

May 8, 1945.

H. C. GLITSCH

2,375,409

FASTENING DEVICE

Filed July 27, 1942

2 Sheets-Sheet 1

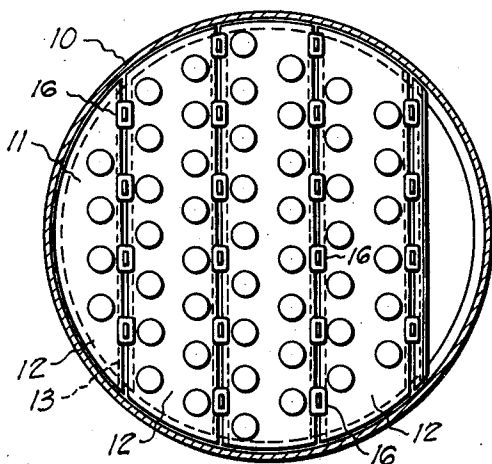


Fig. 1.

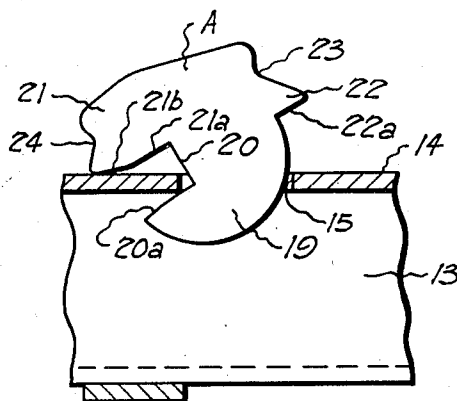


Fig. 3.

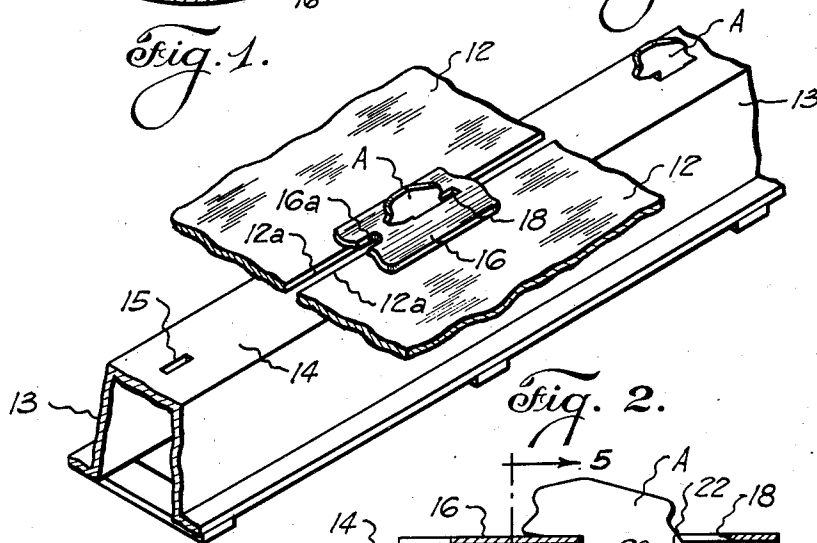


Fig. 2.

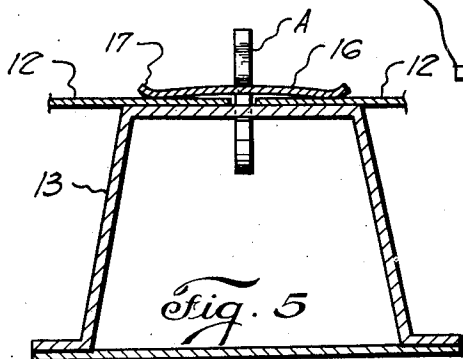


Fig. 5

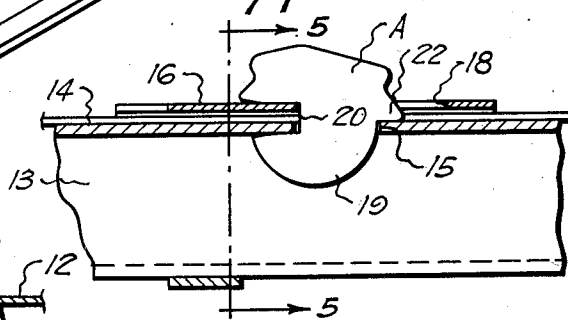


Fig. 4.

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2 Sheets-Sheet 2

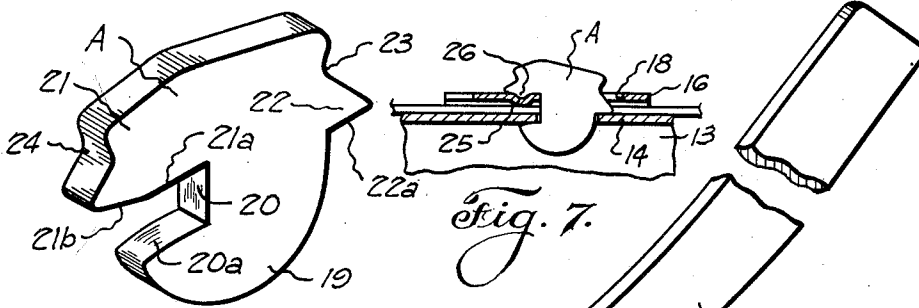


Fig. 6.

Fig. 7.

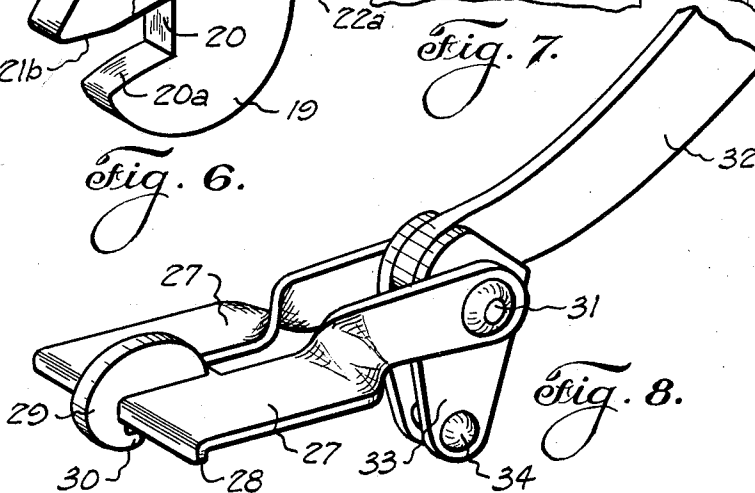


Fig. 8.

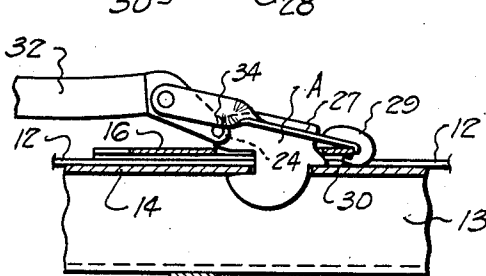


Fig. 9.

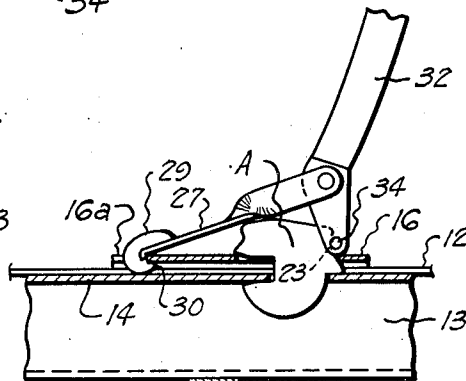


Fig. 10.

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2,375,409

FASTENING DEVICE

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Application July 27, 1942, Serial No. 452,487

7 Claims. (Cl. 189—35)

This invention relates to new and useful improvements in fastening devices.

One object of the invention is to provide an improved fastening device for securing sheets, plates or other members to a support, whereby the usual fastening bolts and nuts, together with their inherent disadvantages are eliminated; the device being particularly adapted for use in securing adjacent plates or sheets to a common support.

An important object of the invention is to provide an improved fastening device which is adaptable for use in fastening adjacent deck sheets of a bubble tower to a supporting member or truss and which includes a co-acting retaining plate and latch element which may be positioned from a point above the tray, whereby application of the fastening device is facilitated and the use of bolts and nuts is obviated.

A particular object of the invention is to provide an improved fastening device which firmly clamps the sheet or plate to its support, while permitting the sheet to undergo a limited sliding movement relative to the device, whereby thermal expansion and contraction of said sheet will not result in a buckling or bending thereof.

Still another object of the invention is to provide an improved fastening device, of the character described, which is so constructed that it is engaged and disengaged by a sliding movement and which is arranged to be applied without the necessity of employing auxiliary supporting means, whereby said device may be quickly and easily manipulated by a single operator, and also whereby the time required for assembling a deck or tray constructed of a plurality of sheets is minimized.

A further object of the invention is to provide an improved device of the character described, wherein a retaining plate overlies the adjacent sheets or members to be fastened, and a latch element co-acts with said retaining plate and with the support to which the sheets are to be secured, whereby a frictional clamping action is produced to frictionally fasten said sheet against upward displacement on the support, the retaining plate being elongate and overlying the marginal edge portions of the sheets so as to hold said sheets in sealing contact with the support and thereby minimize leakage of fluids between said sheets and the support.

A particular object of the invention is to provide an improved device, of the character described, which is extremely simple consisting of only two parts, said device being arranged to be

substituted for the usual nuts, bolts and washers and being of such construction that the number of devices required to fasten adjacent sheets to a support is considerably less than the number of nuts and bolts which would ordinarily be required.

A still further object of the invention is to provide an improved actuating tool for use with the fastening device, said member including means for imparting movement to the latch element of the device, whereby the application and removal of said device is facilitated.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, as an example of the invention is shown, and wherein:

Figure 1 is a horizontal cross-sectional view of a bubble tower or tank, illustrating the bubble tray or deck formed of a plurality of sheets which are secured to supports by the improved fastening device,

Figure 2 is an enlarged isometric view of the fastening device, constructed in accordance with the invention and showing the same fastening adjacent sheets to a support,

Figure 3 is a longitudinal, sectional view, illustrating the latch element being inserted into position,

Figure 4 is a similar view, with the latch in fastening position,

Figure 5 is a transverse, vertical, sectional view, taken on the line 5—5 of Figure 4.

Figure 6 is an enlarged isometric view of the latch element,

Figure 7 is a view, similar to Figure 4, of a slightly modified form of the invention,

Figure 8 is an enlarged isometric view of the actuating tool,

Figure 9 is a view similar to Figure 4, with the latch element inserted in the opening and prior to its movement into final locking position, said element being engaged by the actuating tool,

Figure 10 is a similar view, with the latch moved to final position by said tool, and

Figure 11 is a view similar to Figures 9 and 10 and illustrating the tool applied to the latch to move the same to a released or disengaged position.

The invention will be described herein as applied to the bubble tray of a bubble tower for fastening the sheets of said tray to the trans-

verse supports or trusses within the tower, but it is to be understood that the invention is not to be limited to this particular use since it may be employed for fastening adjacent sheets to any support.

In the drawings, the numeral 10 designates a bubble tank or tower having a bubble tray or deck 11 therein. As is well known, a bubble tower includes a plurality of trays or decks but only one such tray is shown in the drawings. The tray includes a plurality of sheets 12 which rest upon and are secured to transversely extending trusses or supports 13. It has been the usual practice to secure the marginal edge portions of the sheets to the supports or trusses 13 by means of nuts, bolts and washers. However, the use of bolts and nuts has been disadvantageous because the underside of the truss or support is not always readily accessible and furthermore, a large number of bolts and nuts are required for each sheet.

As is clearly illustrated in Figure 2, the support or truss 13 is generally trapezoidal in shape, although it may be of any desired design, and is provided with a flat top 14 upon which the marginal edge portions of the sheets 12 rest. The sheets 12 have their edges 12a spaced from each other and are so positioned in order to permit said sheets to undergo lateral movement due to thermal expansion and contraction. In carrying out the present invention the top of the support 13 is formed with a plurality of rectangular slots or openings 15 which are equally spaced throughout the length of said support. The slots are located at the central portion of the top, whereby when the sheets 12 are resting upon the support 13, the slots 15 are disposed in the space between the adjacent edges 12a of said sheet.

The improved fastening devices are associated with each of the slots 15 and each device includes a retaining or confining plate 16 which is arranged to overlie the adjacent marginal edge portions of the sheets 12 (Figure 2). The plate is bowed upwardly at its central portion and is constructed of a spring steel or similar metal having an inherent resiliency. The longitudinal edge portions of the plate 16 are turned upwardly a slight distance as indicated at 17 and thus, when the plate 16 is placed over the sheets 12, said plate spans the space between the edges 12a of said sheet. Since the central portion of said plate is bowed or curved upwardly, said central portion of said plate is spaced slightly above the upper surfaces of the sheet 12 (Figure 5). The plate 16 is formed with an elongate slot or opening 18 which is located nearer one end of the plate and which is disposed at the longitudinal center thereof. When the plate 16 is placed over the sheets 12, the slot or opening 18 is aligned with the slot or opening 15 in the top of the truss or support 13.

A latch element or key A is adapted to be inserted through the slots 18 and 15 and is arranged to securely lock the retaining plate 16 in position on the sheets 12, whereby said plate will hold said sheets on the support 13. The latch element is clearly shown in Figure 3 and includes a body portion which is formed with a depending tongue 19 having a generally curved shape. The forward portion of the element is provided with a recess 20 and the bottom of this recess is formed by the top edge of the tongue, this edge being indicated at 20a. Above the recess 20, the element has an integral forwardly

projecting extension 21 and the lower edge 21a of the extension forms the top of the recess, said edge being adapted to coact with the upper surface of the retaining plate 16, as will be hereinafter explained. A stop lug 22 extends outwardly at the rear surface of the element A and when said element is in its latching position, the lower edge 22a of the lug engages and rides upon the top 14 of the support or truss 13. A curved recess 23 is provided in the rear edge of the element A above the lug 22, while a similar recess 24 is formed in the forward portion of the extension 21, these recesses being provided for coaction with a suitable actuating tool. However, if desired, these recesses may be eliminated since the latch element A may be applied or removed without the use of the particular actuating tool which will be hereinafter described.

In using the improved fastening device, the sheets 12 are placed in position on the support 13 with the edges 12a of adjacent sheets spaced from each other, whereby the slots or openings 15 in the support 13 are disposed between the spaced edges. Each latching element A is then inserted through one of the slots 15, being passed between the spaced edges 12a of the sheet. In inserting the latch element, the curved tongue 19 is passed through the slot 15 by tilting the element, as shown in Figure 3 and the downward movement of the latch element A is limited by the lug 22 striking the upper surface of the support.

After the latching element A is in position within the slot 15, the retaining plate 16 is then engaged over said latching element, the upper portion of said element passing through the elongate slot 18 in the retaining plate. The plate is moved downwardly until it engages the upper surfaces of the sheets 12 and at such time, the parts are in substantially the position shown in Figure 9. The latching element A is then raised upwardly so that the upper edge 20a of the tongue 19 moves into engagement with the underside of the top 14 of the support 13 and such movement spaces the lower edge 21a of the extension 21 of the latching element above the top of the support, whereby the plate 16 may be slid relative to the latching element so as to be engaged beneath the extension. The sliding movement of the plate causes said plate to move beneath the edge 21a, whereby said plate is confined by the latching element. As has been previously pointed out, the central portion of the plate 16 is bowed upwardly and the depth of the recess 20 in the latching element is cut so that when the plate slides beneath the edge 21a, the plate is placed under tension, whereby said plate is frictionally locked against the sheets 12. The outer end of the edge 21a of the extension is flared or inclined upwardly at 21b so as to facilitate the insertion of the plate into the recess 20. The flaring of this outer end produces a cam action, as the plate moves into the recess 20, whereby a tight frictional engagement between the parts is obtained.

Since each of the retaining plates 16 are relatively elongate, they engage a larger area of the sheet 12, with the result that a fewer number of retaining plates may be employed for fastening the sheets to their support. Since the fastening is accomplished by a frictional clamping action, the plates may undergo a limited lateral movement relative to each other, which movement is occasioned by thermal expansion and contraction.

Although it has been found that the frictional engagement is sufficient to maintain the plate 16 and the element A in a latching position, it may be desirable to provide a positive means for preventing disengagement of the parts. In Figure 7, a modification of the invention is shown and in this instance, the plate 16 is formed with a recess 25 located at its central portion and disposed near one end of the slot 18. A lug 26 is formed on the lower edge 21a of the extension 21 and is adapted to engage the recess 25 in the plate when the parts have moved to a final latching position. Obviously, the complementary lug 26 and slot 25 provide a positive means for preventing unintentional disengagement of the parts and provide an additional lock to assure non-engagement of the device.

When it is desired to remove the device, it is only necessary to slide the retaining plate 16 to the left in Figure 4 so as to align the slot 18 in said plate with the upper portion of the latching element A. When this is done, the plate 16 may be lifted upwardly off of the sheets, such upward movement being permitted since the upper portion of the latching element A passes through the slot 18. The latching element A is then removed from the slot 15 in the top 14 of the support or truss 13.

Any suitable means may be employed for imparting a sliding movement to the plate 16 in order to move it to its engaged or disengaged position. However, it is preferable to employ the tool illustrated in Figure 8. This tool includes a yoke 27 which has the outer end of its arms bent downwardly to provide a flange 28. A keeper 29 having an inwardly directed lug 30 is secured to the central portion of the yoke 27. The yoke 27 is pivoted on a bolt 31 and is capable of swinging movement with respect to a handle 32 which has its inner end also pivoted on said bolt. A pair of spaced arms 33 have their upper ends integral with or secured to the handle, while their lower ends are fastened together by a transversely extending pin 34.

In using the tool illustrated in Figure 8, the latching element A is inserted through the slot 15 in the support 13, after which the retaining plate 16 is engaged over said latch, as has been described. This position of the parts is illustrated in Figure 9. The retaining plate 16 is formed with a recess 16a in the end opposite that in which the slot 18 is located and the lug 30 of the keeper 29 of the tool is engaged in this recess. The pin 34, which extends between the ends of the arms 33 carried by the pivoted handle 32, is engaged with the recess 23 on the latching element. The recess 23 is located above the stop lug 22 and is on that end of the latching element A which is opposite the recess 16a in the retaining plate 16. After the tool is so engaged with the parts (Figure 9) the handle 32 is moved downwardly or swung to the right in Figure 9 and when this occurs, a fixed fulcrum at the pin 34 is had, with the result that the yoke 27 is moved to the right in this figure. Such movement of the yoke 27 imparts a sliding movement to the retaining plate 16, whereby said plate is moved into the recess 20 of the latching element and beneath the edge 21a of the extension 21. This position of the parts is illustrated in Figure 10. Manifestly, the tool provides a means whereby the retaining plate may be quickly moved into a latching position with respect to the latching element A.

The tool may also be employed for releasing

the device and in such instance, the lug 30 of the keeper 29 is engaged beneath the end of the retaining plate 16. The fixed pin 34 carried by the arms 33 is engaged with the recess 24 in the extension 21 and the handle 32 of the tool is moved in an opposite direction, whereby the fulcrum is at the recess 24. Such movement of the handle will result in the yoke 27 being moved to the left in Figure 11, with the result that the retaining plate 16 is disengaged from the notch 20 of the latching element A. Although the particular tool shown and described herein facilitates the application and removal of the device, the invention is not to be limited to use with such tool as any suitable means may be employed.

It is again pointed out that although the invention has been shown and described as applied to the sheet of a bubble tray or deck, said invention may be employed for fastening adjacent sheets to any support.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A fastening device including, an elongate resilient plate bowed transversely from end to end and having a slot in its bowed portion extending longitudinally thereof, and a flat key insertable through said slot and having a recess in one edge only for receiving the plate in fastening relationship at one end of said slot.

2. A fastening device including, an elongate resilient plate bowed transversely from end to end and having a slot in its bowed portion extending longitudinally thereof, a flat key insertable through said slot and having a recess in one edge only for receiving the plate in fastening relationship at one end of said slot, and a stop on the edge of the key opposite the recess.

3. A fastening device including, an elongate transversely bowed plate having its longitudinal edges bent upwardly to provide bearings upon which the plate may flex, said plate having a slot in its bowed portion extending longitudinally with relation to said edges, and a key insertable through said slot having a recess for receiving the plate at one end of said slot, said recess being larger than the thickness of said plate for receiving a support, whereby the key and plate may be fastened in position.

4. A fastening device including, an elongate transversely bowed plate which is yieldable transversely, said plate having a slot extending longitudinally thereof, and a flat key insertable through the slot of the plate and having a recess in one edge only for receiving the plate in fastening relationship at one end of the slot.

5. A fastening device including, an elongate transversely bowed plate which is yieldable transversely, said plate having a slot extending longitudinally thereof, a flat key insertable through the slot of the plate and having a recess in one edge only for receiving the plate in fastening relationship at one end of the slot, and a stop on the edge of the key opposite the recess.

6. The combination with a hollow support having a slot therein and a pair of sheets having adjacent edges resting upon said support in spaced relation, of a flexible plate bowed over the space between the edges of said sheets, said plate having a slot therein adapted to overlie the

slot in the support, and a key insertable through the slots of the support and the plate and provided with a recess for receiving the plate and the support at adjacent ends of their slots, whereby said sheets are yieldably fastened on said support.

7. The combination with a hollow support having a slot therein and a pair of sheets having adjacent edges resting upon said support in spaced relation, of a flexible plate bowed over the space

between the edges of said sheets, said plate having a slot therein adapted to overlie the slot in the support, a key insertable through the slots of the support and the plate and provided with a recess for receiving the plate and the support at adjacent ends of their slots, whereby said sheets are yieldably fastened on said support, and a stop on said key engaging the support through the slot of said plate.

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