May 10, 1966 D. A. DRAUDT 3,250,551

ONE PIECE, QUICK DETACHABLE CONNECTOR

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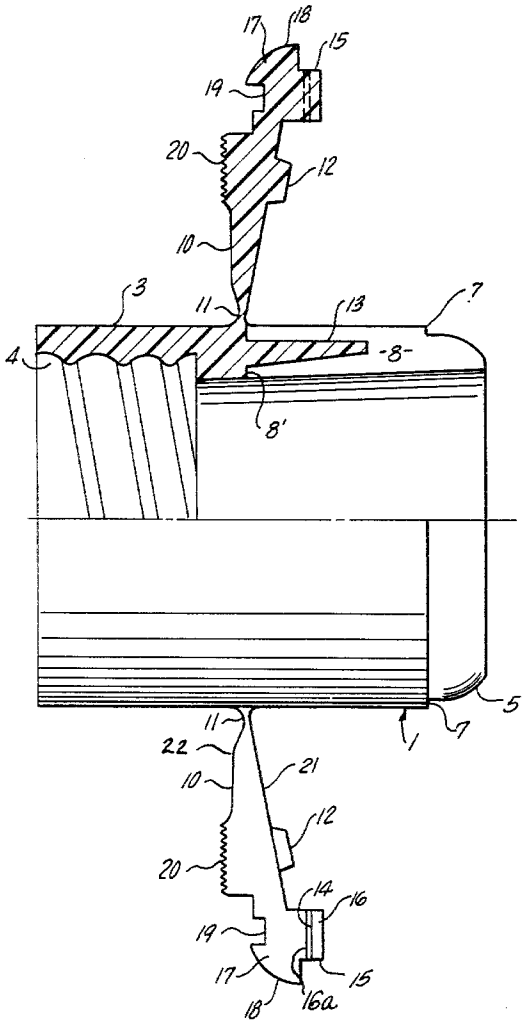



Fig. 1

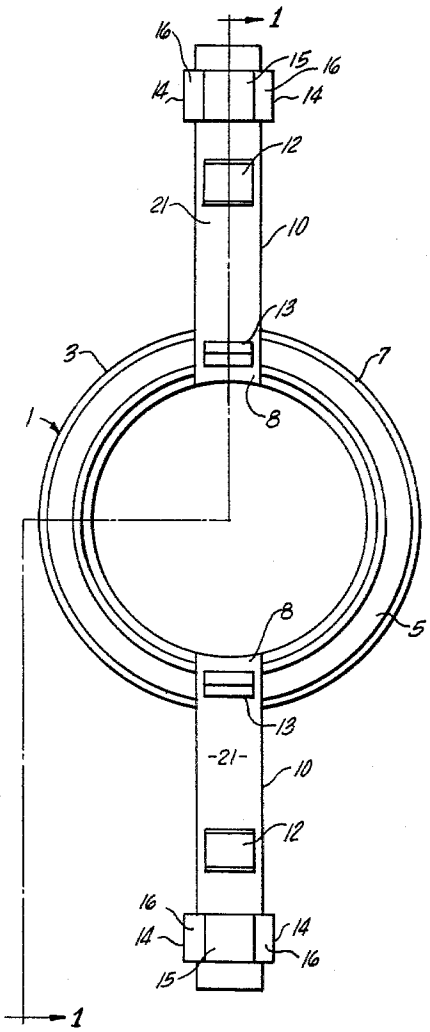



Fig. 2

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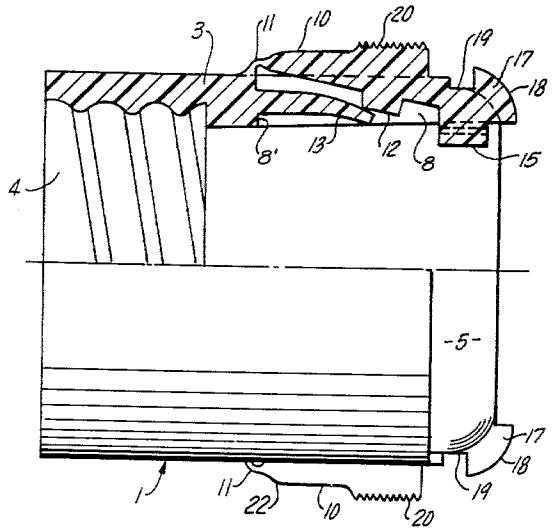



Fig. 3

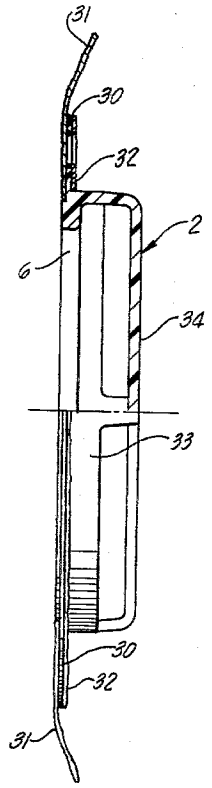



Fig. 5

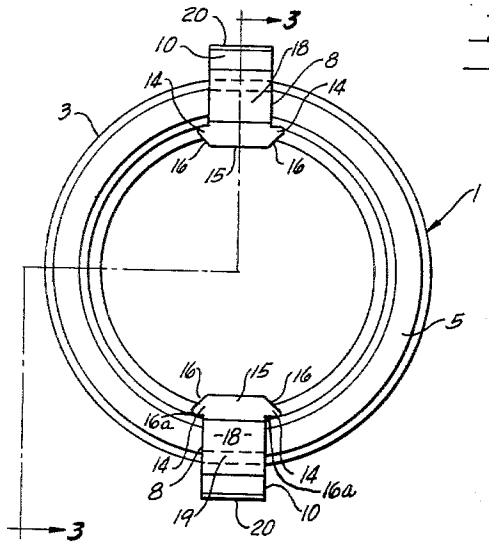



Fig. 4

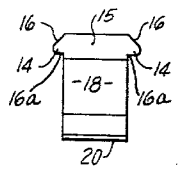



Fig. 6

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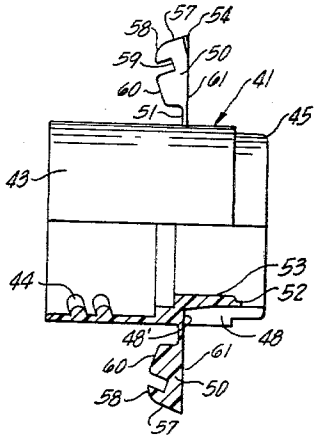



Fig. 7

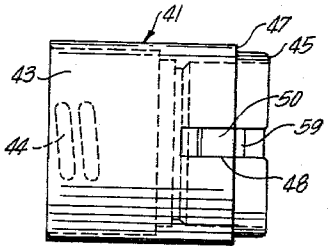



Fig. 8

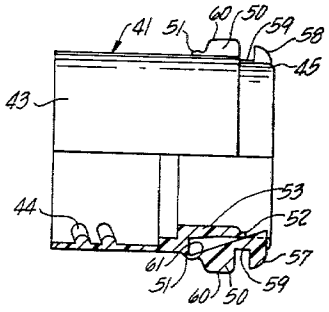



Fig. 9

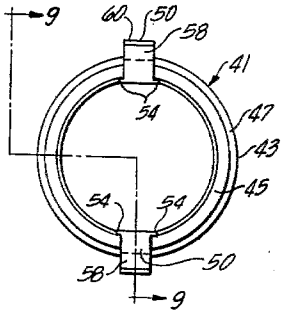



Fig. 10

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United States Patent Office 3,250,551 Patented May 10, 1966



3,250,551

# ONE PIECE, QUICK DETACHABLE CONNECTOR

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Filed Dec. 26, 1963, Ser. No. 333,526
5 Claims. (Cl. 285—7)

This invention relates to the art of quick detachable couplings and more particularly to a plastic, molded, one-piece coupling member, i.e., connector, having its immediate and particular use in detachably connecting a low pressure pneumatic hose to the fitting of a woman's flexible fabric hair-dryer cap or bonnet.

The hair drying art knows and uses textile fabric or flexible plastic bonnets to which flexible pneumatic hoses are detachably connected to supply warm and/or dry air for the removal of moisture from the lady's wet, kinked and/or curled hair. Heretofore inexpensive, one-piece, molded plastic connectors have been difficult to connect to and detach from the socket-like fittings carried in the bonnet, and have tended to leak and/or to lead to destruction of or injury to the bonnet as well as to frustration of and/or injury to the user. On the other hand, prior multipiece connectors that worked more easily and efficiently have been expensive and costly to make and assemble and likely to become inoperative upon loss of, or injury to, any one or more of the several constituent parts of the device. That is to say: the prior, inexpensive connectors failed to serve, and the prior, more useful connectors cost too much.

It is therefore among the objects of my invention to solve the problems stated above and to provide a useful, durable, convenient, inexpensive, efficient, foolproof, easy-to-operate, easy-to-make, one-piece, molded plastic, quick detachable, connector for a low-pressure pneumatic hose coupling, and to provide an efficient and economical method of making the same.

Other objects and advantages of my invention will more fully and at large appear from the following description of a preferred form of my invention, reference being had to the accompanying drawings in which:

FIGURE 1 is a side elevation, partly in longitudinal section taken on the broken section line **1**—**1** of FIG. 2, of the male coupling element or connector embodying my invention in the condition in which it is molded and first removed from the molding dies.

FIGURE 2 is an end elevation of the "nose," right as viewed, end of the connector of FIG. 1; the broken section line **1**—**1** thereof showing the section upon which FIGURE 1 is taken.

FIGURE 3 is a side elevation, partly in longitudinal section of my connector in its operative form and condition; the view being taken on the broken section line **3**—**3** of FIG. 4.

FIGURE 4 is an end elevation of the "nose" end of the connector of FIGURE 3, and

FIGURE 5 is a side elevation, partly in longitudinal section, of the female or socket element of the coupling which also comprises the connector of FIGS. 3 and 4; the female element being shown attached to a fragmentary portion of the fabric cap or bonnet of a hair drying apparatus.

FIGURE 6 is an end view of the lever if the latching levers, as viewed in FIG. 4, detached from the rest of the coupling for the sake of illustration.

FIGURE 7 is a view corresponding to FIG. 1 of a modified form of my invention.

FIGURE 8 is a side elevation of the modified form of my invention with the latching levers in operating position.



FIGURE 9 is a side elevation, partly in longitudinal section as along the line **9**—**9** of FIG. 10, of this modified form taken at 90° from FIG. 8, and

FIGURE 10 is an end elevation like FIG. 4, but of this modified form of my invention.

Referring first to FIGS. 3, 4 and 5, the male coupling element or connector **1** is formed and constructed of one mold piece of plastic, and is adapted to enter and be detachably secured in fairly fluidtight engagement with the female coupling element or socket **2**. For the exemplary purpose for which this preferred form of my invention is conveniently described, the connector may have an external diameter of about one and a half inches for convenient manual gripping and operating. Entering motion of the connector is from left to right as viewed in FIGS. 3 and 5, assuming the parts are coaxially aligned as shown, and assuming the socket stays put or is moved from right to left toward the connector. As the connector **1** approaches the socket **2**, initial contact between the elements will occur between the rearwardly and outwardly inclined cam faces **18** at the forward, rightward as viewed, end of the resiliently movable latching levers **10** of the connector with the ring part **6** of the socket. Further forward motion of the connector into the socket includes the relative constriction of the forward ends of the oppositely disposed levers **10**, see FIG. 4, by and/or with camming engagement of the faces **18** with the inner edge of the ring **6** until the camming faces **18** have fully entered the ring and the levers **10** have sprung outwardly to trap the ring at diametrically opposite points in the external notches **19** which are formed to have a free but close fit with the ring. Detachment of the coupling element merely requires depression of the levers **10**, as by manual squeezing pressure applied to the roughened external, oppositely disposed surfaces **20** of the levers, to free the notches **19** from the ring, and withdrawal of the "nose" of the connector from the socket.

In greater particularity connector **1** is preferably molded of polypropylene in rather thick-walled tubular form with a circular cylindrical exterior surface, and with coarse internal threads **4** in the rearward, left as viewed in FIGS. 1 and 3, portion thereof for screwed attachment to the external helically grooved form of a conventional, low-pressure, pneumatic tube or hose. The internal surface of the forward part of the connector may taper to expand forwardly slightly but sufficiently to provide adequate "draw" for convenient extraction and release from the forming dies or molds. The extreme forward end, or nose, of the connector **1** is preferably rounded as at **5** to a maximum diameter closely fitting but freely entering the inside diameter of the ring **6** of the socket **2**. An annular shoulder **7** of height too great to enter the ring **6** marks the rearward end of the rounded nose **5** and limits intrusion of the connector **1** into the socket **2**.

The detachable coupling mechanisms, including the levers **10**, are associated with the diametrically oppositely disposed slots **8** which extend from about the middle of the connector forwardly, and open longitudinally through the nose **5**, see FIGS. 2 and 4. The slots **8** have parallel chordal walls closely and freely fitting the parallel side walls of the levers **10** for substantialy free, swinging movement of the levers **10** about their respective tangentially acting and disposed, strap-hinge, pivotal supports **11**, FIGS. 1 and 3. Except for the lever retaining catches **14** and **15** which exceed the width of the levers **10** and slots **8**, the levers and slots are of approximately the same width and occupy substantially the same diametrically opposed, longitudinally extending portions and places in the wall and body of the connector.

In each of the slots **8** and rising from the root **8'** of each slot, and spaced from the side walls thereof, FIGS.

1–3 inclusive, is a tapered, cantilever element or resilient finger **13** formed integrally with the wall of the connector at the root of the slot and having resilient stiffness whereby to act as a spring tending to swing the levers **10** radially outwardly, counterclockwise as viewed in the upper half of FIG. 3, when the parts are in the operative condition shown in FIGS. 3 and 4, as well as when the male and female coupling elements are being joined, or detached and/or are coupled together. The taper of the element **13** not only enhances the cantilever spring operation but also provides "draw" for easy extraction, of the newly molded connector from the die.

As shown in FIGS. 1 and 2 my method of making the connector includes the step of molding the same with the levers **10** standing radially outwardly in, or agreeable to, the parting line, or stepped parting line, of the mold. The virtue and advantages of this step are related to the form and structure of the levers which are formed as integral parts of the connector and comprise in each lever: the thin-section, strap-hinge part **11** which flexibly connects the inner end of each lever to the body of the connector adjacent the root of each of the slots **8**; the main outwardly thickening body of the lever having the serrated finger-gripping surface **20** on the rearward face as viewed in FIG. 1, and on the radially outward face as viewed in FIG. 3; the boss **12** on the forward and inner face for sliding engagement with the spring element **13**, FIG. 3; the notch **19** mentioned above, the cam **17** with the camming surface **18** mentioned above, and, lastly, on the rightward face as viewed in FIG. 1, the retaining catch **15** with its one-way yielding side flanges **14**, shown also, in FIGS. 2, 4 and 6.

As shown in FIGURES 1, 2, 4 and 6, the flanges **14** of the catch **15** have flat inner surfaces or squared-off faces **16***a*, leftwardly as viewed in FIG. 1, which lie in the parting line of the molding die whilst the inclined camming surfaces **16** of the catch **15** are steeply inclined and cause no problem of withdrawal from the right, as viewed in FIG. 1, half of the molding die. The portions of the mold in which the levers **10** are cast will then follow the inclined plane of the forward, and inner faces **1** of the levers with the bosses **12** rising from these surfaces and having their faces inclined approximately as shown to "draw" from the mold. The leftward, as viewed in FIG. 1, faces and forms of the levers, including the curving rearward face **22** from the hinge **11** to the serrations **20**, are readily formed in and withdrawn from corresponding cavities in the mold which lie leftwardly of the right face **21** which may lie in the parting line. The sides of the levers **10**, right and left as viewed in FIG. 2, may incline enough toward each other from right to left as viewed in FIG. 1, to withdraw freely from the left half of the mold as viewed in FIG. 1, particularly from the cavities in which the levers, except for the bosses **12** and catchers **15**, are formed. The connectors may be ejected from the male threaded part of the die on which the female threaded portion **4** is formed by pneumatic ejection while the piece is hot according to common practice.

When the connector is in its natal form and state as shown in FIGS. 1 and 2, and preferably while it is warm and/or reasonably fresh from the molding dies, the levers **10** are swung forcibly about their hinged connections **11** from their positions shown in FIGS. 1 and 2 into the slots **8** and into their positions shown in FIGS. 3 and 4. This may be done manually by applying mere digital pressure on or about the portions **20** of the levers with one hand while resisting bodily motion of the connector with the other hand. During their motion of the levers the cam surfaces **16** of the flanges **14** of the respective catches **15** will engage the sides of the slots **8** near the open ends thereof, see FIG. 3, spreading the slots and flexing the flanges sufficiently to pass the catches and flanges all the way through the slots until the flanges **14** are trapped within the interior bore of the connector with their flat faces **14** engaging the inner face of the bore and thereby being retained therein.

When the levers **10** have been swung into their operative position, FIGS. 3 and 4, the bosses **12** will have engaged, flexed and stressed the spring-finger elements **13**, respectively, of FIGS. 1 and 3, which elements, in turn, will always yieldably urge the levers radially outwardly as restrained by the catches and flanges **15–14**, FIG. 4, while the connector is out of the socket **2**. When the connector is introduced into the socket the spring fingers **13** will urge the levers yieldably outwardly whilst the ring **6** and cams **17** increase the bending of the fingers **13**, and then when the nose of the connector and the cams **17** have fully entered the ring **6**, the fingers will snap the levers outwardly and engage the ring **6** in the notches **19** and hold the coupling elements in detachable, useful, reasonably airtight engagement.

While the displacement of the levers from their nascent molded position, FIG. 1, to their stressed operative position, FIG. 3, may be done manually and easily as above decided, I prefer for rapid production to provide a funnel-shaped fixture, not shown, of minimum diameter no less than the O.D. of the connector and formed like the marginal outline of FIG. 4, and of big enough outwardly flaring size to accept the nascent connector and fold the levers **10** to the position of FIGS. 3 and 4 by merely pushing the connector through the funnel with the left end, as viewed in FIGS. 1 and 3, foremost.

The socket **2** with which my improved connector coacts is of known form and structure, and comprises in addition to the attaching ring portion **6**, an outwardly extending perforate radial flange **30** to which the fabric **31** of the bonnet for the air dryer, otherwise not shown, is attached as by an adhesive plastic washer **32**. The socket also comprises an annulus **33** and an attenuated bridge structure **34** tending to keep other inner parts of the bonnet and milady's hair and curlers out of the coupling.

A modified form of my invention is illustrated in FIGURES 7–10 incl. werein the similarities to the preferred form will be apparent and/or may be assumed except as differences are hereinafter mentioned or discussed.

As in my preferred form, the connector **41**, FIGURE 7, is molded with the integral latching levers **50** standing out at right angles to the axis of the cylindrical body **43** of the connector with the planer inner, i.e., forward in FIG. 7, faces **61** of the levers **50** lying flush in the parting line of the mold. This form of my invention may be worked from its nascent molded state of FIGURE 7 to its operative form of FIGURES 8–10 incl in. substantially the same way as the preferred form.

In this modified form of my invention the internal threads **44** are discontinuous and occupy only a limited longitudinal and circumferential part of the rearward, leftward as viewed in FIGURES 7–9, part of the connector. Like the preferred form, the connector has a rounded forward, rightward as viewed, nose **45** to help the connector enter the socket **2** in the manner and for the purposes described about the preferred form of my invention. As in the preferred form, the nose and forward end portion **45** of the modified form of my connector terminates in an annular shoulder **47** corresponding to the shoulder **7** of the preferred form. Like the preferred form, the body portion of the connector has diametric, oppositely disposed longitudinally extending slots **48** which correspond to the slots **8** of the preferred form, but in the modified form, the integral spring fingers **53**, FIGURES 7 and 9, are offset radially inwardly of the roots **48'** of the slots **48**, and tend to have less radial deflection when operatively engaged by the inner faces **61** of the latching levers **50**, as shown in FIGURE 9.

The levers **50** are integrally joined with the body **43** of the connector by the thin portions **51** which serve as flexible strap hinges for the swinging motion of the

levers, first, into, and thereafter within, the slots 48. As shown in FIGURES 7 and 9, the foremost ends of the spring fingers 53 are reduced in thickness at 52 to lend greater flexibility to the tips of the fingers where they resiliently engage the inward faces 61 of the levers; the latter lying at a noticeable angle with respect to the fingers in their operative relation in the latched condition of the coupling shown in FIGURE 9.

For purposes similar to those in the preferred form, each of the levers 50 have small laterally protruding flange-like catches 54, see FIGURES 7 and 9, which are disposed in this form at the outermost ends of the lever and are flexible enough, especially when the connector is nascently taken from the mold, to be snapped in through the slots 8 and become trapped within the interior of the connector, FIGURES 9 and 10. The catches 54 retain the levers in their working position in the slots and permit the levers to be depressed radially inwardly from the position shown in FIGURES 9 and 10, but prevent the levers from moving radially outwardly from the slots under the normal influence of the fingers 53 exerted therefrom.

The foremost ends 57 of the levers 50 have rounded cam-like noses 58 which fairly coincide with the rounded nose 45 of the connector when the levers are depressed to facilitate penetration of the connector into the socket 2. This penetration, as in my preferred form, assumes the inward squeezing of the levers until the ends thereof have entered the ring 6 of the socket and the ring has been engaged axially by the shoulder 47, and the notches 59 in the levers have trapped the ring and engaged it both radially and axially to secure the parts of the coupling in substantially, or reasonably, airtight engagement. The levers 50 are given adequate thickness to facilitate their normal depression and penetration of the ring 6 as reflected in the humped outer surface 60 between the hinge 51 and the notch 59.

This modified form of my invention can be made of the same or substantially the same materials in the same way as my preferred form, and works in about the same way. The mold design for the modified form is more simple than the preferred form with, as I now believe, no substantial loss in excellence of operation and function in the finished coupling.

While I have illustrated and described a preferred and a modified form of coupling and connector embodying my invention and a preferred method of making the same, changes and improvements will occur to those skilled in the art who come to understand and enjoy the same, and therefor I do not care to be limited in the scope of my patent to the specific forms herein particularly illustrated and described, nor in any other way or manner inconsistent with the progress by which the art has been promoted by my invention.

I claim:

1. A one-piece, molded, plastic, quick detachable connector made of plastic having flexibility in thin section and having resilience and strength in thicker sections, comprising a tubular, thick-walled body having a central axis and having a forward end adapted to enter and be coupled to a coaxial female coupling member, said body having a slot with its root spaced from said forward end and open at the said forward end, a latching lever integrally joined to said body by a thin-walled, flexible section comprising a strap hinge near the root of said slot, said lever being disposed in said slot for swinging motion therein about said hinge, and said lever having a latching end adjacent the said forward end of said body for detachable engagement with said female coupling member, said body including a resilient cantilever finger formed integrally with said body, located between the parallel planes defined by the walls of said slots and positioned radially inwardly relative to said lever, said finger being thicker than said strap hinge and having stressed resilient engagement with said lever adjacent the free end of said finger tending to force said lever radially outwardly from said axis and into said detachable engagement.

2. The connector, according to claim 1, wherein said lever has a part wider than said slot extending transversely of the radius of said connector and disposed within said body and restraining said lever from radial outward movement in opposition to the force of said resilient finger, said part having an inclined face tending to admit said lever into said slot and having a squared-off face engaging an inner surface of said body.

3. The connector of claim 2 wherein said resilient finger is integrally joined to said body near the root of said slot and has a portion of greater thickness where it is joined to said body and has a portion of lesser thickness where it engages said lever.

4. The connector of claim 1 in which said finger has a base thicker than its end remote from its base and being integrally joined to said body near the root of said groove and lying substantially parallel to said lever and resiliently engaging said lever at its said end remote from said base and acting as a stressed cantilever beam supported at its base.

5. A connector according to claim 1, said lever having a latching notch facing radially outwardly adjacent the said forward end of said body for detachable engagement with said female coupling member upon radial motion with respect thereto, said lever having a forwardly and outwardly disposed cam surface engageable with said female member and a retaining catch thereon near said cam and remote from said hinge engaging an inner surface of said body and positioning said cam for entrance into said female member.

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