Jan. 16, 1951 C. A. TAYLOR ET AL 2,538,601

EXPANDING FASTENER

Filed Aug. 10, 1945

Fig. 1.

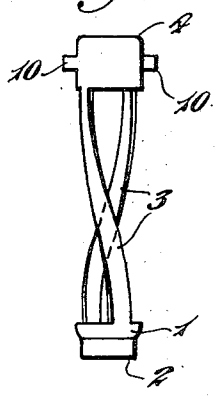


Fig. 2.

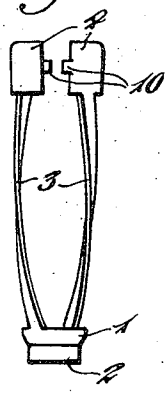


Fig. 3.

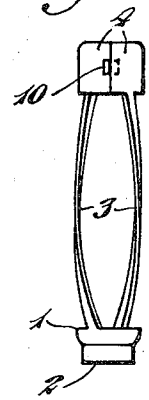


Fig. 4.

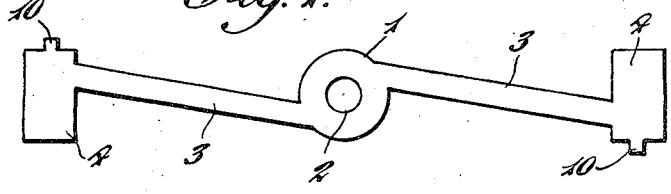


Fig. 5.

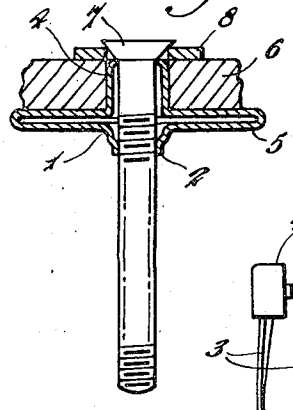
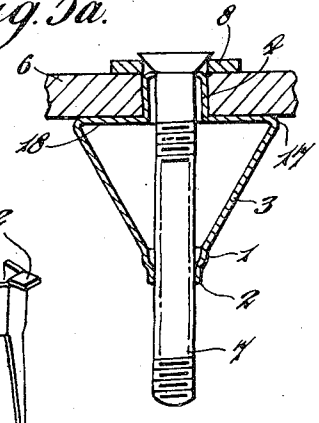


Fig. 5a.



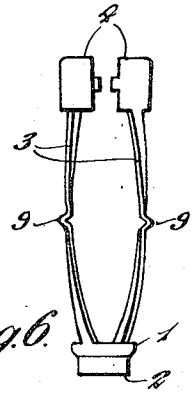


Fig. 6.

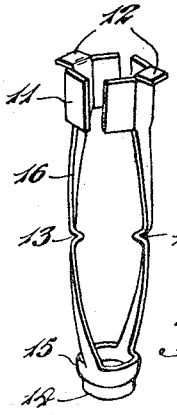


Fig. 7.

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EXPANDING FASTENER

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6 Claims. (Cl. 85—32)

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This invention relates to improvements in fastening devices intended for use in securing fittings or articles such as hooks, switches, cabinets, etc., to walls constructed of materials such as plaster-board, composition board, hollow tiles, and the like, where the available thickness of wall to receive a fastening device is not sufficient to enable efficient or satisfactory fixing to be made by conventional methods such as the known metal or fibrous plugs, which depend upon the friction between the plug and the cylindrical wall of the hole in which it is inserted.

A collapsible tubular fastening device of the type comprising an internally threaded substantially cylindrical end member adapted to be engaged by a screw-threaded member passing through the device, and a pair of oppositely disposed deformable strips adapted to extend through a wall having a preformed hole, the free ends of said strips being enlarged and transversely curved whereby a substantially cylindrical head member is formed for placement in said preformed hole, is known. It has been found in practice that when collapsible fastening devices of this type are used, the tightening of an externally screw-threaded member in the internally screw-threaded end member causes a torque to be transmitted between these members so as to tend to twist the said end member in the same direction as the screw or bolt is being twisted in order to draw the said end member towards it and effect the desired collapse of the side strips. This torque, often of considerable magnitude, stresses the side strips in transverse bending. Due to their relative structural weakness it has been found in practice that these side members often yield under this transverse bending stress before they yield in compression so that the screw or bolt drags the end member around with it before the collapse occurs. In many cases the side members may become so twisted and entwined that the desired collapse is entirely prevented.

It is the object of the present invention to overcome this difficulty and accordingly the invention comprises a device of the type described wherein the deformable strips are inclined with respect to the longitudinal axis of the tubular fastening device, in such a manner that the free ends of the deformable strips are pre-formed so as to be rotationally displaced about said axis with respect to the ends of the strips attached to the end member of the device, such rotational displacement of the free ends being in the same sense as the sense of rotation of the screw-

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threaded member during the insertion thereof into the end member.

It will be seen that, under these conditions, the threaded end member will tend to be rotated by an inserted screw in a direction such as to stress the side strips partly in transverse bending as before and partly in compression, the proportion between these two stresses being adjustable at will by the angle of inclination imparted to the strips during the manufacture of the device. In this way, much of the torque is prevented from bending the strips transversely, and furthermore, said torque is usefully employed stressing the strips in compression and in assisting the longitudinal pulling force exerted on the end member to bring about its collapse in the desired manner.

Various views of a device according to the invention are shown by way of example in the accompanying drawing, in which

Figure 1 is a view of a device according to the invention prior to its insertion in a previously prepared hole in a thin wall or the like.

Figure 2 is a side view at right angles to that shown in Figure 1,

Figure 3 is a side view similar to Figure 2, showing the device in the position it assumes in a previously prepared hole, prior to collapse,

Figure 4 shows the blank strip from which the device of Figures 1 to 3 is made.

Figure 5 is a sectional view of the device shown in Figures 1 to 3, after it has collapsed, in position extending through a wall panel or like fixture,

Figure 5a shows the device of Figures 1 to 3 in a partially collapsed state,

Figure 6 is a view similar to Figure 2 of a modified form of the device, and

Figure 7 is a perspective view of a further modified form of the device.

As shown in the said drawing, Figures 1 to 5, the device comprises a fastening device adapted to receive a right handed screw or like member, formed from a sheet metal strip (Figure 4), the central and end portions of which are upset and punched to form a substantially cylindrical end member 1 having a central screw-threaded bore in a smaller cylindrical extension 2, two oppositely disposed side strips 3 and at the end of such strips 3, enlarged portions 4 bent each to form a semi-cylindrical head member. The side strips 3 are arranged so that when the device is ready for use, as shown in Figures 1 to 3, they are inclined with respect to the longitudinal axis of the device, in such a manner that the enlarged portions 4 are

rotationally displaced about said axis with respect to the ends of the strips attached to the end member 1, such displacement of the enlarged portions 4 being in the same sense as the sense of rotation of a screw or like member during the insertion thereof into the end member. The device is then inserted into a previously formed hole extending through a wall or the like 6 (see Figure 5), until the end 1 thereof having the central screw-threaded part 2 projects beyond the further face of the wall or the like. A screw 7 is then inserted through the hole in the article being fixed or a washer may be substituted for the latter if it is desired that the device be collapsed as a separate operation previous to the final fixing, by which method a shorter screw may be used for making the fixture than that which is necessary for the preliminary collapsing operation. On tightening up the screw, the head 4, 4 is drawn up against the back of the article being fixed (or the washer as the case may be) and further tightening draws the screw end 2 towards the head of the screw and forces the side strips 3 to buckle outwardly under the longitudinal pressure thus applied thereto. The parts of the side strips 3 projecting inwardly beyond the hole are thus forced outwards and fold up to form radially projecting abutments 5 on the inner end of the device, the withdrawal of which through the hole is thus positively prevented. The article 8 to be fixed upon the wall is held in position by the engagement of the screw 7 in the end 2 of the collapsed device.

In order further to facilitate ready collapsing or deformation of the device, the strips 3 may be provided with oppositely arranged indentations or corrugations as indicated at 9 in Figure 6, these being stamped in the strips when blanking out or during the course of the subsequent pressing operation. The object of these indentations 9 is not to arrange for collapse at any particular point but to initiate the outward buckling, the actual points of fold in the side strips being determined by the length of the side strips projecting through the hole and, therefore, capable of deformation. A plurality of such indentations 9 may, if desired, be arranged in each strip 3. Further to facilitate collapsing of the side strips 3, the latter may in the course of manufacture be given a slight outward set as shown in Figures 1 and 2, the resiliency of the metal causing such strips 3 to be slightly outwardly curved, as shown in Figure 3, when the members 4, 4 are brought together by the insertion of the device into its hole.

In order to ensure that after collapse of the device a substantial area of the outer surface of each strip 3 shall lie in contact with the inner face of the wall through which the device has been passed, the said strips are advantageously so formed that longitudinal pressure thereon causes outward buckling of each strip to be initiated at a point in the length thereof projecting inwardly beyond the inner face of the hole in the wall board or the like which is nearer to the wall than to the screwed end 2 of the device.

In order so to predetermine the point at which such outward buckling shall be initiated, the nicks or indentations 9 therein may be suitably positioned, or alternatively the strips may be of tapering width, i. e. the width of each strip may be increased towards the screwed end of the socket (not shown), the inner end of each strip thus being relatively more strongly resistant to collapse than the part thereof closer to the inner face of the wall.

Thus, when longitudinal pressure is exerted upon the device, the strips 3 collapse at a point 17 substantially one third of the inwardly projecting length thereof beyond the wall 6, as shown in Figure 5a, the part 18 thereof adjacent to the wall is caused to lie closely thereagainst.

In order to prevent rotation of the device in its hole when being collapsed or deformed, or after such collapsing or deformation, ribs, tongues or projections 10 may extend laterally from the head members 4, 4 as shown in Figures 1 to 6, such projections biting into the sides of the hole in the wall and positively preventing rotation of the device therein.

The form of device according to the invention shown in Figure 7 is especially suitable for use with thin cardboard or metal. Instead of the head member being provided with projections to prevent rotation, the said head member 11 is made hexagonal in shape so that, when driven into a circular hole of approximately the same diameter as the distance across the flats of the hexagon, the head member 11 of the device 15 becomes firmly fixed against rotation. Nicks or indentations 13 may be provided in the arms 16 of the device in order to facilitate initiation of the collapse of such arms 16. The device is further provided with bent over lugs 12 as shown in Figure 7, to form a partial flange, partly to prevent the device 15 being pushed right through the aperture and partly to provide an adequate surface to bear against the back of the article being fixed when the screw is being tightened. In this form of device, the diameter of the bore formed in the end 14 thereof is preferably such that the external diameter of the screw is only slightly less than the internal diameter of the device, so that when the side strips 16 thereof are collapsed to form radial abutments on the inner face of the walls, since each such abutment comprises two thicknesses of metal (in a manner similar to that shown in Figure 5) the force required to destroy the fixing by forcible withdrawal of the screw is equal either to the strength of the screw itself or to the strength of the material of the wall or the like through a hole in which the device has been inserted. Since the inner collapsed portion of the device comprises two thicknesses of the strip from which it is made, and the space between the internal wall of the prepared hole in the wall or the like and the exterior of the screw is substantially only a single thickness of such strip, it will be appreciated that to withdraw the collapsed portion of the device through the prepared hole would be impossible without destruction either of the screw or of the wall itself.

We claim:

1. An expanding fastener comprising an internally threaded, substantially cylindrical end member adapted to be engaged by a screw-threaded member passing through the device, and a pair of oppositely disposed deformable strips adapted to extend through a wall having a pre-formed hole, each of said strips being formed integrally at one end with said end member and having its other end free, the free ends of said strips being enlarged and transversely curved so that, when said curved and enlarged end portions are brought together, a substantially cylindrical head member is formed for placement in said preformed hole, the deformable

strips being inclined with respect to the longitudinal axis of the fastener in such a manner that the free ends of the deformable strips are disposed in positions rotationally displaced about said axis relatively to the ends of the strips attached to the end members of the device, such rotationally displaced relative positions of the said free ends being in the same sense as the sense of forward rotation of the screw-threaded member to be inserted into the end member.

2. An expanding fastener in accordance with claim 1, wherein the corresponding ends of the deformable strips are diagonally oppositely disposed with respect to each other.

3. An expanding fastener in accordance with claim 1, wherein each of said enlarged and curved end portions is provided at one edge with a lateral projection for engagement with the surface of the preformed hole to prevent rotation of the head member.

4. An expanding fastener in accordance with claim 1, wherein each deformable strip is formed with at least one transverse corrugation in order to facilitate collapse or deformation thereof at a desired point in its length.

5. An expanding fastener in accordance with claim 1, wherein each deformable strip is bent slightly outwardly in the form of a bow in order to facilitate collapse or deformation thereof.

6. An expanding fastener in accordance with claim 1, wherein the fastener is composed of a unitary piece of sheet metal.

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