

- [54] **CLAMP WITH IMPROVED LATCH**
[75] Inventor: **John H. Batts**, Grand Rapids, Mich.
[73] Assignee: **John Thomas Batts, Inc.**, Zeeland, Mich.
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- [52] U.S. Cl. **24/255 SL, 223/96**
[51] Int. Cl. **A47j 51/14**
[58] Field of Search **223/96; 24/243 GC, 24/249 SL, 249 LL, 248 BB, 248 SL, 255 SL, 20 TT, 67.9, 137 R, 81 GS**

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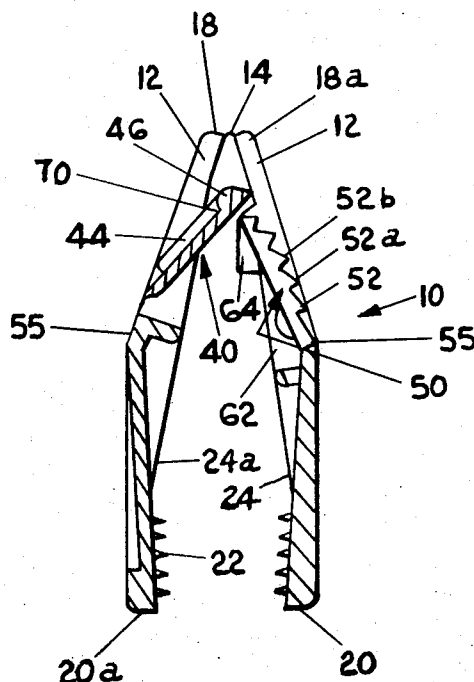
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Primary Examiner—Donald A. Griffin
Attorney—Peter P. Price et al.

[57] **ABSTRACT**

A one-piece, molded, plastic clamp is formed of a pair of clamping members hingedly joined together so that the clamp is closed when the free ends of the members are urged together. The clamp includes a central opening generally symmetric about the hinge and extending into both members. The clamp is held closed by a progressive latch means having a T-shaped latch hingedly extending into the opening from one member for selective engagement by its cross portions with a pair of stepped keeper ramps formed in the other member on each side of the opening. The keeper ramps are inclined inwardly toward the latch with the steps opening downwardly for receiving the bottom edges of the T-cross portion. The steps of each ramp form an arc so that the latch is cammed successively over the steps to achieve maximum wedging of the material between the clamp members. The entire clamp is so designed that it can be molded as a complete product in a two-piece mold without the use of cams.

17 Claims, 10 Drawing Figures



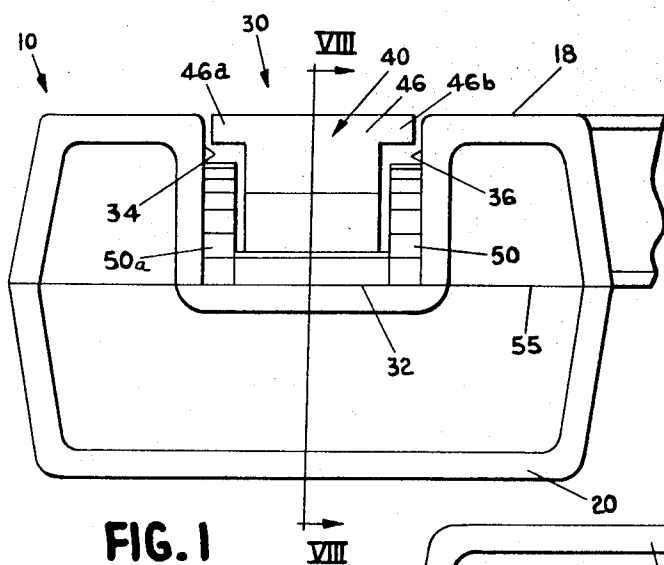


FIG. 1

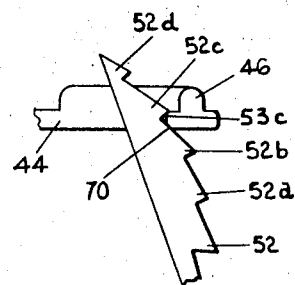


FIG. 10

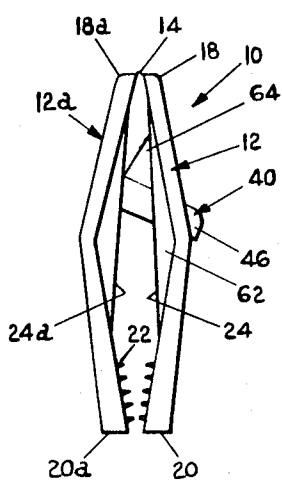


FIG. 6

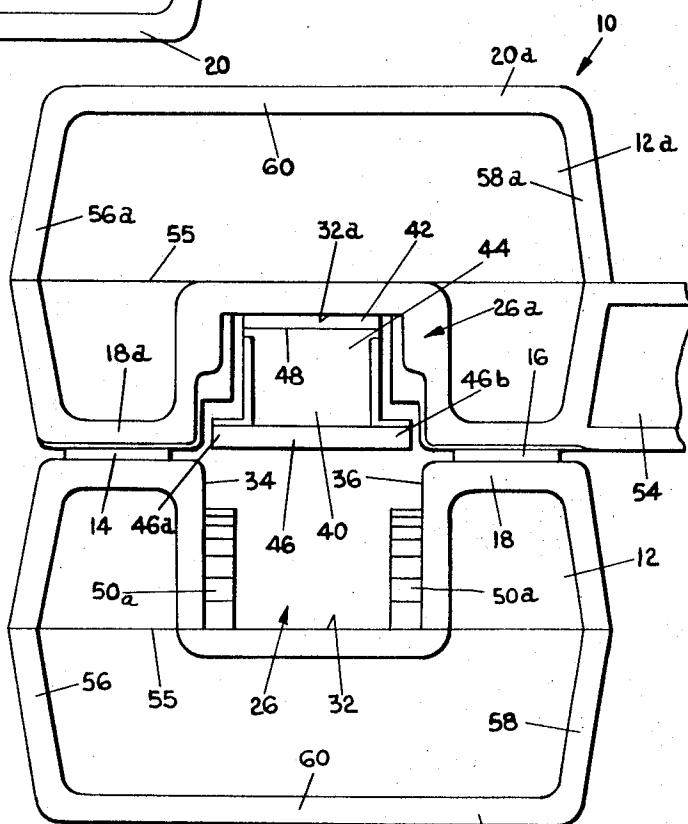


FIG. 2

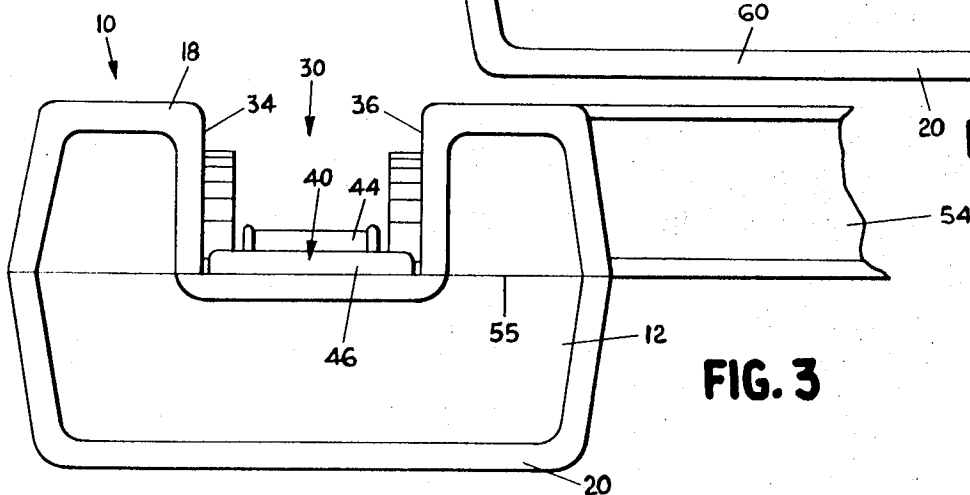


FIG. 3

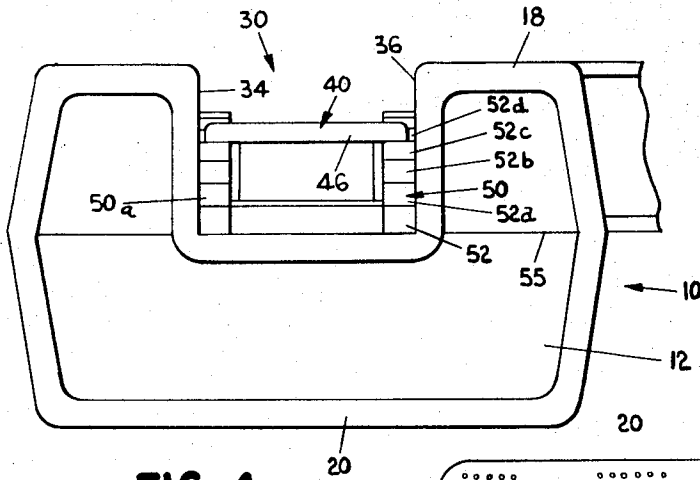


FIG. 4

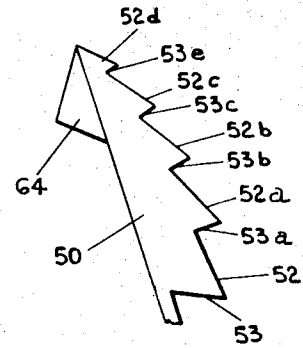


FIG. 9

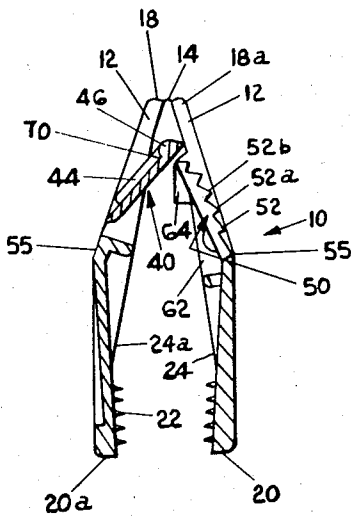


FIG. 8

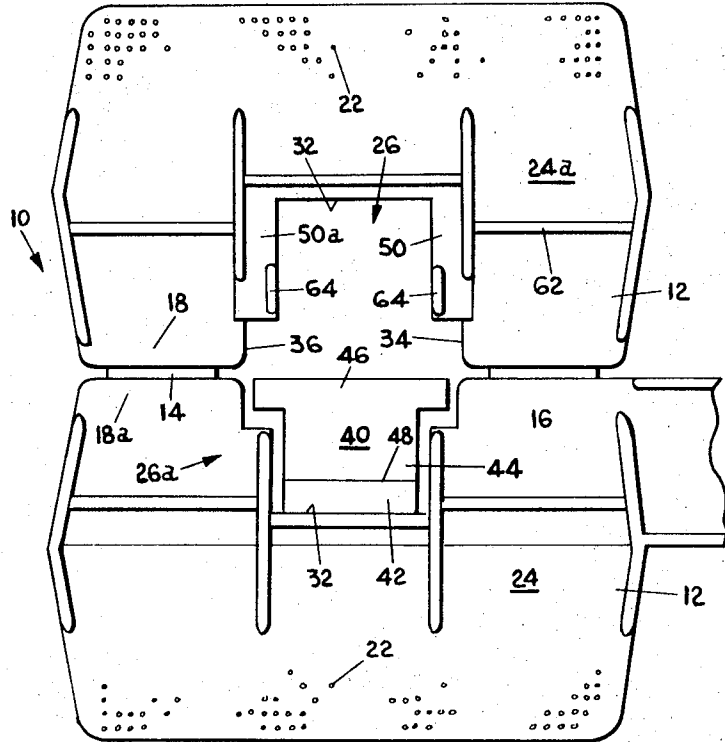


FIG. 7

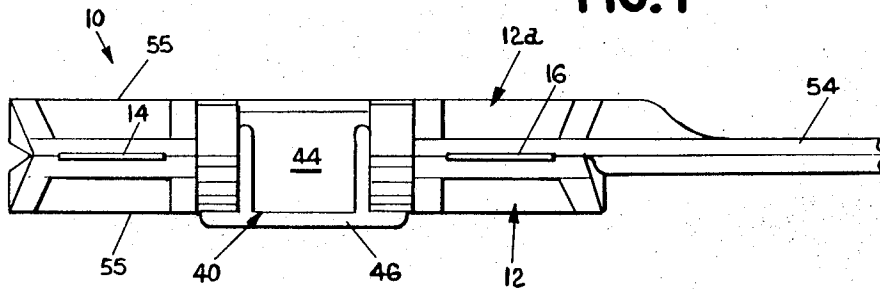


FIG. 5

CLAMP WITH IMPROVED LATCH

BACKGROUND OF THE INVENTION

I. Field Of The Invention

This invention relates to an improved latch and keeper for a clamp, and more particularly to a one-piece molded plastic clamp having a progressive latch means.

II. Description of the Prior Art

Clamps of the prior art utilize a pair of hinged joined clamping members held closed by a latch having one or more teeth engageable with a lip or step. The principal problem with such latches has been that it is fairly easy to accidentally disengage the latch by slight vertical upward movement thereof. A second overall disadvantage is that the latches of prior clamps tend to concentrate the clamping force at a point, rather than distribute the clamping force more evenly over the entire clamping surface which in many cases is substantial. Therefore, there is a need for an improved latching mechanism which provides a more positive and evenly distributed clamping force and which will not become easily and unintentionally disengaged. Finally, it is difficult to mold the plural teeth of the keeper since they are oriented in line and in a plane which is perpendicular to the clamping members. If the clamp is molded with the clamping members opened and lying generally in a common plane, the mold parting in that plane, the teeth will be above and below one another and will interfere in the mold. If the mold is designed to part at the plane of the teeth, the clamping halves will be above and below one another and will interfere.

SUMMARY OF THE INVENTION

A one-piece plastic clamp of the type disclosed herein includes a pair of clamping members joined along one edge by a flexible web with the opposite edges of each being free to move toward or away from each other to close or open the clamp. In between the free edges and the flexible web, the sides of the clamp are spaced apart and are resiliently deflectable to permit clamping pressure to be increased by deflecting the sides against their resilient bias. A generally symmetric opening is formed about the web and extends into both members. A latch integral with one member extends into the opening for engagement with a keeper means integral with the other member to lock the clamp into a closed position.

In accordance with the invention, the latch has a general T-shape and is hingedly joined at its base to one of the members. The two spaced cross portions on each side of the stem portion are engageable with a pair of stepped keeper ramps formed on the other member along each side of the opening. In a narrower aspect of the invention, the keeper ramps are inclined inwardly towards the latch with the steps opening downwardly for receiving the bottom edges of the T-cross portion. The steps of each ramp form an arc so that the latch is cammed successively over the steps to deflect the members until the material being clamped is wedged tightly between the clamping members. The vertical orientation of the keeper ramps permits the maintenance of a clamp design which permits injection molding as a single part by a mold having only two moving parts. No re-entry portions are required to prevent release of the clamp from a two-part mold.

The invention provides a compact clamp for many and varied uses. The resilient characteristics of the clamping members provides a positive locking urgency on the latch due to its physical relationship with the keeper portions. The latch is extremely simple to manipulate since it is automatically cammed successively over the steps or teeth until maximum clamping is achieved. In further accordance with the invention, the clamp is subject to injection molding as one piece in such an economical fashion that it can be treated as a disposable item.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view of the clamp of my invention shown in a closed but unlatched position;

FIG. 2 is a front elevation view of the clamp illustrated in FIG. 1 with the clamping members unfolded approximately 180° so that they lie in essentially the same plane;

FIG. 3 is a front elevation view similar to FIG. 1 with the latch in a locked position;

FIG. 4 is a front elevation view similar to FIG. 3 illustrating the latch in an alternative locked position;

FIG. 5 is a plan view of the clamp shown in FIG. 3, the clamp being closed and locked;

FIG. 6 is an end elevation view of the clamp illustrated in FIGS. 3 and 5;

FIG. 7 is a rear elevation view of the clamp illustrated in FIG. 2, the clamping members being rotated approximately 180°;

FIG. 8 is a cross-sectional view of the clamp illustrated in FIG. 1 taken along the line VIII—VIII;

FIG. 9 is an enlarged fragmentary end view of one of the keeper ramps of the invention; and

FIG. 10 is an enlarged fragmentary end view similar to FIG. 9 with the latch engaged with the keeper.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, FIG. 2 illustrates a clamp 10 comprised of a pair of clamping members 12 and 12a joined together by a pair of spaced hinger 14 and 16 along the upper margins 18, 18a of each clamping member. Preferably, clamp 10 is molded from a resiliently deflectable plastic material with the hinges being characterized as a flexible web or living hinge. Clamping members 12 and 12a can be rotated relative to each other from the position shown in FIG. 2 wherein each member lies in essentially the same plane to the position illustrated in FIG. 6 wherein the lower margins 20, 20a of clamping members 12, 12a are urged toward each other in close proximity to clamp material (not shown) therebetween. To facilitate positive gripping of the material, a plurality of opposite facing, inwardly projecting teeth 22 (FIG. 6-8) may be formed on the inner surfaces 24, 24a of each clamping member in the vicinity of lower margins 20, 20a.

Each clamping member 12 and 12a includes a generally U-shaped opening 26 and 26a beginning respectively from the upper margins 18 and 18a which openings form a central opening 30 intermediate hinge portions 14, 16. Opening 30 extends essentially symmetrical with hinges 14, 16 into both clamping members 12, 12a. Although openings 26, 26a are not identical, they are of comparable size so that the formed opening 30 has a generally rectangular cross-section bounded by ends 32, 32a and sides 34 and 36. The rectangular

cross-section is achieved when the two clamping members are in an open position as illustrated in FIGS. 2 and 7 wherein they lie essentially in the same plane. When the clamp is closed as shown in FIGS. 1, 3, 4 and 5, opening 30 has a general U-shape unbounded at the top when viewed from the side.

A latch 40 (FIG. 2) is formed integrally with member 12a and pivotal relative thereto about a living hinge 42 similar to hinges 14 and 16. The latch has a general T-shape with a stem portion 44 and cross portion 46, latch 40 being hinged to member 12a at the base 48 of stem 44. The latch projects inwardly when the clamp is closed (FIGS. 6 and 8) through opening 30 for latching engagement with a pair of keepers 50, 50a. Keepers 50, 50a are in the form of ramps formed along a portion of each side 34, 36 of opening 30 and terminating at end 32. Each ramp includes a plurality of teeth 52, 52a, 52b, etc., (FIG. 8) which receive and hold cross portions 46 of latch 40 to lock clamping members 12 and 12a into a closed position. The details of the latching function will be described in more detail hereinafter.

In FIGS. 1-5 and 7, an arm 54 is shown extending laterally from and integral with clamping member 12a. Arm 54 represents a connecting arm between a pair of clamps 10 on each end only one of which is shown in the drawings. In accordance with one particular adaptation of the invention, a one-piece garment hanger is provided having a clamp in accordance with the invention on each end to suspend and hold a garment such as a pair of slacks. The invention is not intended to be so limited however, since the type of clamp provided by the invention can be utilized for a variety of materials and items.

Referring to FIGS. 2 and 10, latch 40 includes a stem portion 44 and cross portion 46. The stem portion is relatively wide when compared with the projection portions 46a and 46b of cross portion 46. Regardless of the exact width of stem 44, it is the projecting portions 46a and 46b which are captured by keeper ramps 50 and 50a. Thus, the locking function is distributed over a large portion of the clamp since opposite ends of the cross portion 46 of latch 40 are captured. This provides a more evenly distributed clamping force by members 12 and 12a.

Referring now to FIGS. 8-10, keeper ramp 50 is illustrated having a plurality of steps 52, 52a, 52b, etc. The ramps as illustrated in FIG. 8 are inclined upwardly and inwardly toward latch 40 with the steps opening downwardly so that the bottom edge 70 (FIG. 10) of cross portion 46 of latch 40 is captured selectively by one of the steps. As illustrated in FIG. 8, the keeper ramps extend approximately from the pint 55 of maximum arch of members 12, 12a upwardly toward the hingedly connected ends of each clamp member.

FIG. 9 is an enlarged view of keeper ramp 50 and it is noted that the outer end of each step 52, 52a etc. lies on a line defining an arc having a radius R related to the arcuate movement of latch 40 so that as the cross portion 46 is engaged with the upper step 52d, it can be cammed progressively over the successive steps 52c, 52b etc. and in each instance, clamping members 12 and 12a are progressively brought into closer and closer proximities toward each other. For example, in FIGS. 1 and 8, clamping members 12 and 12a are positioned approximately at the position wherein latch 40 can be brought into engagement and captured by step 52d. FIG. 4 illustrates the cam closed with latch 40 cap-

tured by step 52d. With the arcuate configuration of each step for keeper ramps 50, 50a the clamp may be easily manipulated from the position illustrated in FIG. 4 by downward movement on latch 40 to cam it over the descending steps of the keeper ramps thereby pulling the clamping members into closer proximity to each other to the ultimate position shown in FIGS. 3, 5 and 6.

Referring back to FIG. 9, the stop faces 53, 53a, 53b, etc. of each step opens downwardly or away from latch 40 so that the resilient characteristics of each clamping member when deflected to clamp the material therebetween acts to pull latch 40 directly into the particular stop face it is engaged with and thereby prevent unintentional disengagement of the latch itself. This is illustrated in FIG. 10 wherein the inner edge 70 of cross portion 46 is seated against stop face 53c. In order to disengage the latch, it must be snapped or pulled outwardly and up to clear the particular stop face capturing it. Actually this is achieved by deflecting or squeezing the clamping members inwardly to permit release of the latch. The resilient bias of clamping members 12 and 12a (described below) keeps tension on latch 40 when captured by keepers 50, 50a so that there is positive seating to prevent unintentional disengagement of latch 40.

Referring now to FIG. 2, each clamping member 12 and 12a is bounded by an upper margin 18, 18a; lower margin 20, 20a; and a pair of sides 56, 56a and 58, 58a. The upper margins 18, 18a are of course interconnected by hinges 14 and 16. The entire periphery of the outer surface of each clamp is bounded by a ridge 60 which both re-enforces the overall strength of each clamping member and provides a means for an improved grip area for manipulating the clamping members into or out of their closed position. Since the clamp of my invention is generally manually manipulated, ridge 60 defines a nest within which to grasp the clamp.

Referring to FIGS. 6 and 8, clamping members 12 and 12a are arched intermediate their ends 18, 18a and 20, 20a such that the clamping members when closed are spaced apart at approximately the center 55 of the clamp. The space thereby created between the clamping members is bridged by latch 40 for engagement with keeper ramps 50, 50a. As noted earlier, the preferred composition of the clamping members is a molded plastic. Preferably, the plastic is resiliently deflectable to permit the clamping pressure to be increased by deflecting the sides against their resilient bias.

Referring to FIG. 7, the inner surface 24 of clamping members 12 and 12a includes a network of ribbing 62 in order to strengthen the central and exterior portions of each clamping members. This inhibits these portions from taking a set (permanent deflection) upon repeated manipulation of the clamping members which as noted above are subjected to defection. Although the plastic material is resilient, it will be appreciated that continuous deflection may cause a permanent deflection due to fatigue. It will be noted in FIG. 7 that on the under side of each ramp 50, 50a there is provided a small integrally formed projection 64 illustrated also in FIGS. 6, 8 and 9. Since the camming effect of latch 40 on keeper ramps 50, 50a exerts a deflection force on the ramps, projections 64, 64 are designed to provide a physical stop for the keeper ramps when the

clamp is closed as illustrated in FIGS. 6 and 8. Projection 64 when deflected into contact with the inner surface 24a of clamping member 12a prevents further deflection of the keeper ramps thereby prohibiting a permanent deflection. Although a slight set may occur, projection 64 prevents a set of the magnitude of which would defeat the camming and latching function.

It will be observed from FIGS. 2 and 7 that when clamp 10 is in its fully open position the two clamping members 12 and 12a together with latch 40 and ramps 50, 50a lie basically in a common plane. Thus the entire clamp has no portions which will hang up on a simple two-part mold when the mold is open. This permits the clamp to be manufactured as a single, integral part more rapidly and with lower cost tooling. For this purpose, the design must be such that no part of the clamp is so related to the remainder of the clamp that in one plane it over lies any other portion of the plane of the clamp lying on another plane which planes are spaced apart perpendicular to the surfaces of the clamp in such a manner as to create an undercut or re-entry condition. In other words, all surfaces must be accessible and withdrawable from each of the two mold halves movable perpendicular to the surfaces of the clamp the direction of which in regards to FIGS. 2 and 7 would be into and out of the plane of the paper. Although a slight re-entry could occur in the case of the steps of the keeper ramps 50, 50a, the withdrawal of one-half of the mold will permit removal of the clamp from the mold because the resilience of the molded part will permit minor deflection of the keeper ramps sufficient to effect disengagement of the steps from the other mold half.

Although but one embodiment has been shown and described in detail, it will be obvious to those having ordinary skill in this art that the details of construction of this particular embodiment may be modified in a great many ways without departing from the unique concepts presented. It is therefore intended that the invention is limited only by the scope of the appended claims rather than by particular details of construction shown, except as specifically stated in the claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a clamp having a pair of clamping members each having a free end and hingedly joined at the other end by a flexible web whereby they can be pivoted from an open position in which said free ends are spaced from each other and a closed position wherein said free ends are inwardly pressed toward each other to clamp material therebetween, said clamp having means defining an opening in one of said members, said opening having a pair of ends and sides; the improvement comprising: a generally T-shaped latch having a stem portion and cross portion, said latch being hingedly joined at the free end of said stem to the other of said clamping members and projecting inwardly of said clamp through said opening when said clamp is closed and keeper means in the form of a stepped ramp on opposite sides of said opening, said cross portion of said T-shaped latch being selectively captured by aligned steps on said ramps to maintain said clamp in a selected closed position, said latch being pivoted out of captured engagement with said keeper means to open said clamp.

2. The improvement according to claim 1 wherein each of said ramps are inclined upwardly and inwardly toward said latch when said clamping members are in said closed position, said steps opening downwardly away from said latch to receive the lower edge of said cross portion.

3. The improvement according to claim 2 wherein the outer free edge of each step defines a locus of points defining a curve having a radius of curvature comparable to the arcuate movement of said cross portion of said latch whereby said latch cams said clamping members toward each other as said latch is pivoted progressively downward over successive steps of said keeper ramps.

4. The improvement according to claim 1 wherein said clamping members are arched intermediate their ends in opposite directions when positioned in said closed position to provide a space at approximately the center of said clamp, said latch bridging said space.

5. The improvement according to claim 4 wherein said clamping members are resiliently deflectable to permit the clamping pressure to be increased by deflecting the clamping members against their resilient bias.

6. The improvement according to claim 5 wherein said latch is tensioned when captured by said keeper means as a result of said resilient bias.

7. The improvement according to claim 6 wherein each of said ramps are inclined upwardly and inwardly toward said latch when said clamping members are in said closed position, said steps opening downwardly away from said latch to receive the lower edge of said cross portion, said tension in said latch preventing unintentional disengagement thereof unless said clamping members are urged further toward each other to permit said cross portion of said latch to clear said steps.

8. The improvement according to claim 6 wherein the back sides of said keeper ramp include stop means projecting toward the other of said clamping members for engagement therewith to prevent excessive deflection of said keeper ramps when in said closed position.

9. The improvement according to claim 1 wherein said means defining an opening extends through said other ends of said clamping members, said latch being hingedly joined to the other of said clamping members at one end of said opening.

10. A clamp comprising, in combination; a pair of clamping members each having a free edge and joined together along an opposite edge thereof by a pair of spaced flexible web portions; means intermediate said spaced web portions defining an opening formed partially in each clamping member whereby said clamping members can be pivoted from a fully open position with the clamping members generally aligned in a common plane on opposite sides of said web portions to a closed position in which their free edges are urged inwardly toward one another, said opening in said closed position having an overall U-shaped cross section and in said open position having an overall rectangular cross section; a generally T-shaped latch having a stem portion and cross portions, said latch being hingedly joined at the free end of said stem to one of said clamping members at the edge of said opening, said latch projecting inwardly of said clamp when said clamp is closed; and keeper means on the other of said clamping members along opposed side edges of said opening for interengaging with said cross portions of said latch to

lock said clamp in said closed position, said keeper means including a pair of aligned step portions, one on each side of said opening, said step portions opening generally downwardly and away from said latch toward the free end of said clamping member for receiving the bottom edges of said cross bar portion; said clamping members, flexible web portions; latch and keeper means being a single integral part in which, when said clamp is fully open, no portion of the clamp in any plane parallel to that occupied by the clamping members overlaps any other portion of the clamp so that the clamp may be molded in a two-piece mold opening and closing in a direction perpendicular to said aligned clamping members.

11. The clamp according to claim 10 wherein said aligned step portions are further characterized as a ramp on each side of said opening, said ramps being inclined upwardly and inwardly toward said latch when said clamp is closed, said ramps including a plurality of steps opening downwardly away from said latch, one aligned pair of steps receiving the lower edge of the cross portion of said latch to close said clamp.

12. The clamp according to claim 11 wherein said clamping members further include a stop extending from beneath each keeper ramp and formed integrally therewith in a two-piece mold, said stops preventing deflection of said keeper ramps beyond a preselected degree by engagement with said one of said clamping members when said clamp is in said closed position.

13. The clamp according to claim 11 wherein only the portions of said cross portion extending away from said stem engage said keeper means.

14. A clamp comprising, in combination: a pair of clamping members each having a free end and hingedly joined at the other end by a flexible web whereby they

can be pivoted relative to each other into and out of a clamped position, one of said members having means defining an opening; a generally T-shaped latch having a stem and cross portion, said latch being hingedly joined at the free end of said stem to the other of said clamping member and projecting inwardly of said clamp through said opening 15 when said clamp is closed; and keeper means on said one of said clamping members for releasably capturing the cross portions of said latch to lock said clamp in a closed position, said keeper means including a step portion on each side of said opening, said step portions opening generally downwardly and away from said latch toward the free end of said one of said clamping members for receiving the bottom edges of said cross bar portions.

15. The combination according to claim 14 wherein the width of said opening exceeds the width of said cross bar portion with the space between said step portions being less than the width of said cross bar portion to permit the cross portion of said latch to be inserted through said opening and over said keeper means.

16. The combination according to claim 15 wherein said keeper means is further characterized as a ramp on each side of said opening, said ramps being inclined upwardly and inwardly toward said latch when said clamp is closed, said ramp including a plurality of aligned steps opening downwardly away from said latch, one aligned pair of steps receiving the lower edge of said cross portion of said latch to close said clamp.

17. The combination according to claim 16 wherein said means defining an opening extends through said other ends of said clamping members, said latch being hingedly joined to the other of said clamping members at one end of said opening.

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