Feb. 17, 1970 J. R. METZ 3,495,307

ADJUSTABLE LOCKING TYPE QUICK-RELEASE FASTENER

Filed Aug. 14, 1967

Fig. 1

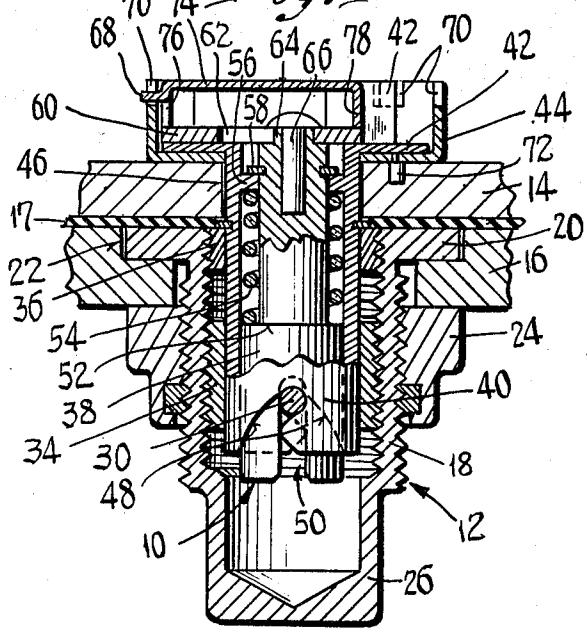


Fig. 4

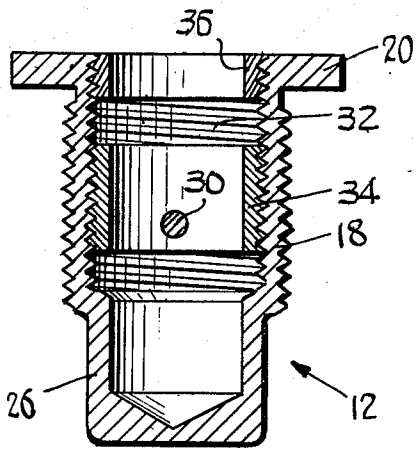


Fig. 5

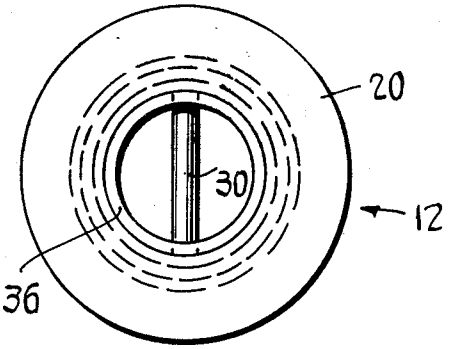


Fig. 2

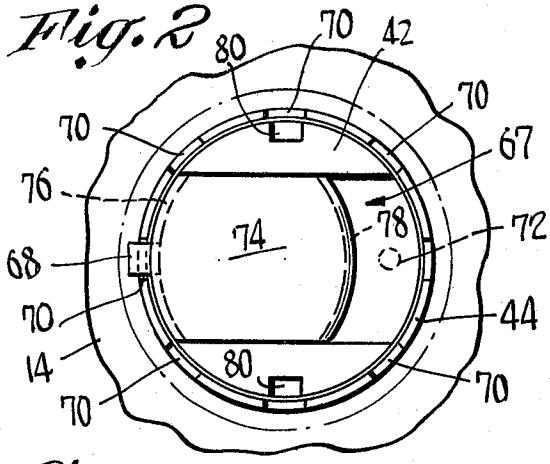


Fig. 6

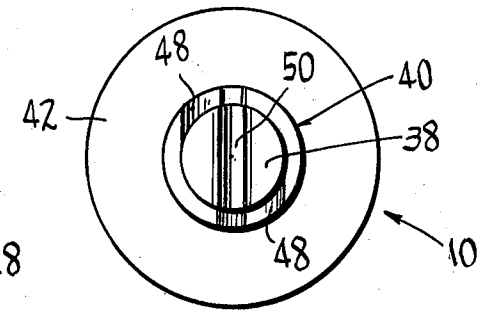
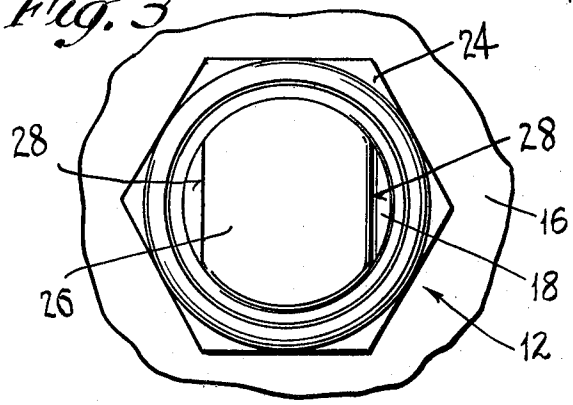


Fig. 3



INVENTOR.
Joseph R. Metz
BY
H. Gibner Lehmann
AGENT

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ADJUSTABLE LOCKING TYPE QUICK-RELEASE FASTENER

Joseph R. Metz, Ridgefield, Conn., assignor to Norco, Inc., Ridgefield, Conn., a corporation of Connecticut

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U.S. Cl. 24—211 10 Claims

ABSTRACT OF THE DISCLOSURE

An adjustable plug-and-socket type quick-release fastener wherein the socket has a cross bar carried by internal threads, enabling the bar to be shifted axially of the socket. The cross bar is adapted to be received in registerable front-end slots of a two-piece plug constituted of relatively turnable inner and outer telescoped members. Slots in the front end of one member are parallel to the axis of the plug, and in the other member they follow a helical curve whereby relative turning movement of the members is required to enable the cross bar to be received in or shifted out of the slots. An accessible, easily operated locking piece at the other ends of the telescoped members enables the inner member to be locked in different adjusted rotative positions against turning with respect to the socket, thereby to prevent unintended release of the cross bar when the latter is seated in the slots. The locking to the socket is done by a slide on the inner member, cooperable with an anchorage part turnably carried on the plug and having a key connection with structure connected to the socket.

CROSS REFERENCES

(1) U.S. Patent No. 3,253,310 dated May 31, 1966.

(2) U.S. Patent No. 3,280,439 dated Oct. 25, 1966.

(3) Copending application Ser. No. 390,617 filed May 31, 1966, now Patent No. 3,345,711, in the name of John J. McCarthy, entitled "Releasable Mechanical Coupling," having common ownership with the present application.

(4) Copending application Ser. No. 542,938 filed Apr. 15, 1966, now Patent No. 3,362,050, in the name of John J. McCarthy, entitled "Concentric Tube Releasable Clasp," having common ownership with the present application.

(5) Copending application Ser. No. 618,722 filed Feb. 27, 1967, now Patent No. 3,372,908, in the name of John J. McCarthy, entitled "Quickly-Openable Snatch Block," having common ownership with the present application.

(6) Copending application Ser. No. 652,917, filed July 12, 1967, now Patent No. 3,407,455 dated Oct. 29, 1968, in the name of Joseph R. Metz, entitled "Locking Type Quick-Release Fastener," having common ownership with the present application.

BACKGROUND

This invention relates to quick-release fastener devices, and more particularly to plug-and-socket type releasable fasteners where the plug comprises telescoped members differently notched at their forward ends to accept and lock to a cross bar of the receiver.

Prior releasable fasteners of the kind indicated generally employ a manually operable release lever or sleeve which is carried by one member of the plug and is drivingly connected to the other member to effect, by its movement, actuation of the same for releasing the cross bar. Such an arrangement does not at all times positively prevent the possibility of accidental release of the fastener, especially under adverse conditions of use, vibration, contact with other external objects, etc. Accordingly the reliability of the fastening is questionable in some circumstances.

To remedy this, one prior fastener has a releasable locking piece connected between the two members of the plug so as to positively prevent their relative turning and thereby insure against accidental release. While this solved the problem of reliability of the fastener, there still remained a consideration that adjustment or pull-up of the plug in the socket to secure a particular desired positioning or tightness of the structures secured by the fastener, was not possible. In some circumstances this constituted a drawback.

SUMMARY

The above drawback of lack of adjustment of prior plug-and-socket type fasteners is obviated by the present invention, and one object of the invention is to provide a novel and improved positive-locking plug-and-socket type quick release fastener wherein instant adjustment or pull-up of the parts is possible after their securement or lock-up. This is accomplished by adjustably carrying a cross bar in the socket, by means of internal socket screw threads. Turning of the cross bar about the socket axis shifts the bar deeper or less deeply into the socket. The plug part which cooperates with the cross bar turnably carries an anchorage member which is adapted to be keyed, against turning, to the carrier for said part. A locking slide on the plug part is cooperable with the anchorage member to releasably hold one member of the plug against turning which would release the cross bar.

Other objects of the invention are to provide an improved adjustable, failure-proof quick-release fastener as above set forth, which is especially simple and economical in construction, involving few, easily fabricated and assembled components; to provide a fastener as characterized, which is small and compact, especially easily operated, positive in its fastening and releasing actions, and adapted to a wide variety of uses.

Other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is an axial sectional view of the present improved locking-type quick release fastener, shown as securing two structural members to each other in spaced relation and against separation.

FIG. 2 is a top plan view of the rear or head end of the plug part of the fastener.

FIG. 3 is a bottom plan view of the receiver part of the fastener.

FIG. 4 is an axial sectional view of the receiver part per se.

FIG. 5 is a top plan view of the receiver part of the fastener.

FIG. 6 is a bottom plan view of the plug part of the fastener.

As shown, the improved fastener comprises essentially a plug part **10** and a socket or receiver part **12**, said parts being carried respectively by carrier structures or panels **14, 16** which are required to be releasably secured to each other in closely spaced relation as indicated in FIG. **1**, preferably with a yieldable or compressible gasket **17** interposed between them.

The receiver part **12** comprises a tubular body portion **18** having an annular end flange **20** which is received in a recess **22** in the panel **16**. The body **18** extends through a suitable aperture in the panel and carries at its underside a nut **24** by which it is rigidly secured in place. The receiver body **18** includes a downward extension **26** provided with flats **28** for accommodating a wrench, to facilitate tightening of the nut **24**.

In the body **18** there is a cross bar **30** adapted to be received and held captive in the notched lower or forward end portion of the plug part **10**.

In accordance with the present invention, for the purpose of effecting an adjustable relation between the plug and receiver parts **10**, **12** and consequently between the panels **14** and **16**, preferably so as to compress the gasket **17**, the cross bar **30** is adjustably mounted in the recciver body **18** whereby it can be positioned either deeper in said body or else less deeply therein. For this purpose, the interior or bore of the receiver body **18** is provided with screw threads **32**, and the cross bar **30** is diametrically mounted in a threaded bushing **34** which has exterior threads by which it can be screwed into the threaded bore **32** of the receiver body **18**. As a consequence, it will be understood that turning of the cross bar **30** and bushing **34** carrying it, about the axis of the receiver body **18**, will effect an adjustable positioning of the cross bar in the receiver body, either more or less deeply therein.

In order to take up looseness between the receiver body **18** and the plug **10**, a second threaded bushing **36** is screwed into the body **18** and disposed at the mouth of the same, directly within the flange **20**. The second bushing **36** preferably is a tight fit in the body **18** whereby it will remain in the given position illustrated in FIGS. 1 and 4, whereas the first-mentioned bushing **34** is a slidable fit enabling it to be readily turned or screwed in or out in response to forces applied to the cross bar **30**.

As seen in FIGS. 1, 2 and 6, the plug part **10** comprises inner and outer telescoped members **38**, **40** respectively, arranged to have a sliding fit with each other whereby the members are capable of relative turning movement. The outer member **40** comprises a tubular body having at its upper end an enlargement or head **42** which is received in a shallow cup-like washer **44** engaged with the panel **14**. The body **40** of the plug part **10** passes through an aperture **46** in the panel **14** and at its lower end has a slotted configuration comprising a pair of oppositely disposed transverse or diagonal slots **48** extending along helixes about the axis of the plug part. The diagonal slots **48** have divergent edges at their mouths, said slots being open-ended and having their openings at the bottom end of the body member **40**. The diagonal slots **48** can deeply accommodate the cross bar **30** if the body is given a turning or screwing movement when it is inserted in the receiver **18**.

The inner plug member **38** has at its bottom end a straight slot **50** which is also adapted to receive the cross bar **30**. Intermediate its ends, the inner member **38** has had an annular shoulder **52**, and said member carries a helical compression spring **54** in a space provided between the members. The spring **54** at one end engages the shoulder **52** of the inner member **38**, and at its other end engages an internal annular shoulder **56** of the plug body member **40** whereby the inner member **38** is biased downward with respect to the member **40** as viewed in FIG. 1. A split ring **58** is carried by the inner member **38** above the shoulder **56** of the outer member, and engages said shoulder to constitute a stop device by which the members **38**, **40** normally occupy the positions of FIG. 1, with their lower ends not quite flush, the inner member **38** projecting downward past the bottom edge of the outer member **40**. These relative positions are maintained by the action of the spring **54** and the engagement between the shoulder **56** and split ring **58**, as will be understood.

Further details explaining the action of the members **38**, **40** can be had by referring to U.S. Patent No. 3,253,-310 showing a similar type twist-lock fastener.

With the above organization, the cross bar **30** can be received in the slots **48**, **50** to occupy the locked position illustrated in FIG. 1 if the plug members **38**, **40** experience a slight relative back and forth turning movement as the cross bar is engaged and moves inward. Thus, the plug part **10** can be forced deeply into the receiver part **12** with the cross bar **30** of the latter accommodated in the slotted end portion of the plug part as shown in FIG. 1, in response to said parts being forcibly assembled or being pushed one into the other. During such assembly, the members **38**, **40** of the plug part **10** will experience a slight relative clockwise and counterclockwise movement as the diagonal slots **48** are being traversed by the cross bar **30**, such movement requiring the overcoming of the friction established between the members by the stop device **56**, **58** under the action of the spring **54**. Also, the cross bar **30** itself and the carrier bushing **34** may experience movement, these turning in the receiver body **18**. Or both the bar **30** and bushing **34** on the one hand, and the members of the plug part **10** on the other hand may turn as the parts **10**, **12** are forcibly assembled or pushed one into the other.

It will be understood that, in order to withdraw the plug part **10** from the receiver part **12**, an opposite relative back and forth turning of the plug parts **38**, **40** must occur to enable release of the cross bar **30** from the slots **48**, **50**. If such relative movement of the plug members **38**, **40** cannot occur, then the cross bar **30** will remain captive in the slots **48**, **50** with the result that the plug part **10** cannot be withdrawn from the receiver part **12**.

In accordance with the present invention, an improved accessible and easily operated locking device is provided at the upper ends of the members **38**, **40** of the plug part **10** in conjunction with the variable positioning of the cross bar **30** in the receiver part **12**. The organization enables the members of the plug part **10** to be locked against relative turning, thereby to prevent unintended or accidental release of the plug part **10** from the receiver part **12**, while at the same time enabling an adjustable positioning or tightening of the plug part in the receiver part, thereby to pull up tightly the panels **14**, **16** and compress the gasket **17**.

The releasable lock device comprises a slide **60** which is preferably formed from sheet metal, having a slot **62** accommodating a small-diameter hub portion **64** of the inner plug member **38**. A headed push pin **66** is pressed into the hub **64** and upper portion of the inner member **38** to retain the slide **60** in place while enabling it to move transversely of the inner member as permitted by the slot **62**. The slide **60** is movable in a wide diametric groove **67** in the flange or head **42** of the outer plug member **40**, and can shift from a locking position as shown in FIGS. 1 and 2 in a direction from left to right to an unlocking position while still retained in the groove **67** of the head.

To effect a control of the turning movement of the outer plug member **40** by means of the slide **60**, the latter is connected to a lug **68** and the cup-like washer **44** (hereinafter also termed an "anchorage member") is provided with notches **70** in its top edge, said notches being adapted to receive the lug **68** for various adjusted rotative positions of the plug member **40** when the slide **60** is in the advanced or locking position as shown in FIGS. 1 and 2.

The cup or anchorage member **44** has a depending pin or lug **72** adapted to be received in a suitable aperture in the panel **14** whereby the anchorage member is keyed thereto and prevented from turning. Inasmuch as the panels **14** and **16** are not relatively turnable, and since the receiver **12** is securely fixed to the panel **16**, it follows that the anchorage member **44** is prevented from turning with respect to the receiver part **12**. Thus, when the locking slide **60** is in its advanced, locking position, the fact that it is carried in the groove **67** of the outer plug member **40** results in said outer plug member being also prevented from turning. Accordingly, relative turning is prevented between the inner and outer plug members **38**, **40** by virtue of the fact that the inner plug member in accommodating the cross bar **30** in its slot **50** is prevented from turning in the receiver **12** (for the conditions of use wherein the threaded bushing **34** is under appreciable axial stress, from the compressed gasket **17** as transmitted to the panel **14** and the plug part **10**, and in turn from the plug part

to the cross bar **30** carried by the bushing **34**). Such force is similar to the friction force experienced by a nut which has been pulled up tightly on a screw. For such conditions, appreciable friction exists between the cooperable thread elements, preventing relative turning of the same unless a considerable turning movement is applied.

The slide **60** preferably carries a cover piece **74** on which the locking lug **68** is disposed, said cover piece having down-turned flanges or edges **76, 78** which are welded or otherwise secured to the slide **60**. The head portion **42** of the outer plug member **40** has a pair of diametrically opposite recesses **80** to accommodate the prongs of a wrench, for the purpose of enabling the plug part **10** to be pulled up tightly in a manner now to be described.

The tightening or binding of the threaded bushing **34** and cross bar **30** in the body **18** is effected by the pull-up of the fastener as the panel **14** is secured to the panel **16** by introduction of the plug part **10** in the receiver part **12**. Such assembly or lock up of the fastener is effected as follows: The slide **60** is retracted or shifted to the released position (not shown) which is attained by moving it from left to right as viewed in FIGS. 1 and 2. The plug **10** is then inserted in the receiver **12** and turned until the slot **50** aligns with and starts to receive the cross bar **30**.

Using the wrench as applied to the head **42** of the plug part, the said part is now turned counterclockwise when viewed from the wrench end, until the cross bar **30** is completely received in the slots **48, 50**. A slight relative turning between the plug members **38, 40** is necessary in order for this to be effected, as will be understood. Such relative turning is possible due to the locking slide **60** being in the retracted, releasing position.

As the plug part **10** is now continued in its counterclockwise turning, the accompanying turning of the cross bar **30** and bushing **34** carrying the said bar will result in unscrewing of the bushing or a slight raising of the entire assemblage. When this is noted, the turning of the plug part **10** is reversed, causing the bushing **34** and the captivated cross bar **30** to be screwed inward. The clockwise turning is continued until the plug **10** is pulled up snugly, bringing the panels **14, 16** together. After the snug condition is attained, the clockwise turning is continued for one revolution, effecting a compression of the gasket **17** disposed between the panels **14, 16**. The turning is then stopped, and using the wrench a slight turning adjustment of the plug part is made to bring the locking lug **68** in alignment with one of the notches **70** of the anchorage cup **44**. The slide **60** is then shifted to dispose the locking lug **68** in the adjoining slot. The wrench is now removed, and the fastener is said to be "locked-up."

To unlock or release the fastener, the spanner wrench may be utilized to remove pressure from the locking slide **68** whereupon the latter may be shifted to the releasing position. Then the force exerted on the panels **14, 16** by the gasket **17** will effect relative turning movement of the plug parts **38, 40**, causing release of the cross bar **30**. In an emergency, unlocking of the fastener may be effected without the use of the spanner wrench but instead by using a hammer, screwdriver or other tool. The locking slide **60** is struck or otherwise forcibly shifted to the releasing position wherein the lug **68** is not contained in the notched rim of the anchorage cup **44**. Upon this being effected, the force of the gasket **17** against the panels **14, 16** will effect the release of the fastener in the manner described above.

It will now be understood from the foregoing that I have provided a novel and improved adjustable locking-type quick-release fastener of the kind having a plural-member notched plug part cooperable with the cross bar of a receiver part, wherein the fastener can be securely locked in the assembled condition, wherein it will normally resist accidental or unintentional separation which might occur from adverse environmental conditions, and wherein it will also permit an adjustable pull-up or tightening of the fastener parts and the associated structural members such as panels and the like. The fastener is simple in its construction, involving relatively few parts which may be economically fabricated and assembled. Moreover, the fastener is seen to be small and compact, and the parts may be sturdily constituted or constructed whereby the fastener will resist appreciable disruptive forces. The fastener parts can be quickly separated by the mere act of shifting the locking slide to its releasing position. Such shifting of the locking piece is not depended on to effect a relative turning of the plug members of the plug part, and accordingly may be carried out by the use of a suitable instrument or wrench. The relative turning of the members of the plug part is effected by forces exerted between the plug part and the receiver part, as by means of the gasket **17** as will be understood.

Variations and modifications may be made within the scope of the invention, and portions of the improvement may be used without others.

I claim:

1. A quick-release fastener comprising, in combination:

(a) a plug part adapted to be releasably attached to the cross bar of a receiver part, said plug part including inner and outer relatively turnable telescoped members,

(b) said members having one set of corresponding forward end portions provided with juxtaposed open-ended slot means arranged to have their openings at the forward end of the plug part and to receive said cross bar therein,

(c) the slot means of one member extending axially and substantially parallel to the axis of the plug part, and the slot means of the other member extending substantially along a theoretical helix disposed about said axis,

(d) said telescoped members having another set of corresponding end portions located in juxtaposition to each other and remote from the first set, wherein the improvement comprises:

(e) an anchorage member turnably carried by the outer one of the telescoped members adjacent said other set of end portions,

(f) said anchorage member having means engageable with the carrier for the fastener, to prevent its turning relative to said carrier, and

(g) releasable, manually operable lock means engageable with the anchorage member and the inner one of the telescoped members for locking the latter to the anchorage member against relative turning when certain rearwardly located portions of the slot means are in registration so as to enable them to accommodate said cross bar, the forwardly located portions of the slot means being out of registration, thereby to enable a locking of the cross bar to be effected in said slot means.

2. A quick-release fastener as in claim **1**, wherein:

(a) the lock means enables the inner member to be locked to the anchorage member in any of a plurality of different rotative positions.

3. A quick-release fastener as in claim **2**, wherein:

(a) the anchorage member comprises a shallow, cup-shaped part,

(b) said outer telescoped member having an external flange adjacent said other set of end positions,

(c) said cup-shaped part being disposed under said flange,

(d) said cup-shaped part having a slotted rim,

(e) said lock means comprising a cross slide on the inner telescoped member, provided with a lug engageable with the slotted rim of the cup-shaped part.

4. A quick-release fastener as in claim **3**, wherein:

(a) the means for preventing turning of the anchorage member comprises a lug extending from the bottom of the cup-shaped part.

5. A quick-release fastener as in claim 2, wherein:
(a) the lock means comprises a cross slide on the inner telescoped member, provided with a lug engageable with the anchorage member.
6. A quick-release fastener as set forth in claim 1, and further including:
(a) a receiver part comprising a tubular body adapted to be mounted on a carrier,
(b) a cross bar disposed substantially diametrically in said body,
(c) means turnably mounting the cross bar in the body to enable it to assume any of a plurality of different substantially diametric positions.
7. A quick-release fastener as in claim 6, wherein:
(a) the lock means enables the inner member to be locked to the anchorage member in any of a plurality of different rotative positions.
8. A quick-release fastener as in claim 7, wherein:
(a) the means turnably mounting the cross bar comprises screw threads in the body whereby turning of the bar about the axis of the body shifts the bar laterally and along said axis.
9. A plug-and-receiver type fastener comprising, in combination:
(a) a plug having a slot to engage the receiver,
(b) a tubular body fixedly mounted on a carrier against relative movement,

(c) a cross bar disposed substantially diametrically in said body, wherein the improvement comprises:
(d) means turnably mounting the cross bar in the body to enable it to assume any of a plurality of different axial and different substantially diametric positions therein, said cross bar being engageable by said plug slot.
10. A receiver part as in claim 9, wherein:
(a) the means turnably mounting the cross bar comprises screw threads in the body whereby turning of the bar about the axis of the body shifts the bar laterally and along said axis.

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BERNARD A. GELAK, Primary Examiner

U.S. Cl. X.R.

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