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R. O. WILEY

3,155,808

NONLATCHING RESILIENT FASTENING ARRANGEMENT

Filed April 18, 1961

Fig. 1.

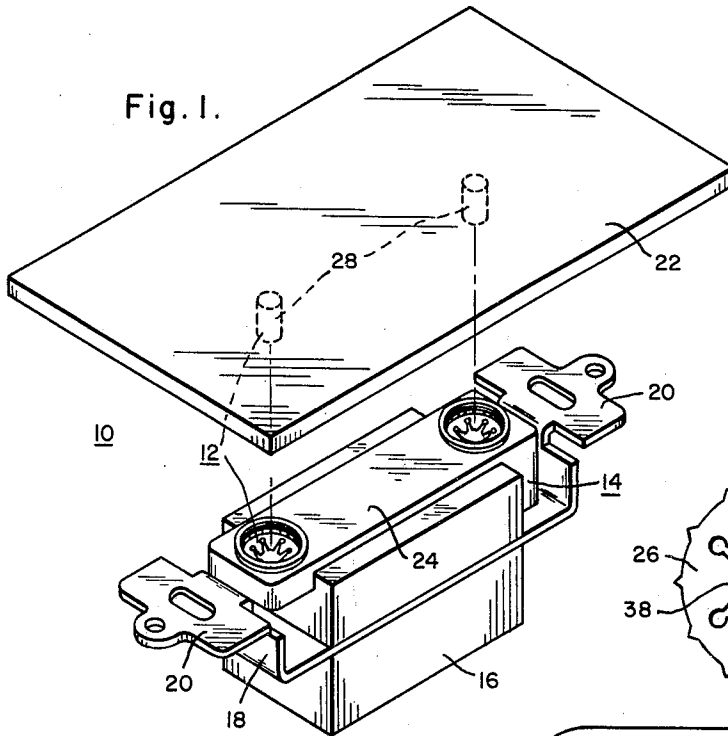


Fig. 2.

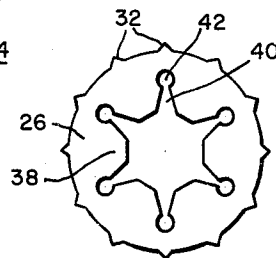


Fig. 5.

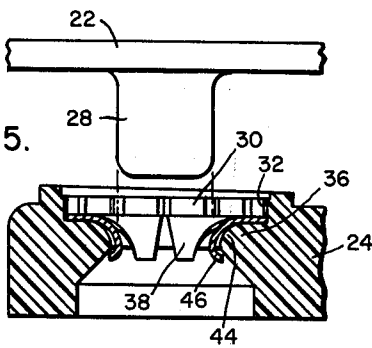


Fig. 3.

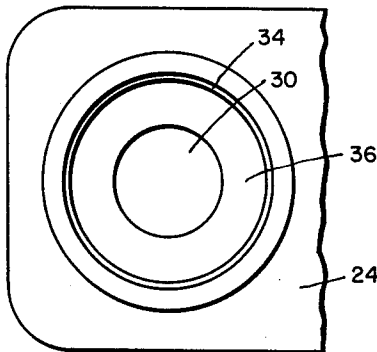
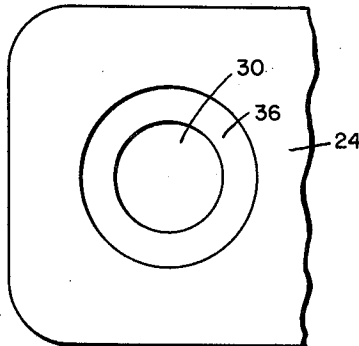


Fig. 4.



WITNESSES

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NONLATCHING RESILIENT FASTENING ARRANGEMENT

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9 Claims. (Cl. 200-172)

The present invention relates to arrangements for automatically fastening separate physical objects to each other, and more particularly to such arrangements as adapted for use in wiring devices or wiring device installations.

In many cases where two or more physical objects are to be fastened together automatically on in a quick-attach manner, that is without the use of screws or other separate fasteners which require a separate act of labor to accomplish the fastening relationship, it is desirable that this relationship be so characterized as to enable the objects also to be separated readily or automatically when separating forces above a predetermined magnitude are exercised upon the object or objects. In addition, it is desirable to enable the secureance and removal operations to be accomplished repeatedly.

For one example, consider a switch having a substantially planar actuator which is to be attached to the switch housing after installation of the latter in a wall-mounted switch box yet which is to be readily removable without any resulting breakage of the housing or actuator when internal access to the switch is desired. An automatically obtained fastening relationship is clearly desirable in this example not only because added cost and inconvenience are generally incurred through the use of separate fasteners, but also because any fastener which could be observed from a frontal viewpoint would detract from the appearance of the switch. Thus, the fastening relationship, once obtained, should enable the planar actuator to be held against the switch housing during normal operation of the actuator and it should also enable the actuator to be removed from the switch housing simply by applying to the actuator outward or separating forces valued above a predetermined magnitude. Similar results are also obtainable in other applications of the described fastening relationship, for example in fastening a face plate over an ordinary wall receptacle or toggle switch.

Thus, it is an object of the invention to provide a novel arrangement for automatically fastening separate objects to each other.

It is another object of the invention to provide a novel arrangement for automatically fastening separate objects to each other and for enabling ready separation of these objects.

A further object of the invention is to provide a novel arrangement for fastening separate objects to each other, with the object being separable without risk of breakage.

It is another object of the invention to provide a novel arrangement for engaging separate objects in fastened yet separable relation through the use of frictional forces and without the presence of biting forces otherwise interfering with separation of the objects.

An additional object of the invention is to provide a novel switch in which a generally planar actuator is assembled therewith in an automatic or a ready manner, with the actuator being smoothly removable upon the

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application of separating forces valued above a predetermined magnitude.

These and other objects of the invention will become more apparent upon consideration of the following detailed description along with the attached drawing in which:

FIG. 1 is an exploded perspective view of a wiring device or a switch which embodies the principles of the invention;

FIG. 2 is a top plan view of a resilient element which is assembled with the wiring device of FIG. 1 to accomplish the fastening function;

FIG. 3 is a top plan view of a portion of the wiring device of FIG. 1 with the resilient element of FIG. 2 being removed;

FIG. 4 is a bottom plan view of the wiring device portion shown in FIG. 3; and

FIG. 5 is an exploded elevational view, partially in section, showing in general the manner in which an actuator plate is fastened to or assembled with the wiring device or switch of FIG. 1.

In accordance with the broad principles of the invention, there are provided separate physical objects with means for automatically fastening these objects together. The fastening means may be concealed between the objects and separation of the objects by the exercise of separating forces above a predetermined magnitude can be readily or automatically accomplished. Further, the fastening means hold the objects together during normal usage substantially by frictional forces so that separation of the objects is obtained substantially without any biting interference which might otherwise lead to breakage of one of the objects if it is frangible.

More specifically, in FIG. 1, there is shown a wiring device 10 in which fastening means 12 of the invention are embodied. In this instance, the wiring device 10 is in the form of an electric switch 14 for controlling the continuity of a given electric circuit. For a specific description of a switch similar to the switch 14, reference is made to a copending application of R. O. Wiley and C. D. Baxendell entitled "Wiring Device," filed March 24, 1959, Serial No. 801,660, now Patent No. 3,036,185, and assigned to the present assignee.

The switch 14 includes an insulative housing 16 and a relatively rigid yoke 18 having mounting ears 20. As standardized in the wiring device industry, the switch 14 is sized to fit in a wall-mounted box. Accordingly, once the switch 14 is mounted through the use of the mounting ears 20, actuating means for the switch, including an insulative object or plate 22, are then accessible adjacent the wall face for operation of the switch 14. The actuating means also include a pivotable object or bar 24 which functions mechanically to open or close circuit contacts (not shown) enclosed by the switch housing 16. Actuator plate 22 is provided as a facing for the switch 16 and it serves to communicate actuating forces to the actuator bar 24. In addition, as described in the previously noted copending application, a frame member (not shown) may be provided for circumscribing the actuator plate 22.

To function both as a facing for the switch 16 and as an element which contributes to the actuating function, it is clear that provision must be made both for securing the plate 22 to the bar 24 subsequent to mounting of the switch 14 relative to the aforementioned wall and for

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enabling the plate 22 to be removed when internal access to the switch 16 is desired. Thus, the fastening means 12 are provided for this purpose, and, for reasons presented previously, it is preferred that the fastening means be automatic in character.

The fastening means 12 include a resilient clip 26, secured in this instance to the switch bar 24, and a projection 28, provided in this instance as a part of the switch actuator plate 22. To prevent rotative motion of the actuator plate 22 about the switch 16, a pair of clips 26 and a pair of projections 28 are provided, with the actuator projections 28 being alignable with the clips 26 for engagement therewith.

An opening 30 is provided in the switch bar 24 for reception of each clip 26. Means are also provided for securing each clip 26 to the switch bar 24 in the respective openings 30. The securing means include a plurality of barbs 32 about the periphery of each of the clips 26 and, if desired, a rim 34 of insulative material about each opening 30 with which the clip barbs 32 are bitingly engaged. Thus, each clip 26 is pressed into its opening 30, with the barbs 32 bitingly engaging the bar rim 34, until it is seated upon a shoulder 36 (FIG. 5) which projects into the opening 30,

Each clip 26 additionally includes resilient tabs 38 which extend inwardly of the adjacent opening 30 and generally define a passage within which the plate projection 28 can be frictionally retained. Slots 40, including enlarged end portions 42, are provided in each clip 26 as means for enhancing or ensuring substantially independent deflection of each tab 38 in response to insertion of the plate projection 28.

The clip tabs 38 generally curve from the plane of the clip 26 inwardly of the opening 30. Among other objects, insertion of the plate projections 28 is thereby facilitated. In addition, the clip tabs 38 curve generally adjacently of a rounded portion 44 of the shoulder 36. The radius of curvature of each of the tabs of the clip tabs 38 is so provided relative to the radius of curvature of the rounded shoulder portion 44, for example, its average value can be greater than that of the latter, as to enable lateral deflection of the clip tabs 38 upon insertion of the plate projection 28.

If it is preferred to obtain an added measure of securance of the clips 26 relative to the switch bar 24, the securing means previously mentioned can also include an outer end portion 46 of each clip tab 38 which is provided generally with a short radius of curvature so as to latch beneath the shoulder 36 when the plate projection 28 is partially or fully inserted in the opening 30. In such a case, as here, removal of the plate projection 28 tends to produce responsive forces by the tab portions 46 against the shoulder 36 rather than by the barbs 32 against the bar rim 34. Thus, with the use of this feature, there is a tendency not to derogate the biting engagement of the clip barbs 32 with the bar rim 34 when removal of the plate 22 is undertaken.

Because a plurality of peripherally disposed tabs 38 and a considerable area of each of the tabs 38 are provided for holding the plate projections 28, there is produced sufficient frictional force to hold the actuator plate 22 against the switch bar 24 during normal usage. Further, since the holding forces are distributed over a considerable area, there generally is insufficient force over any one segment of the plate projections 28 to result in cold flow of the insulative material thereof. Even if a nominal amount of cold flow of the insulative material does result, enmassing of the material would generally occur on the plate projections 28 adjacent the slots 40 so as not to result in biting interference against withdrawal of the plate projections 28 along the clip tabs 38. Thus, separation of the actuator plate 22 from the switch bar 24 is opposed substantially only by frictional forces and not by biting forces.

The actuator plate 22 is automatically fastened to the

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switch bar 24 by simply applying pressure to the face of the plate 22 until the plate projections 28 are fully inserted and frictionally engaged by the resilient clip tabs 38. Separation or removal of the actuator plate 22 from the switch bar 24 is also automatically accomplished since it requires only the exercise of pulling forces on the actuator plate 22. In addition, removal or separation of the actuator plate 22 is readily accomplished without causing any breakage of the insulative material of the housing 16 or the switch bar 24 since the removal forces need only be slightly greater than the frictional holding forces of the clips 26 or, in other terms, need not be so great as to overcome biting holding forces. This follows from the fact that, with the presence of substantial biting forces, the removal forces on the actuator plate 22 which are necessary to overcome the biting forces are likely to cause breakage of an insulative part prior to a disengagement of the biting relationship.

In the foregoing description, an embodiment of the invention has been described only for illustrative purposes. It is therefore desired that the invention be not limited by the described embodiment but, rather, that it be accorded an interpretation consistent with the spirit and scope of its broad principles.

What is claimed is:

1. An arrangement for engaging separate objects in fastened yet separable relation, said arrangement comprising a projection extending outwardly from one of said objects, a resilient generally planar metallic clip secured adjacent an opening in another of said objects, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other object opening, said one object projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one object projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one object projection provides for substantial nonlatching fastening of said objects.

2. An arrangement for engaging separate objects in fastened yet separable relation, said arrangement comprising a projection extending outwardly from one of said objects, a resilient generally planar metallic clip, means for securing said clip adjacent an opening in another of said objects, said securing means including a plurality of barbs about the outer periphery of said clip for bitingly engaging said other object when said clip is forced into location against the same, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other object opening, said one object projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one object projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one object projection provides for substantial nonlatching fastening of said objects.

3. An arrangement for engaging separate objects in fastened yet separable relation, said arrangement comprising a projection extending outwardly from one of said objects, a resilient generally planar metallic clip, means for securing said clip adjacent an opening in another of said objects, said securing means including a shoulder of said other object projecting into said opening and plurality

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of barbs about the outer periphery of said clip for bitingly engaging said other object when said clip is seated against said shoulder, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip inwardly of said other object opening, said one object projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one object projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one object projection provides for substantial non-latching fastening of said objects, said clip securing means also including an outer end of each of said clip tab end portions captively deflected under said shoulder when said one object projection is engaged by said clip tab portions.

4. An arrangement for engaging separate objects in fastened yet separable relation, said arrangement comprising a projection extending outwardly from one of said objects, a resilient generally planar metallic clip, means for securing said clip adjacent an opening in another of said objects, said securing means including a shoulder of said other object projecting into said opening and providing a seat for said clip, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other object opening, said one object projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one object projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said object projection provides for substantial nonlatching fastening of said objects, said tab end portions being so formed as to be deflected toward said other object shoulder which operates as a limit of deflection.

5. An arrangement for engaging separate objects in fastened yet separable relation, said arrangement comprising a projection extending outwardly from one of said objects, a resilient generally planar metallic clip secured adjacent an opening in another of said objects, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other object opening, said one object projection having a generally smooth outer surface extending inwardly from the outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one object projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one object projection provides for substantial nonlatching fastening of said objects, and means for enabling said clip tab end portions to respond in deflection substantially independently of each other.

6. An arrangement for fastening a face plate to a wall-mounted object, said arrangement comprising a projection extending outwardly from said face plate, a resilient generally planar metallic clip secured adjacent an opening in said object, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of

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the plane of said clip and inwardly of said object opening, said face plate projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said face plate projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said face plate projection provides for substantial nonlatching fastening of said face plate and said object.

7. A wiring device comprising an insulative housing having a member to which an insulative face plate member is to be fastened, one of said members having an outwardly extending projection, a resilient generally planar metallic clip secured adjacent an opening in the other of said members, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other member opening, said one member projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one member projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one member projection provides for substantial nonlatching fastening of said members.

8. A wiring device comprising an insulative housing having a member to which an insulative face plate member is to be fastened, one of said members having an outwardly extending projection, a resilient generally planar metallic clip, means for securing said clip adjacent an opening in the other of said members, said securing means including a shoulder of said other member projecting into said opening and providing a seat for said clip, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other member opening, said one member projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one member projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one member projection provides for substantial nonlatching fastening of said members, and said tab portions being so formed as to be deflected toward said other member shoulder which operates as a limit of deflection.

9. An electric switch comprising an insulative housing having an actuating bar member to which an insulative face plate member is to be fastened for actuating purposes, one of said members having an outwardly extending projection, a resilient generally planar metallic clip, means for securing said clip adjacent an opening in the other of said members, said securing means including a plurality of barbs about the outer periphery of said clip for bitingly engaging said other member when said clip is seated against a shoulder projecting into said other member opening, said clip having a plurality of deflectable tabs disposed peripherally about and extending toward an opening through said clip, each of said tabs having an elongated end portion extending outwardly of the plane of said clip and inwardly of said other member opening, said one member projection having a generally smooth outer surface extending inwardly from an outer end of the projection along its projecting length so as to be

frictionally insertable into said clip opening, and each of said clip tab end portions deflecting to be frictionally engaged laterally thereof with said one member projection when it is inserted as described so that the total frictional intersurface engagement about the periphery of said one member projection provides for substantial non-latching fastening of said members, said tabs being so formed as to be deflected toward said other member shoulder which operates as a limit of deflection.

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