Nov. 24, 1970 F. W. HAMILTON 3,542,980

THROTTLE CABLE GUIDE

Filed Jan. 13, 1969

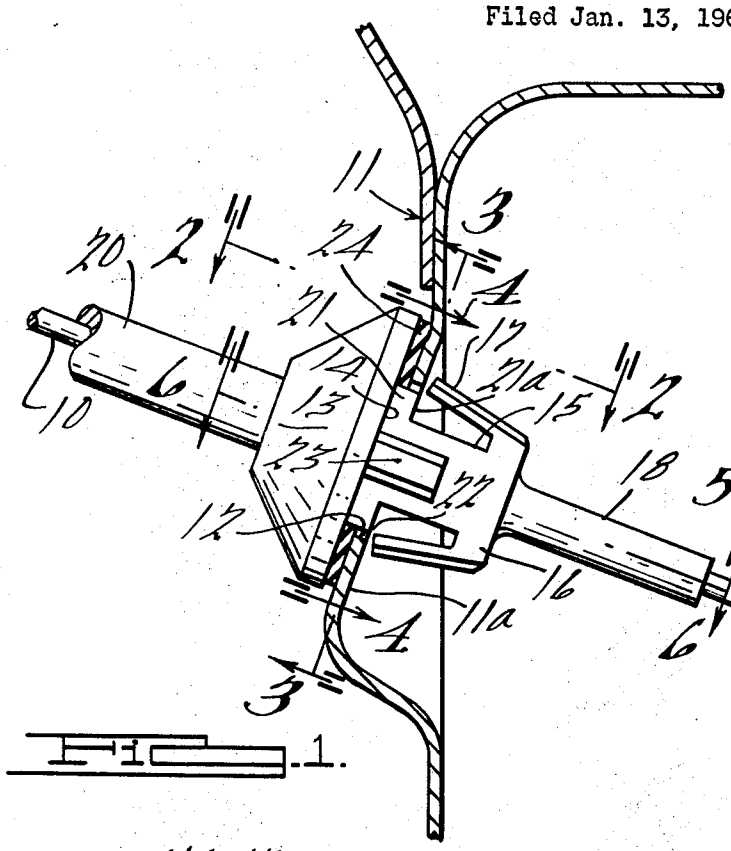

Fig. 1.

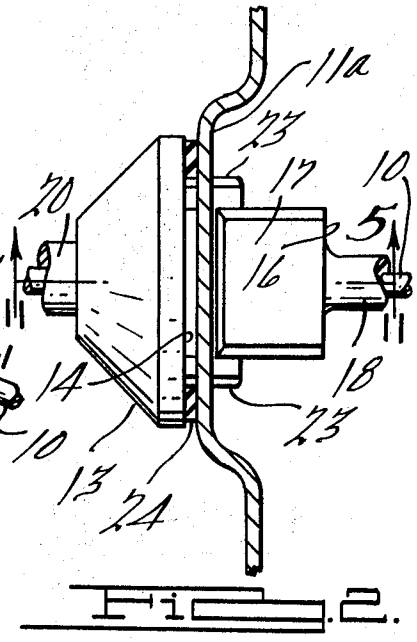

Fig. 2.

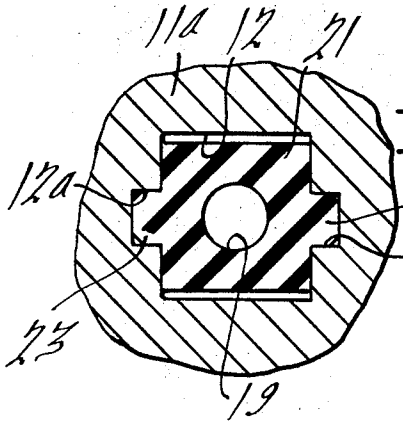

Fig. 3.

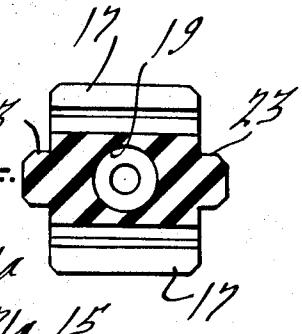

Fig. 4.

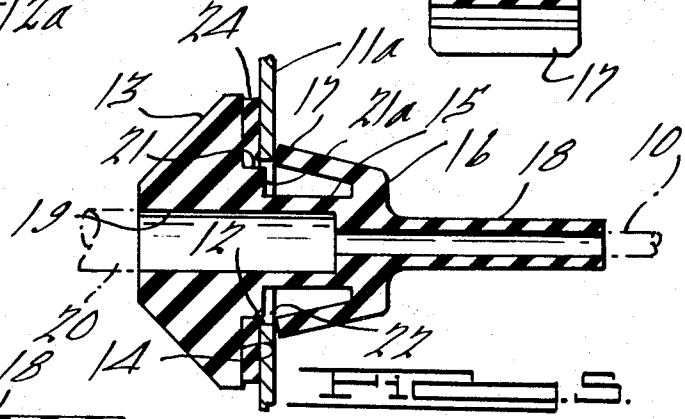

Fig. 5.

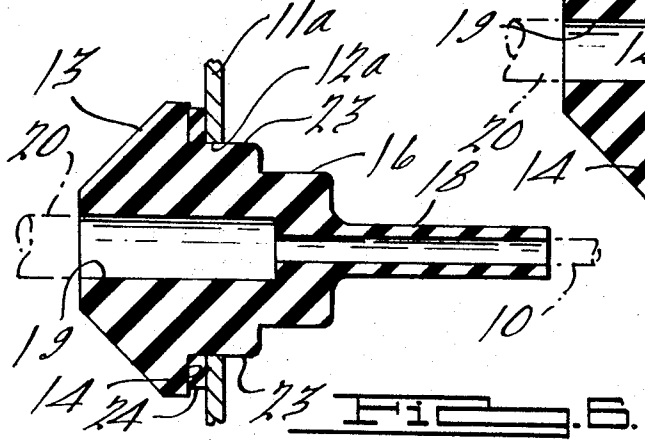

Fig. 6.

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United States Patent Office 3,542,980 Patented Nov. 24, 1970

3,542,980

THROTTLE CABLE GUIDE

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Filed Jan. 13, 1969, Ser. No. 790,679
Int. Cl. F16b 9/02
U.S. Cl. 287—20 6 Claims

ABSTRACT OF THE DISCLOSURE

A throttle actuating cable extends through a tubular guide anchored within an aperture in a thin sheet metal firewall of an automotive vehicle. The guide comprises a one-piece molded plastic body confronting a front face of a panel of the firewall and having a projection extending rearwardly through the aperture. The projection has an enlarged rearwardly tapered nose from which a pair of integral arms diverge forwardly and laterally to engage the rear face of the panel, the arms being resiliently yieldable toward the projection to pass freely through the aperture. A pair of lugs fit closely within mating portions of the aperture and extend integrally from opposite sides of the projection transversely to the lateral directions of divergence of the arms and also rearwardly from the body to overlap said forward ends. A resilient spacer under compression between said front face and body normally urges the latter forwardly and holds said rearward ends firmly against the rear face of the panel, but is resiliently yieldable to enable rearward movement of the body sufficiently to move said arms out of engagement with said rear face.

This invention relates specifically to a throttle actuating cable and means for guiding the same through the thin sheet metal firewall of an automotive vehicle, although the invention may be employed in other applications wherein it is desired to guide a cable inexpensively through a thin wall or panel.

Various unitary cable guides adapted to be inserted through an aperture in a panel from one side thereof and to interlock with the panel are well-known to the art. Such guides however, unless expensively manufactured to close tolerances with respect to the thickness of the panel and the aperture, tend to shift and cock relative to the panel during operation and frequently become disengaged. Particular trouble arises when the panel comprises thin sheet metal and the cable guide comprises a one-piece tubular molded plastic having portions engageable with opposite faces of the panel in a clamping action and spaced by an intermediate portion dimensioned to engage the edges of the panel defining the aperture to limit relative movement of the guide. The region of engagement between the intermediate portion of the guide and the panel is so slight that in the event of unavoidable limited cocking of the guide, the panel frequently slips out of engagement with said intermediate portion and moves between the latter and the adjacent portion of the guide which engages the panel face and thus enables disengagement of the guide from the panel.

It is accordingly an important object of the present invention to provide an improved throttle cable guide of the above type which overcomes the foregoing problems and which may comprise an economically fabricated one-piece plastic material molded to comparatively relaxed dimensional tolerances, yet which is adapted to interlock positively and firmly with the panel to prevent inadvertent shifting and separation therefrom and which is readily operable to be separated from the panel to enable repairs or replacement.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIG. 1 is a longitudinal sectional view through the firewall of an automobile body, showing in elevation the assembled tubular guide for the throttle actuating cable, the guide being forced rearwardly, as for example during an assembly operation, to release the resilient arms of the guide from engagement with the firewall panel.

FIG. 2 is a fragmentary sectional view taken in the direction of the arrows substantially along the line 2—2 of FIG. 1.

FIG. 3 is a transverse sectional view taken in the direction of the arrows substantially along the line 3—3 of FIG. 1.

FIG. 4 is a transverse sectional view taken in the direction of the arrows substantially along the line 4—4 of FIG. 1.

FIG. 5 is a longitudinal sectional view taken in the direction of the arrows substantially along the line 5—5 of FIG. 2, but showing the guide in its normal assembled position.

FIG. 6 is a longitudinal section taken in the direction of the arrows substantially along the line 6—6 of FIG. 1.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, a particular embodiment of the present invention is illustrated in the application of adapted to receive a tubular guide for the cable **10**. through the sheet metal firewall **11** of an automobile. A portion of the firewall is embossed to rigidify the structure and to provide a thin sheet steel panel **11***a* perpendicular to the axis of the cable **10** and having an aperture **12** adapted to receive a tubular guide for the cable **10**.

The guide comprises a comparatively rigid one-piece molded resilient plastic material having a body **13** oversize with respect to the aperture **12** and providing a plane backing surface **14** adapted to confront the panel **11***a* in parallelism. An integral projection **15** of the body **13** extends through the aperture **12** and is provided with an integral rearward enlargement **16** comprising a rearwardly tapered nose for guiding the projection **15** through the aperture **12** by cam action. Also integral with the nose or rearward enlargement **16** at opposite sides are a pair of laterally and forwardly diverging arms **17** spaced throughout the major portion of their length from the projection **15**. Rearwardly of the enlargement **16**, the projection **15** continues at **18** to provide a tubular guide for the cable **10** which may be operatively connected at its rearward and forward ends in a conventional manner with the throttle foot pedal and throttle valve, respectively. The bore of the projection **18** extends coaxially forward into the enlargement **16** and enlarges at **19** to tightly receive a sheath **20** for the cable **10**.

Integral with the body **13** and extension **15** and extending rearwardly from the face **14** into the aperture **12** is a forward enlargement **21** which terminates in a rear face **21***a* normally parallel to the surface **14** and slightly forwardly of the rear face of the panel **11***a* when these elements are in their assembled condition, FIG. 5. The rear face **21***a* is also spaced slightly forwardly from the forward ends of the arms **17** so that the latter may yield resiliently toward the extension **15** into the space **22** immediately rearward of the enlargement **21** to permit

passage of the projection **15** and arms **17** through the aperture **12** during assembly or disassembly.

In order to limit lateral movement of the body **13** within the aperture **12**, a pair of lugs **23** integral with the body **13** and projection **15** extend rearwardly from the surface **14** (to appreciably overlap the forward ends of the arms **17**) and radially from the projection **15** transversely to the directions of lateral divergence of the arms **17**. As illustrated in FIG. 3, the lugs **23** are dimensioned laterally so as to be confined closely within mating portions **12***a* of the aperture **12**, thereby to limit lateral movement of the integral body **13** and projection **15** within the aperture **12**. Seated on the forward enlargement **21** under compression between the surface **14** and front face of the panel **11***a* is a spacer **24** of resiliently compressible material which yieldingly urges the body **13** forwardly and maintains the forward ends of the arms **17** in snug engagement with the rear face of the panel **11***a*. Thus the cable guide is positively maintained in substantially fixed position within the aperture **12**.

It is apparent from the foregoing that the cable guide may be readily assembled with the panel **11***a* by inserting the extension **18** through the aperture **12** until the rearwardly tapered nose **16** engages the edges of the aperture **12** and cams the arms **17** resiliently into the spaces **22**. The compressible spacer **24** is sufficiently compressible within its elastic limits to enable rearward movement of the arms **17** beyond the rear face of the panel **11***a*, FIG. 1, whereupon the resiliently yieldable arms **17** are free to return to their normal undistorted condition as illustrated in FIGS. 1 and 5. Thereafter the rearward force applied to the body **13** during assembly is released and the resiliency of the spacer **24** moves the body **13** forwardly from the panel **11***a* and urges the forward ends of the arms **17** tightly against the panel **11***a* as aforesaid.

The cable guide may be readily disassembled from the panel **11***a* by substantially the reverse operation wherein the body **13** is forced forwardly to compress the spacer **24** to the condition illustrated in FIG. 1. The arms **17** are then squeezed inwardly into the spaces **22** and withdrawn together with projection **15** forwardly from the aperture **12**.

By virtue of the structure described, the arms **17** will readily yield resiliently into the space **22** without interference from either of the enlargements **21** or **23**. In this regard, the minimum clearance between the surface **21***a* and the forward ends of the arms **17** must be adequate to assure that the latter will swing into the space **22** to enable their passage through aperture **12**, as for example during assembly with the panel **11***a*, regardless of production variations in the length of the arms **17** and the axial width of the enlargement **21**. When such minimum clearance is assured, the maximum clearance in the event of a stackup of dimensional tolerances or flexing of the arms **17** or panel **11***a*, as occurs during operation of the cable **10**, may be greater than the thickness of the thin panel **11***a*. Nevertheless, regardless of the gap that might exist between the face **21***a* and the forward end of one of the arms **17**, the thin edge of the panel **11***a* still cannot slip off the enlargement **21** and into the space **22** at one side of the projection **15** sufficiently to enable the arm **17** at the opposite side to be withdrawn forwardly through the aperture **12**. Thus a commercially satisfactory cable guide which will not work loose from the panel **11***a* during operation may be economically formed by conventional mass production molding processes which are usually not susceptible of dimensional precision.

I claim:

1. Guide means for supporting and guiding a cable axially through an aperture in a comparatively thin panel, said means comprising a body having a backing surface oversize with respect to said aperture and adapted to confront a front face of said panel around said aperture, a projection of said body extending axially rearwardly from said backing surface for insertion through said aperture, said projection having a forwardly extending arm spaced from and diverging from one side of said projection to engage the rear face of said panel laterally of said aperture to prevent forward passage therethrough when said projection extends therein, said arm being resiliently yieldable sidewise toward said side to pass through said aperture, resilient means adapted to extend around said projection under compression between said front face and surface to urge the latter yieldingly forward from said front face and hold the forward end of said arm firmly against said rear face, said resilient means being resiliently compressible between said surface and front face to enable said arm to move rearwardly from said rear face when said body is forced toward said panel, a bore extending axially through said body and projection for passage of said cable, and means to prevent sidewise movement of said body within said aperture in the direction of resilient yielding of said arm comprising a panel engaging portion of said projection dimensioned to fit closely within mating portions of said aperture, to interengage said panel at various locations which do not define a plane parallel to both the axis of said bore and said sidewise direction of resilient yielding of said arm, the surface of said panel engaging portion being parallel to the axis of said bore and extending axially rearwardly at least to overlap said forward end of said arm and extending axially forwardly at least to within said aperture when said projection is forced rearwardly through said aperture to the limit of resilient compressibility of said resilient means, said side and arm defining a space therebetween dimensioned to receive said arm upon resilient yielding thereof and having a transverse opening which freely opens transversely of said sidewise direction of resilient yielding.

2. In the combination according to claim **1**, said body, projection and arms comprising a comparatively rigid, resilient, one-piece, molded material, the portion of said side located inwardly of said arm also extending transversely of said sidewise direction to define one edge of said transverse opening.

3. In the combination according to claim **1**, said projection having a forward enlargement dimensioned to fit closely within said aperture, said forward enlargement also extending axially rearwardly from said surface to a location short of said forward end of said arm and also short of the rear face of said panel when the latter and guide means are assembled.

4. In this combination according to claim **2**, said projection having an integral rearward enlargement comprising a rearwardly tapered nose for guiding the passage of said projection rearwardly into said aperture by cam action, said arm comprising an integral extension of said rearward enlargement.

5. In the combination according to claim **4**, said body having an integral forward enlargement, said forward enlargement extending from said backing surface into said aperture and terminating rearwardly at a location proximate and forward of said forward end of said arm when the latter is deformed yieldably toward said side of said projection to pass through said aperture, said panel engaging portion comprising a lug integral with said projection and body and extending rearwardly from said backing surface to prevent movement of said panel between said forward enlargement and the forward end of said arm, said lug extending outwardly from said projection transversely of said sidewise direction to a greater extent than the outward extension of said projection in said sidewise direction and terminating in said sidewise direction short of said transverse opening of said space, thereby to avoid obstructing said opening.

6. In the combination according to claim **2**, the dimension of said panel engaging portion transversely of said sidewise direction being different from the dimension of said projection in said sidewise direction, and said panel engaging portion terminating in said sidewise direction

short of said transverse opening of said space, thereby to avoid obscuring said opening.

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U.S. Cl. X.R.

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