piping 101.

The outer fitting member 31 and the ring 32 are joined together to be fixed by welding 80 at two places where both side edge portions of the outer fitting member 31 make contact with an outer circumferential surface of the ring 32. The ring 32 and the steam piping 101 are joined together to be fixed by welding 81 at three

places where an inner circumferential surface of the ring 32 makes contact with an outer circumferential surface of the steam piping 101. Further, the outer fitting member 31 is joined to a curved outer wall surface of the tail tube 102 by welding 82, 83 at two places where both end portions of the outer fitting member 31 make contact with the curved outer wall surface of the tail tube 102. Thus, the steam piping 101 is supported to the tail tube 102.

In the piping support 3 of the above construction, the steam piping 101 is fixed to the inner circumferential surface of the ring 32 by welding 81 at the three places, the ring 32 at the outer circumferential surface thereof is fixed to the both side edge portions of the outer fitting member 31 by welding 80 at the two places and the outer fitting member 31 at the both end portions thereof, which are formed to the size of the height of the piping above the curved outer wall surface of the tail tube 102, is fixed to the outer wall of the tail tube 102 by welding 82, 83.

As the result of this, like the piping supports 1, 2 shown in Figs. 2(a) to (d) and Figs. 3(a) to (c), the steam piping 101 is supported to the outer wall of the tail tube 102 via the ring 32 and the outer fitting member 31, wherein the ring 32 and the outer fitting member 31 are joined together by welding 80. Thus, even when both the welding 82, 83 at two places of the outer fitting member 31 are detached due to combustion vibration, etc., the outer fitting member 31 is fixed to the ring 32 and the ring 32 is fitted in around, and fixed to, the steam piping 101, hence there occurs no case of the outer fitting member 31 being dropped of the steam piping 101.

It is understood that the invention is not confined to the particular construction and arrangement of parts herein illustrated and described but embraces such modified forms thereof as come within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A piping support of a gas turbine steam cooled combustor, characterized in that said piping support comprises a ring (12, 22, 32) fitted in around a steam piping (101) to be fixed to each other, and an outer fitting member (11, 21, 31) formed in a U-shape so that said ring makes contact with an inner circumferential surface portion of said outer fitting member to be fixed to each other, said outer fitting member at both ends thereof opposite to said inner circumferential surface portion being fixed to a wall surface of a tail tube (102).

2. A piping support of a gas turbine steam cooled combustor as claimed in Claim 1, characterized in that said ring (12, 22, 32) and said steam piping (101) and said ring (12, 22, 32) and said outer fitting member (11, 21, 31), respectively, are fixed to each other by welding (81, 80).

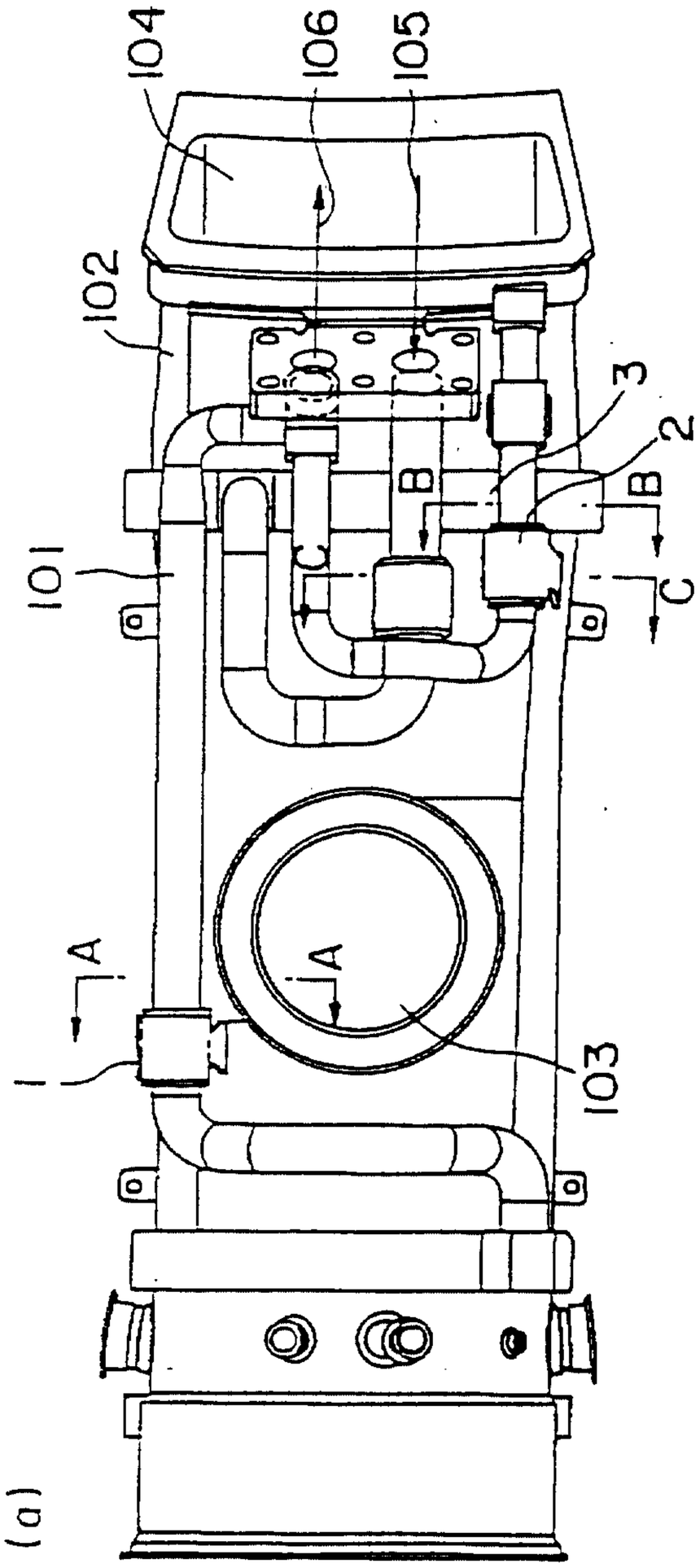


Fig. 1

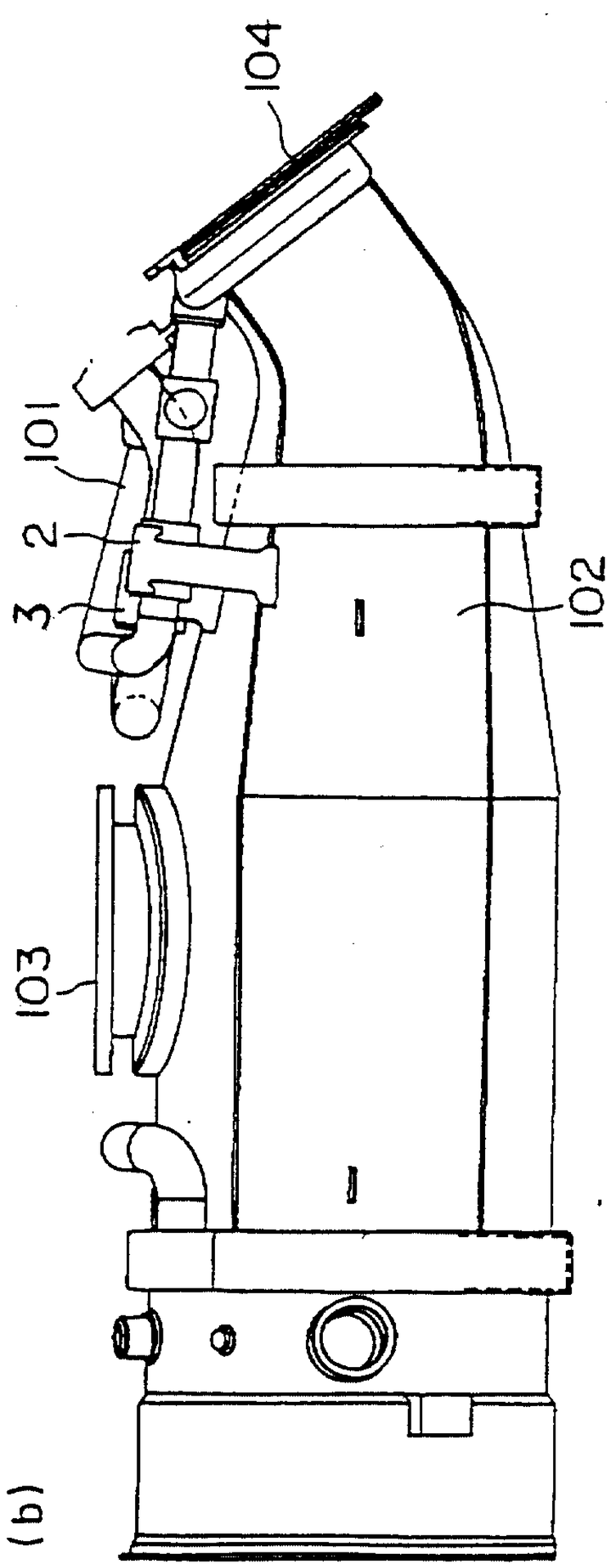
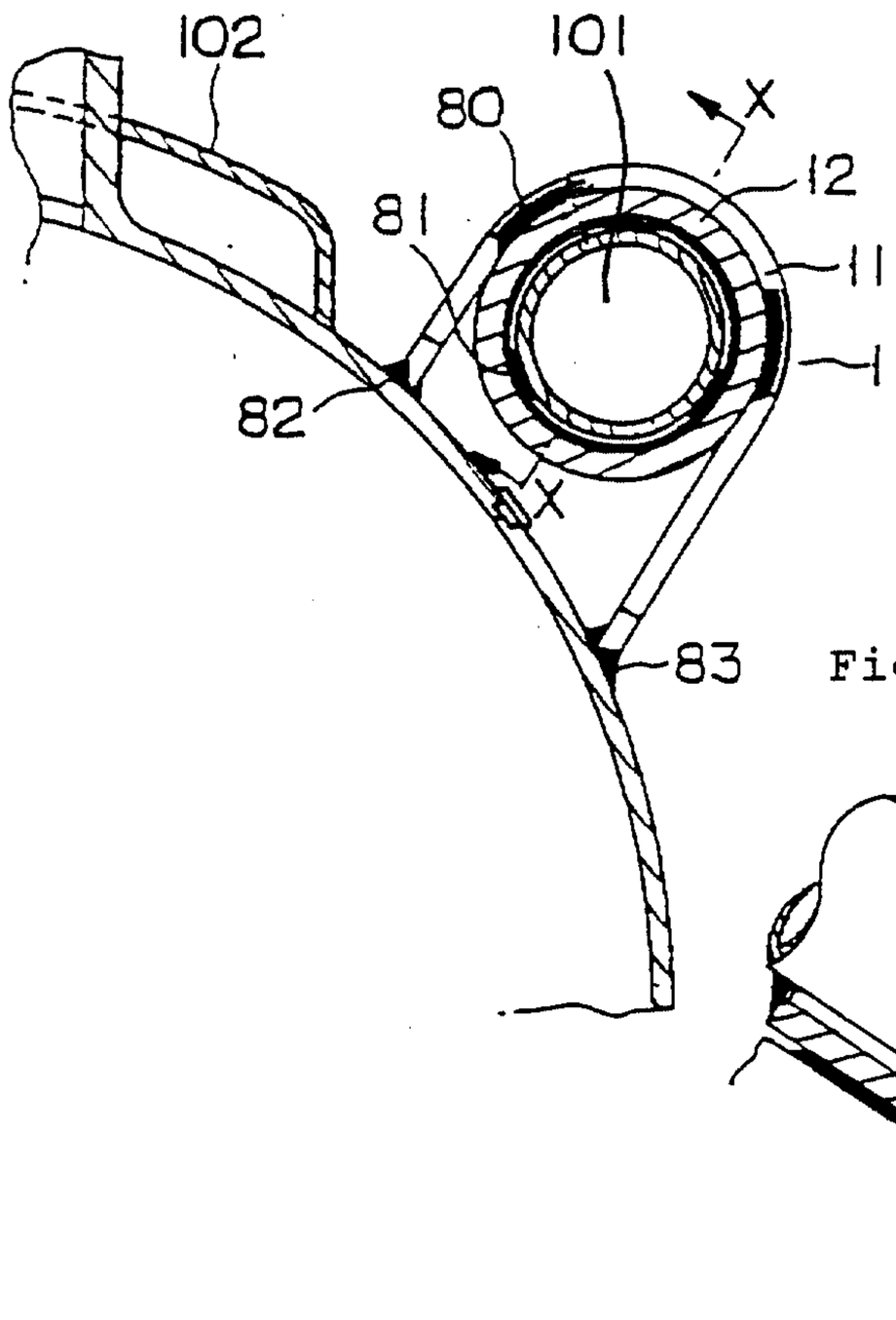


Fig. 1

Fig. 2 (a)



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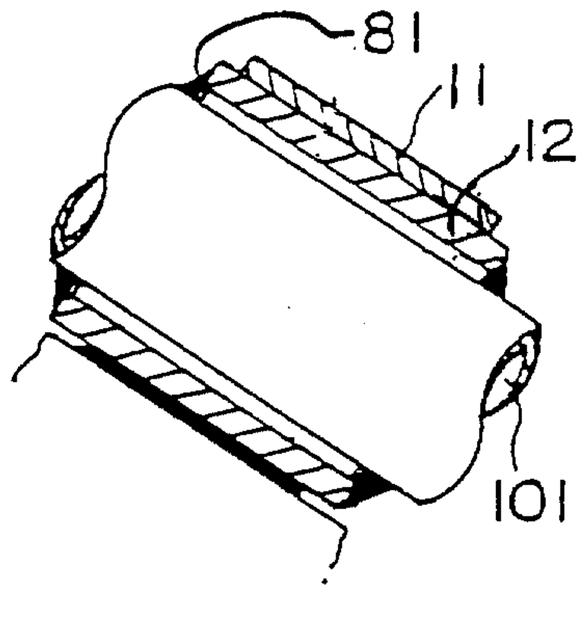


Fig. 2 (c)

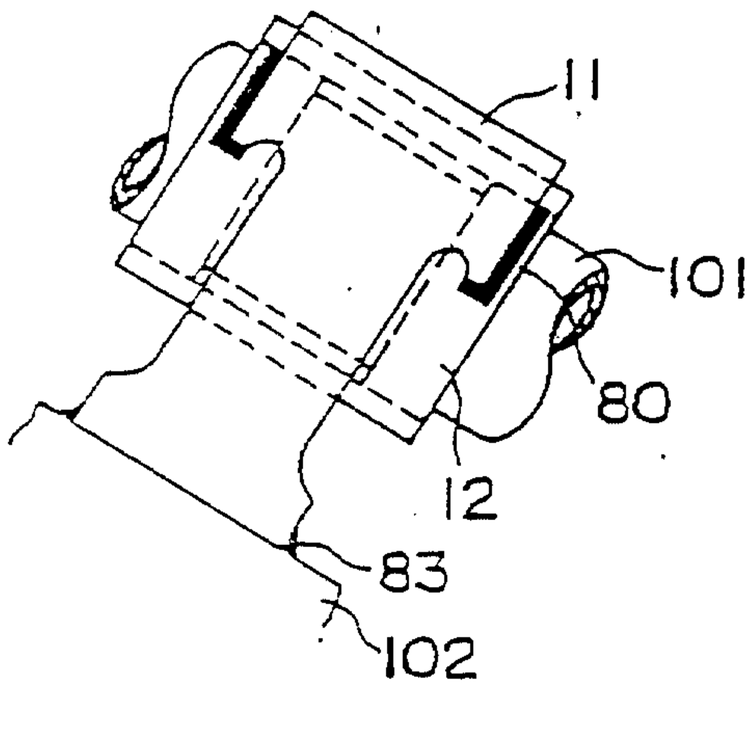


Fig. 2 (d)

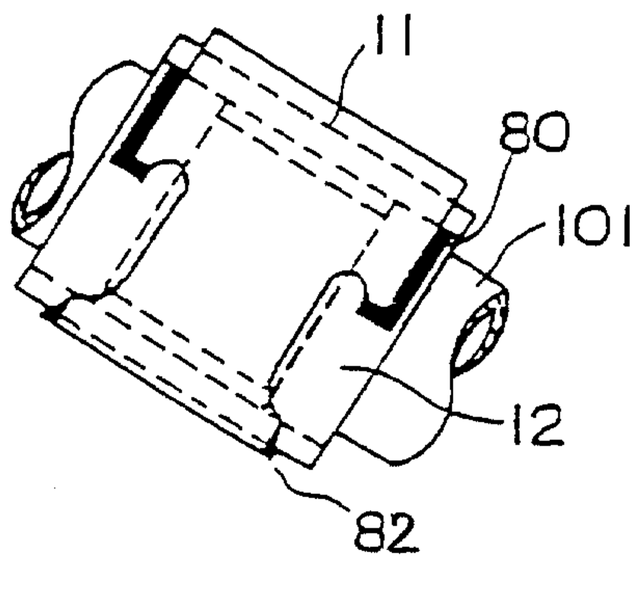


Fig. 3(a)

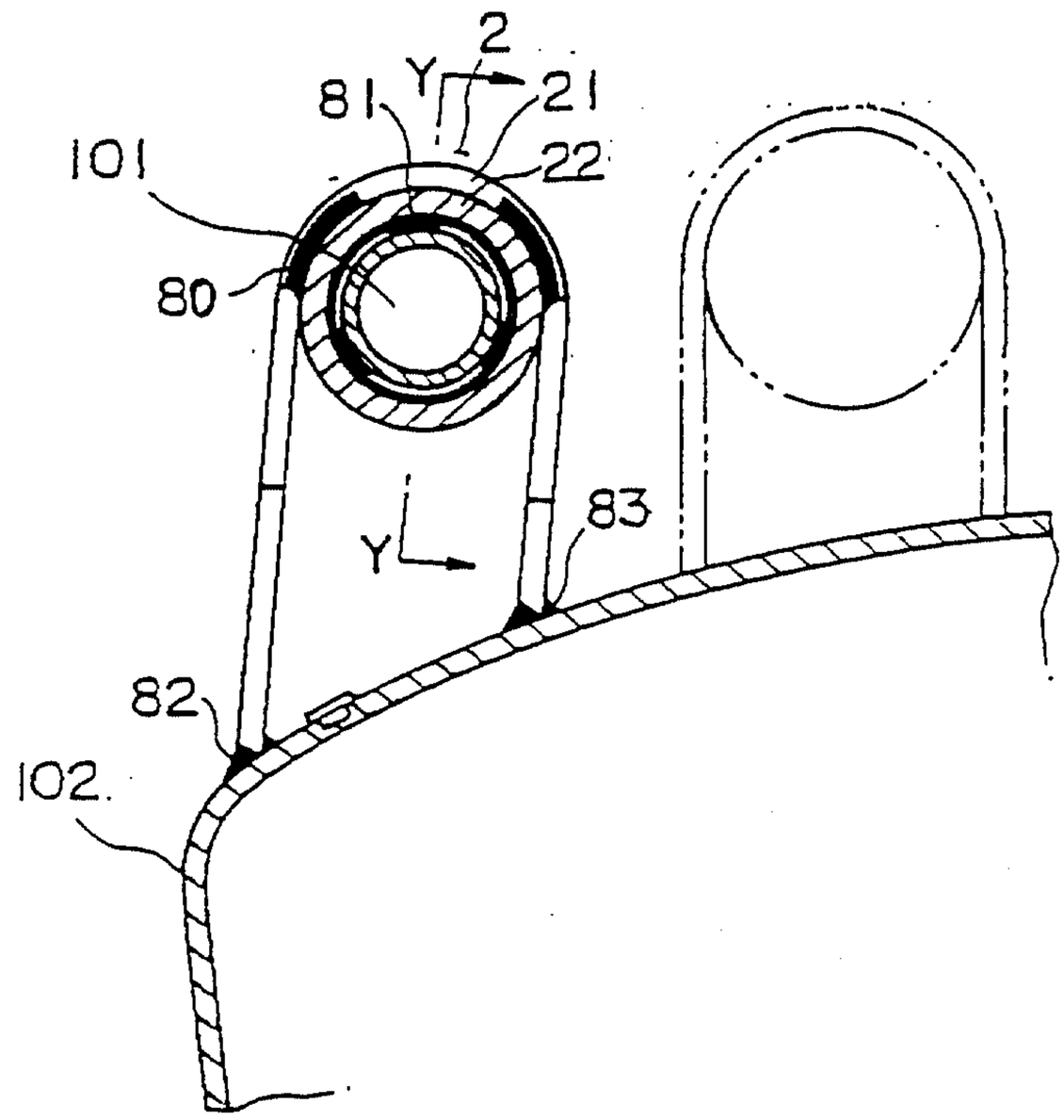


Fig. 3(b)

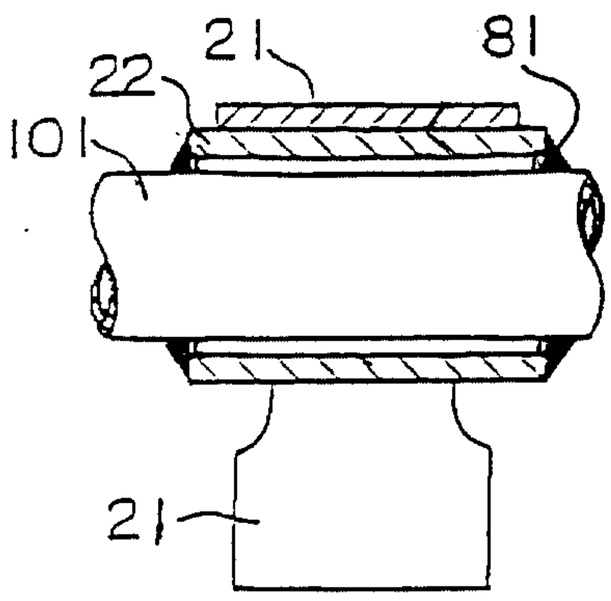


Fig. 3(c)

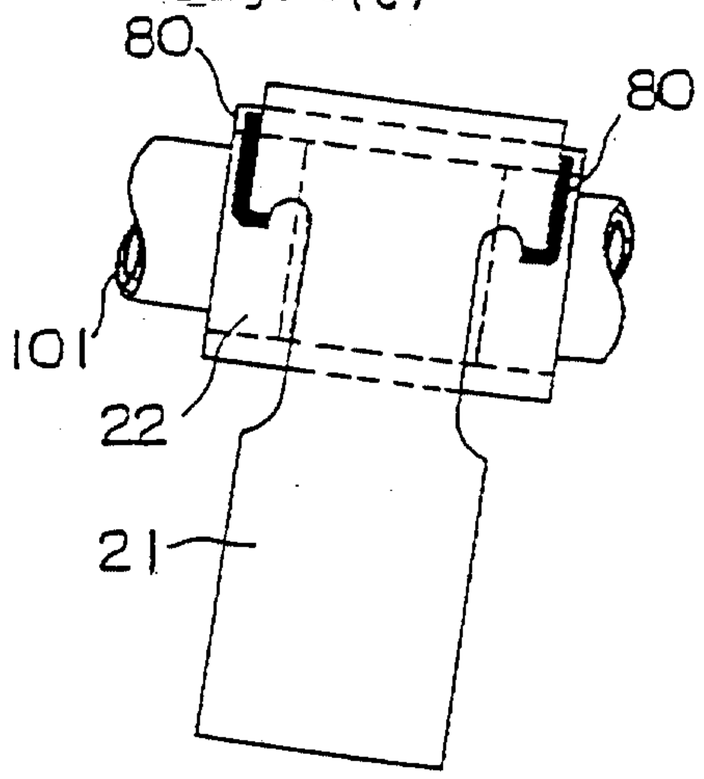


Fig. 4(a)

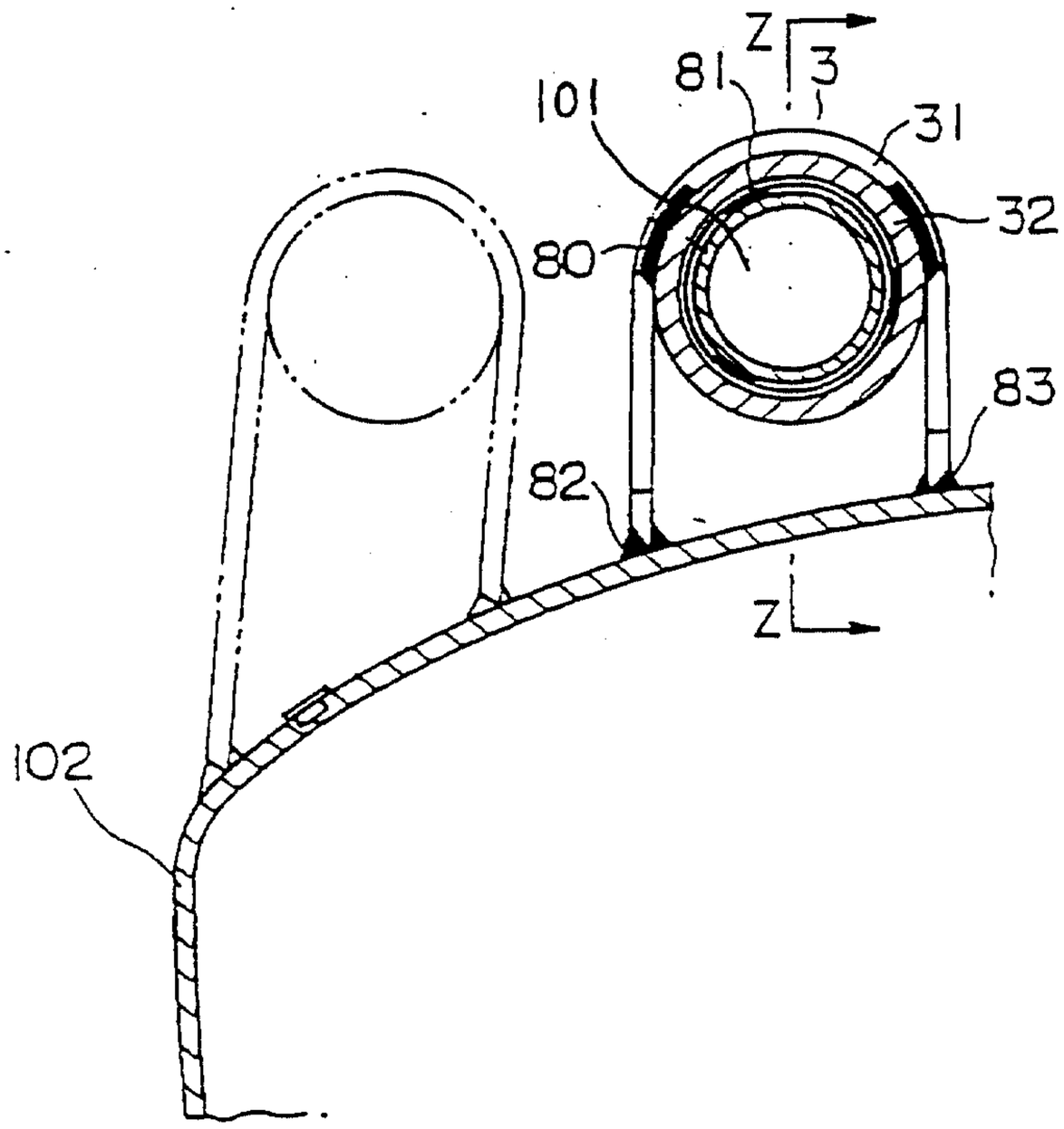


Fig. 4(b)

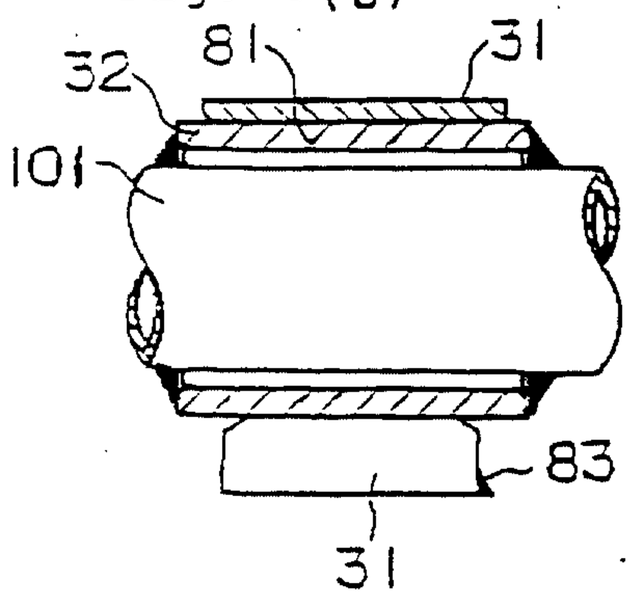
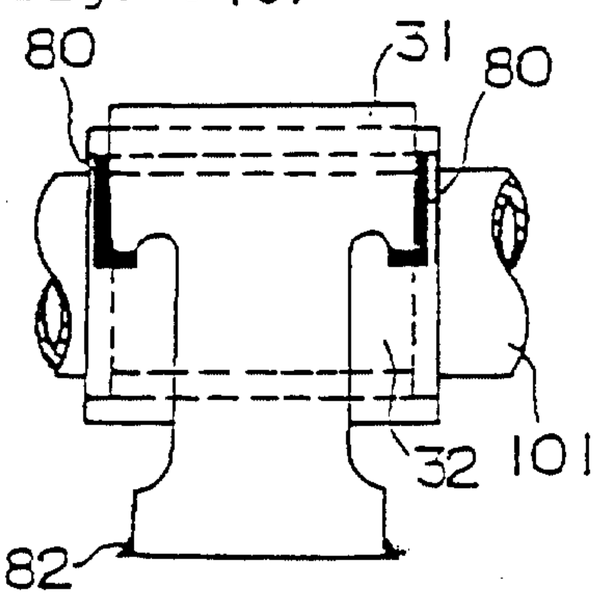


Fig. 4(c)



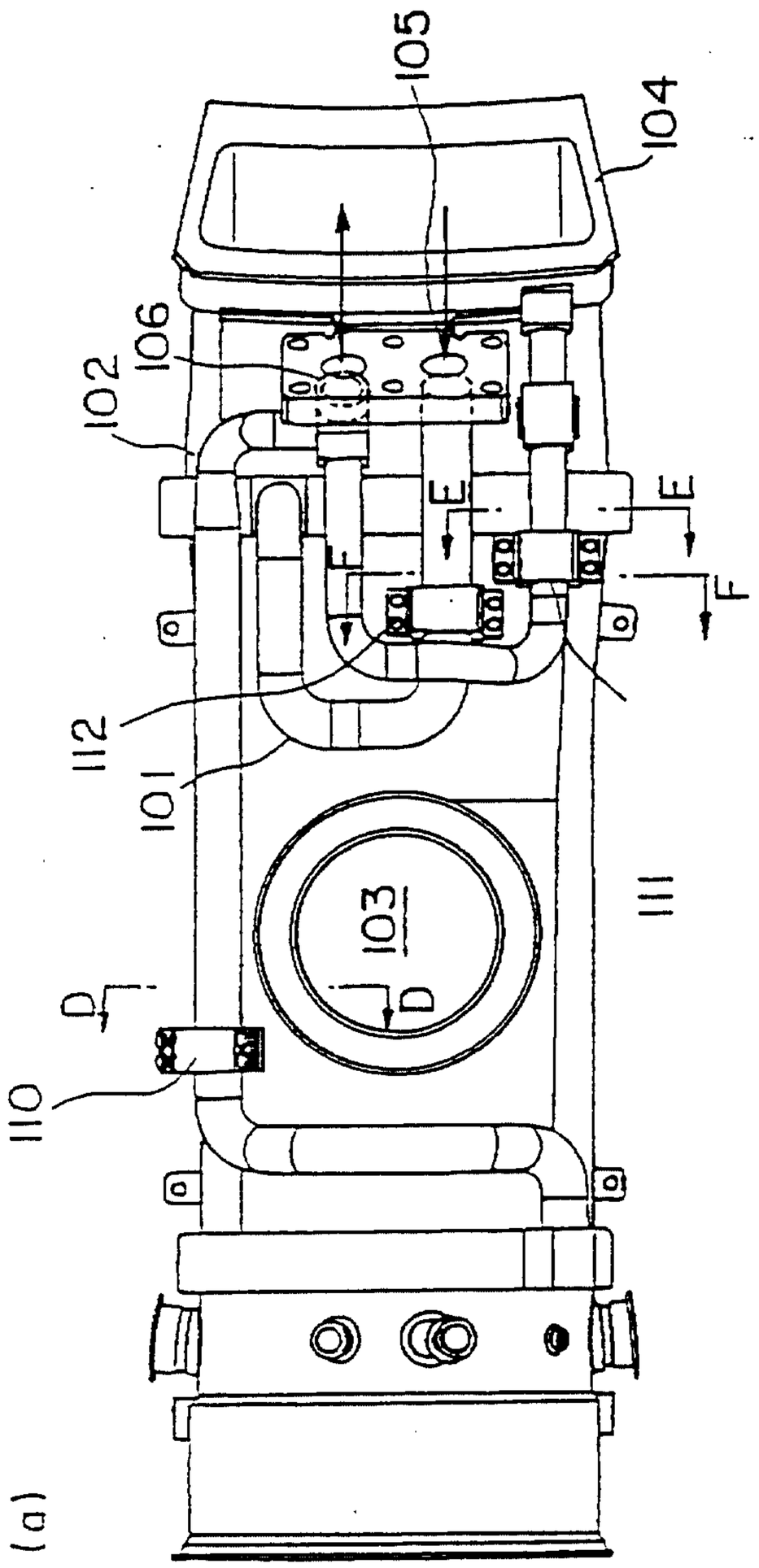


Fig. 5 (a)

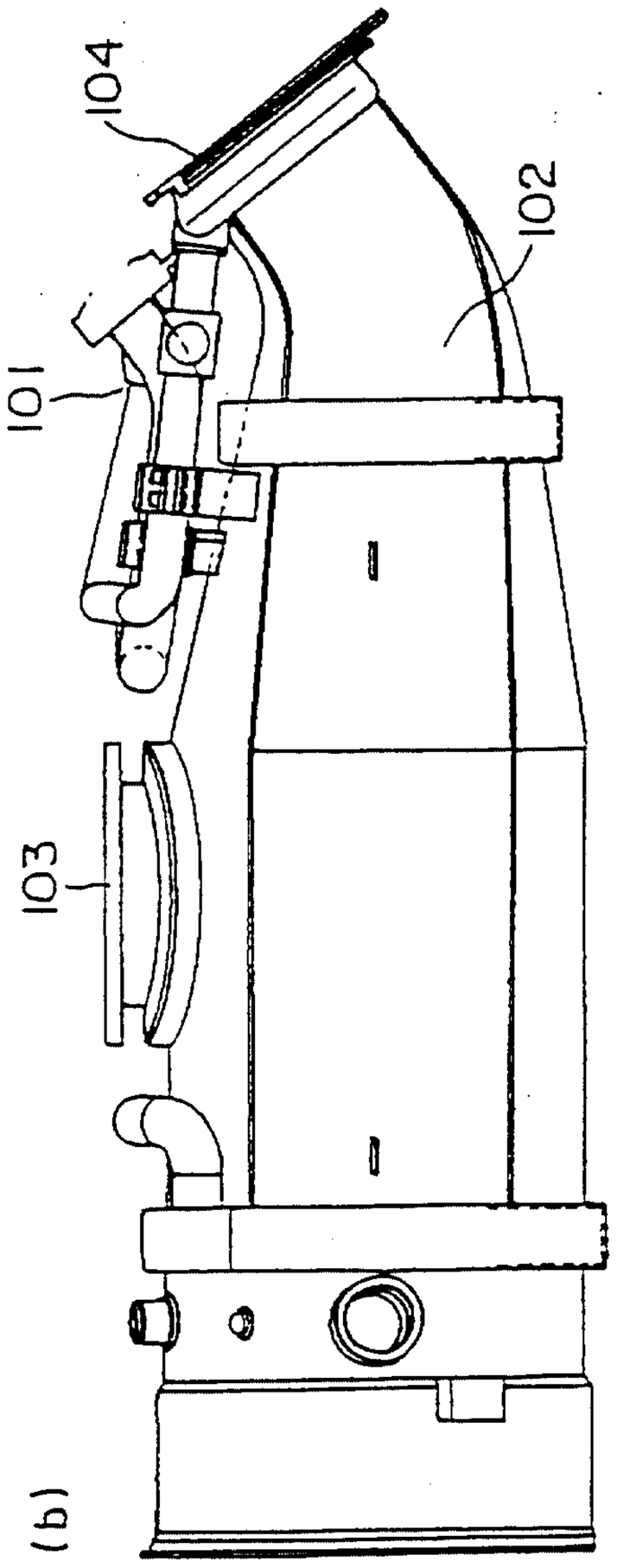


Fig. 5 (b)

Fig. 6 (a)

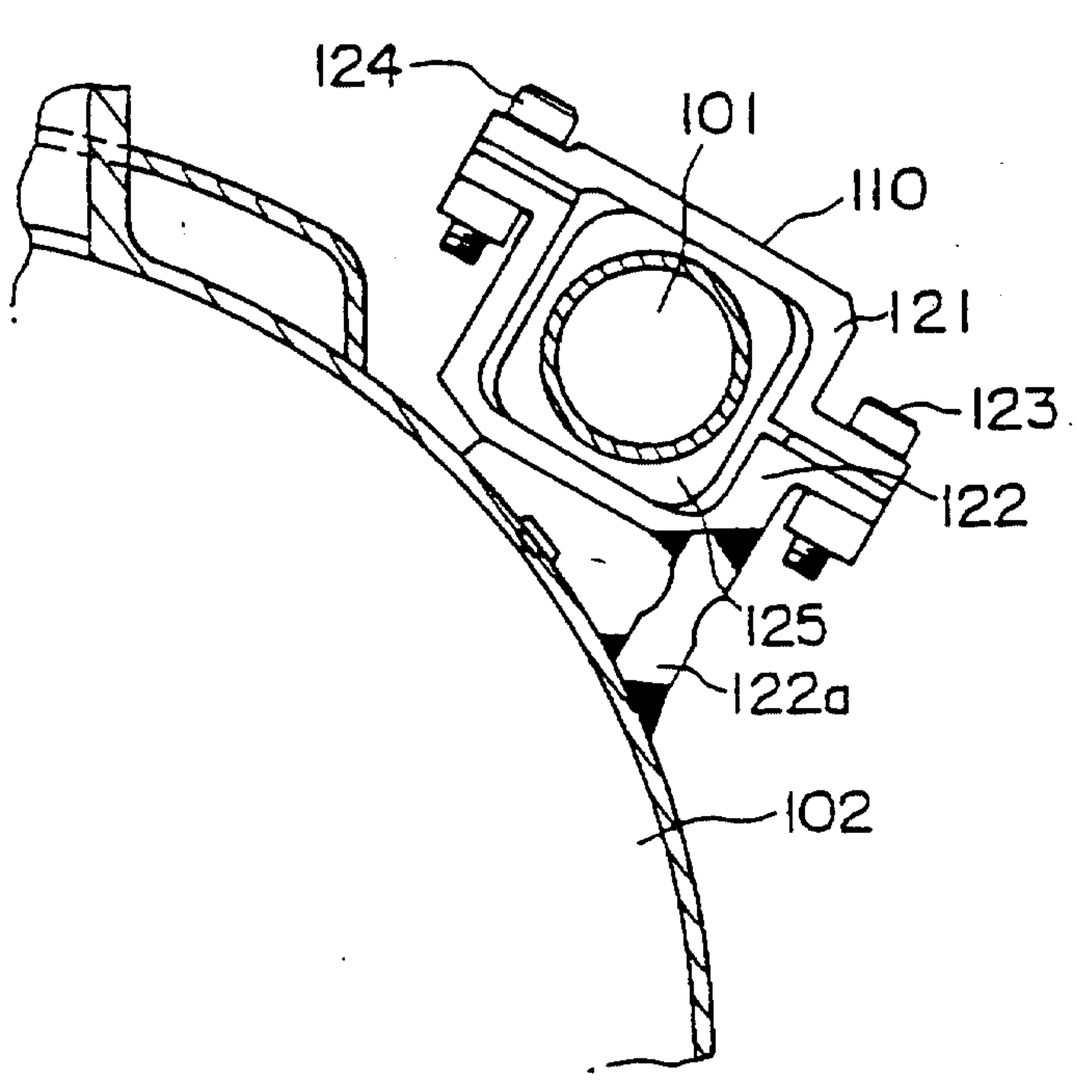


Fig. 6 (b)

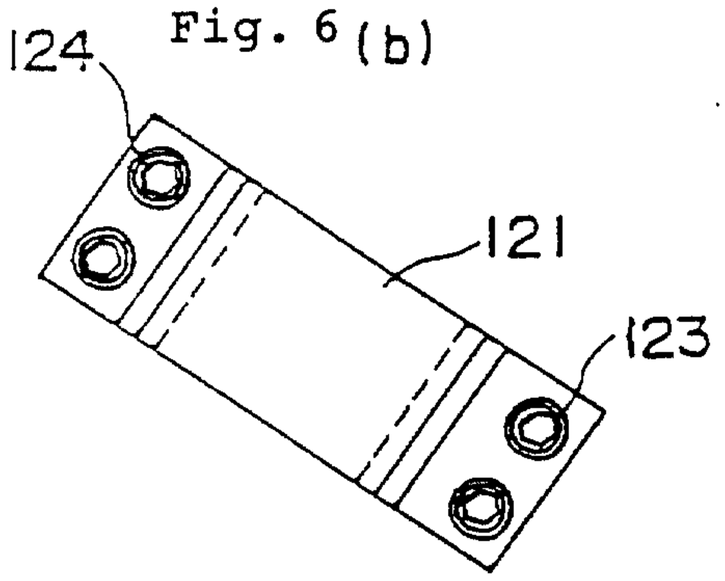


Fig. 6 (c)

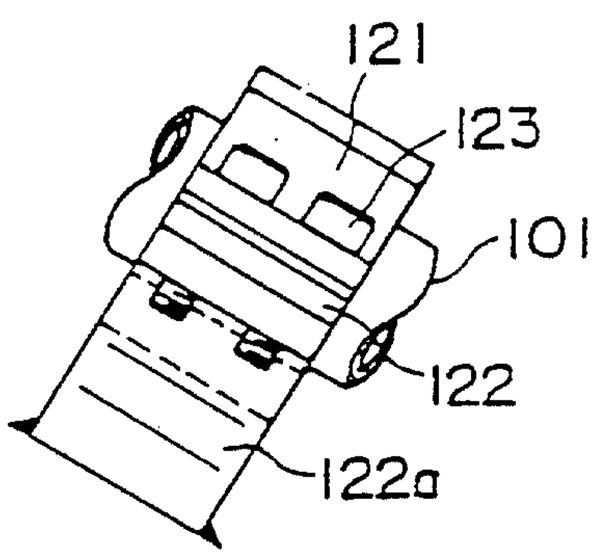


Fig. 7(a)

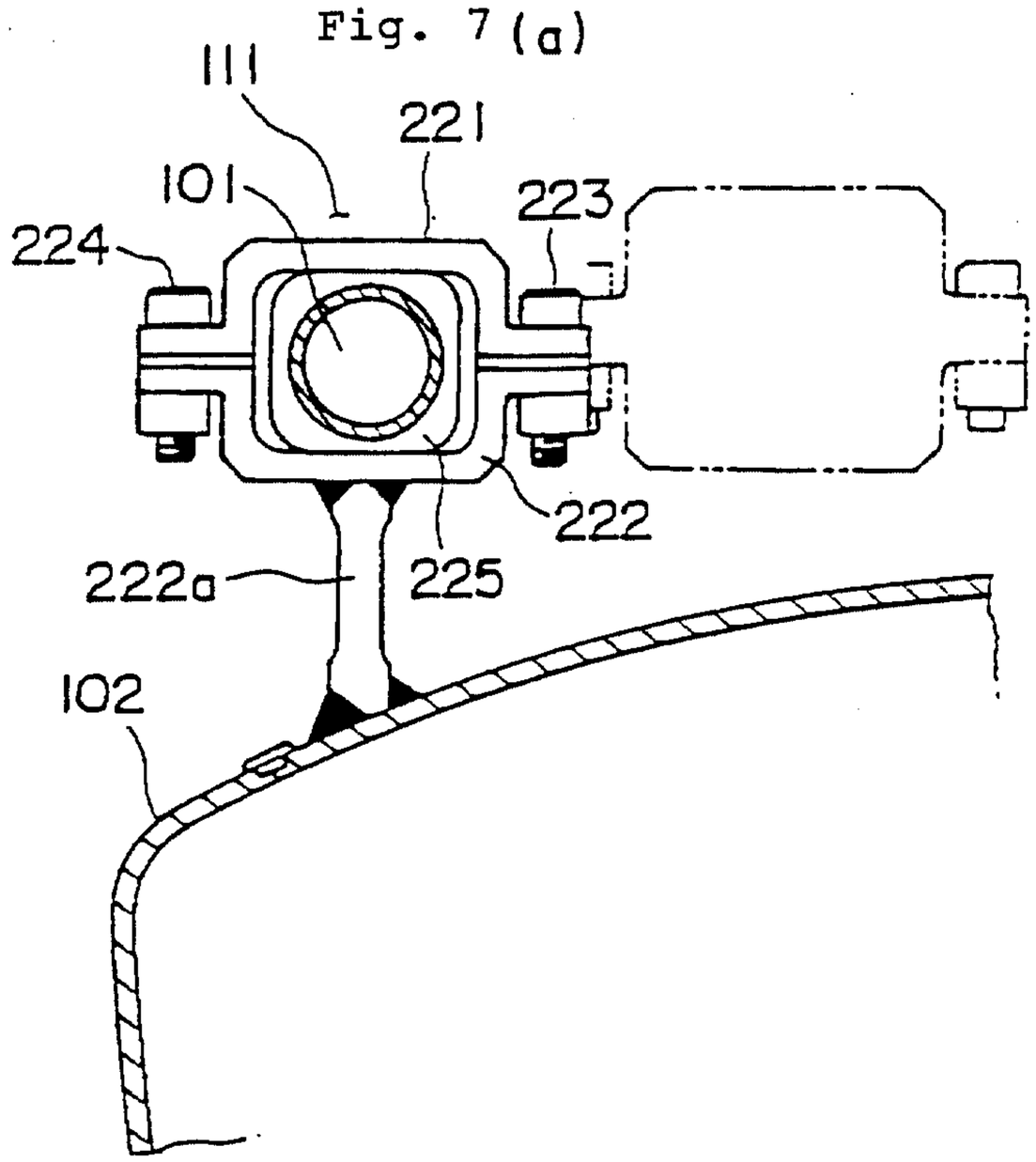


Fig. 7(b)

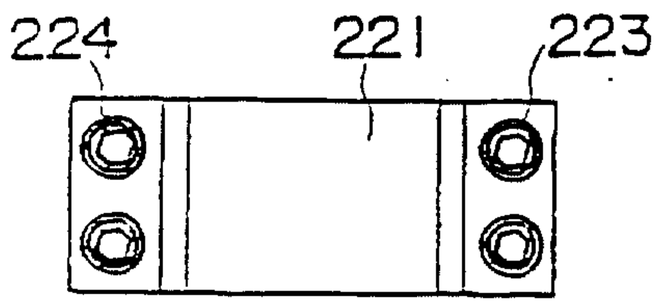


Fig. 7(c)

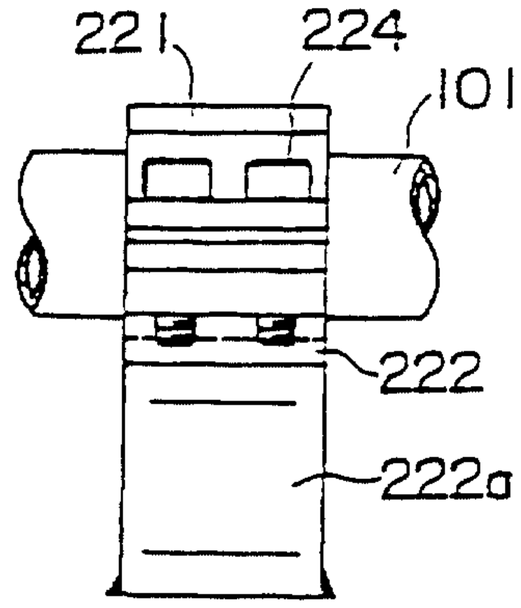


Fig. 8 (a)

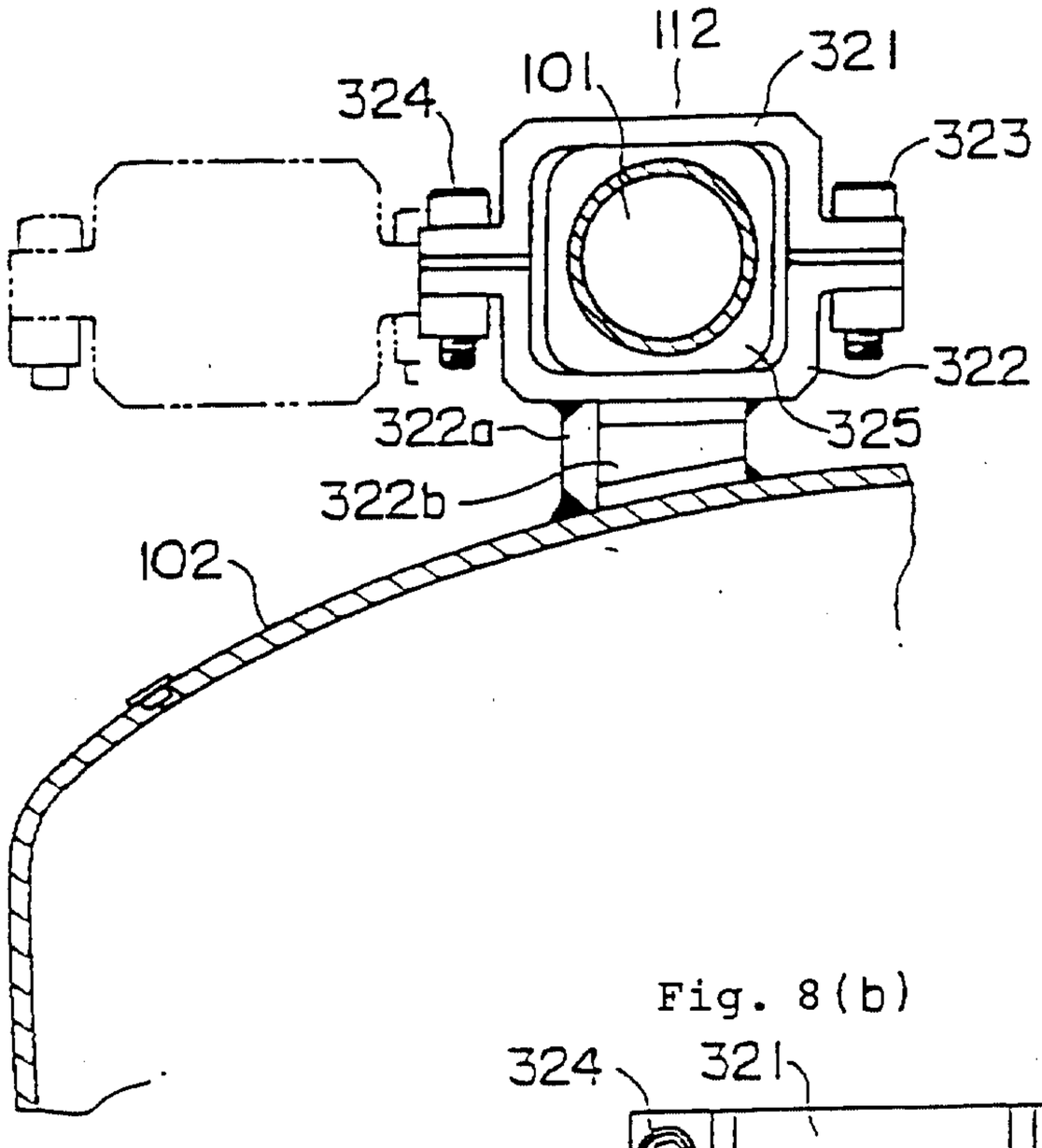


Fig. 8(b)

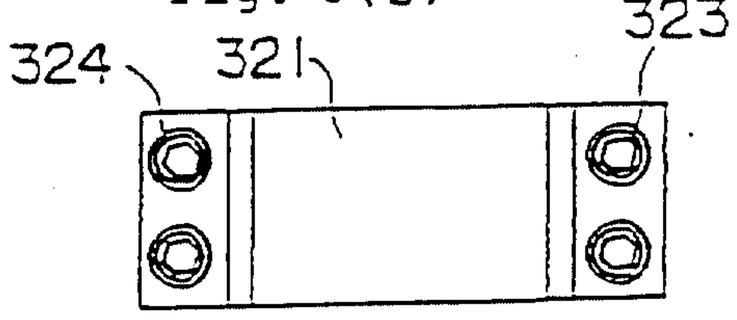


Fig. 8(c)

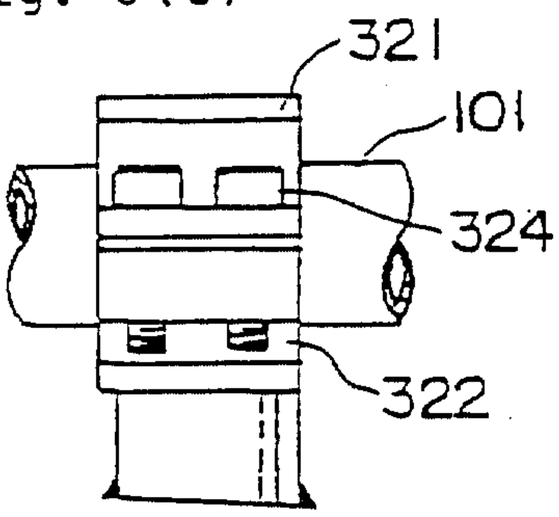
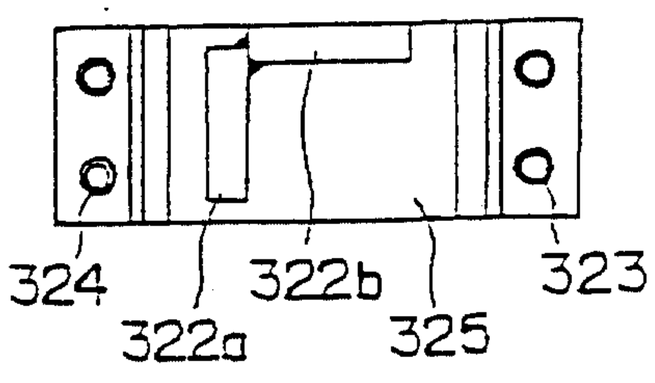
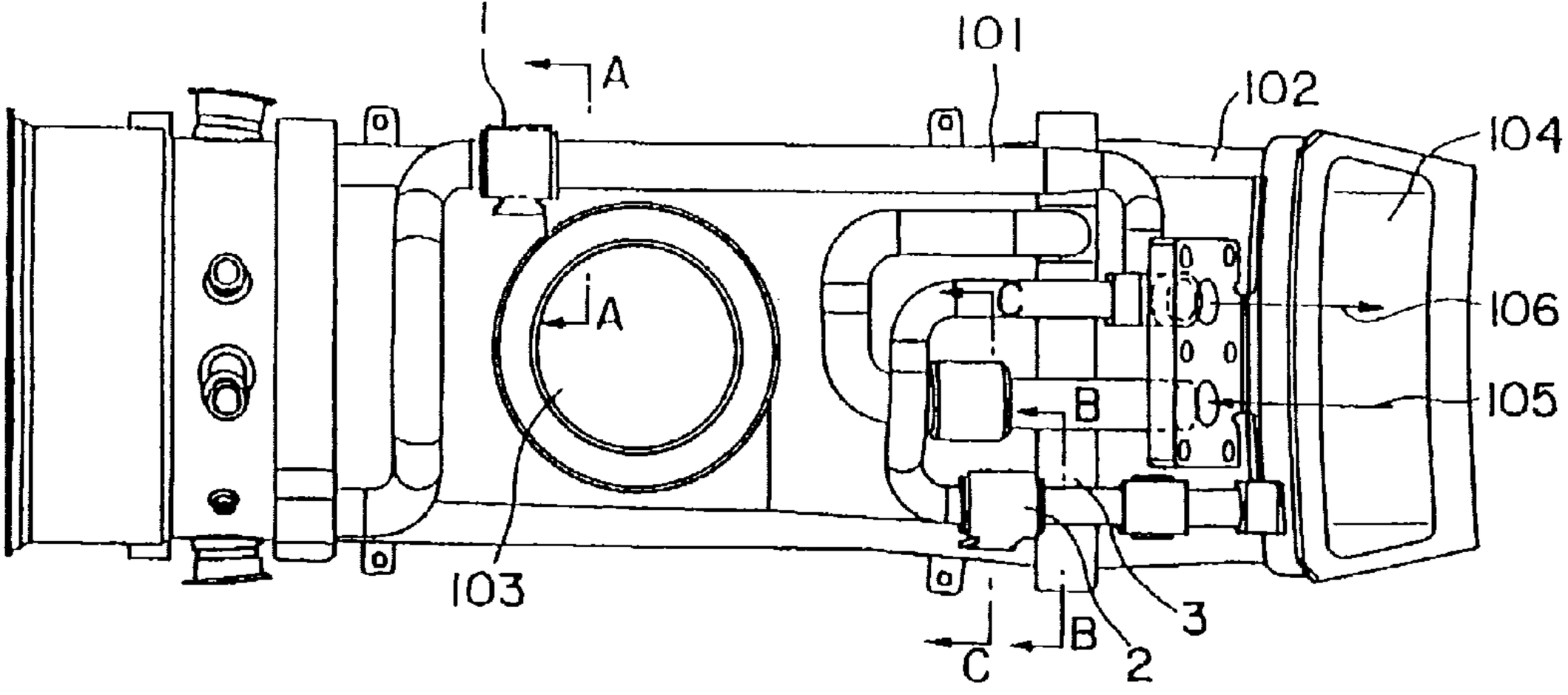


Fig. 8 (d)

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