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Petrie

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[54] **CLAMPING DEVICE**

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[52] **U.S. Cl.** **211/46;** 24/67.1

[51] **Int. Cl.** **A47f 7/16**

[58] **Field of Search** ..... 211/46, 48, 47, 45, 89, 211/94, 94.5, 124; 24/67.1, 67.3, 260, 255 SL, 248 SL, 243 R, 245 R, 137 R, 67.3, 251; 281/45; 24/67.7, 67.5, 67.9, 67.11

[56] **References Cited**

UNITED STATES PATENTS

1,154,489	9/1915	Daniels	24/67.1
1,911,277	5/1933	Helmer	211/46 X
2,623,526	12/1952	Page	211/46
3,014,258	12/1961	Pearl	24/67.3 X
3,027,015	3/1962	Miller	211/94
3,221,892	12/1965	Morcheles et al.	211/48
3,292,223	12/1966	Esposito	24/137 R
3,308,831	3/1967	Kritske	24/67.1
3,729,099	4/1973	Kritske	211/46

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[57] **ABSTRACT**

A cam operated clamping device for holding sheet material along one edge. The clamp has a support member and a pair of angular gripping arms pivotally connected to the support member. The movement of the gripping arms to open and close the clamp is facilitated by a cam mechanism controlled from one end of the clamp. Each of the angular gripping arms has two sections wherein the first section holds the sheets and the second section reacts to the movement of the cam mechanism, causing the opening and closing movement of the first section. An additional embodiment of the device allows interchangeability with regard to attachment to a support hanger.

16 Claims, 7 Drawing Figures

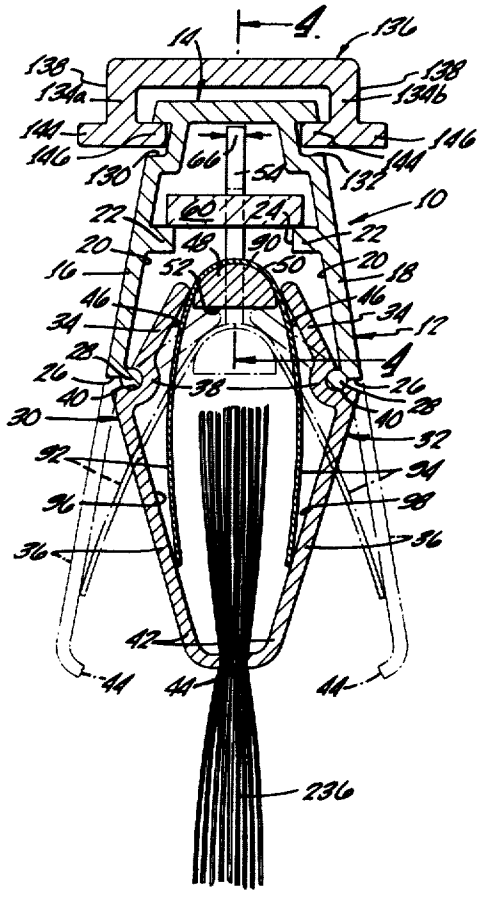


FIG. 1

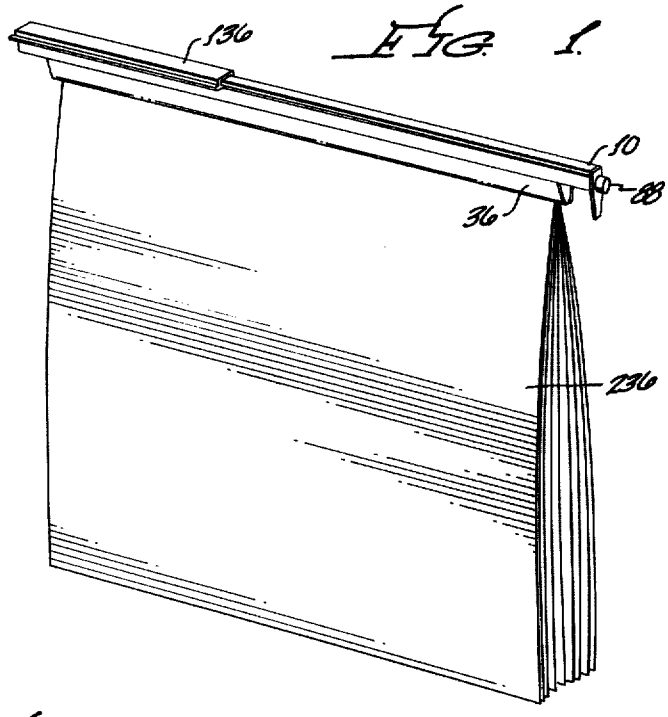


FIG. 2

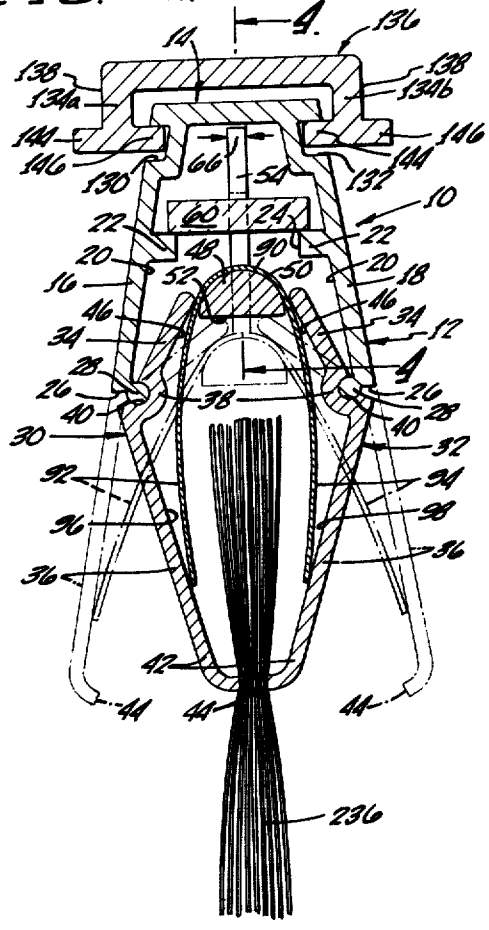
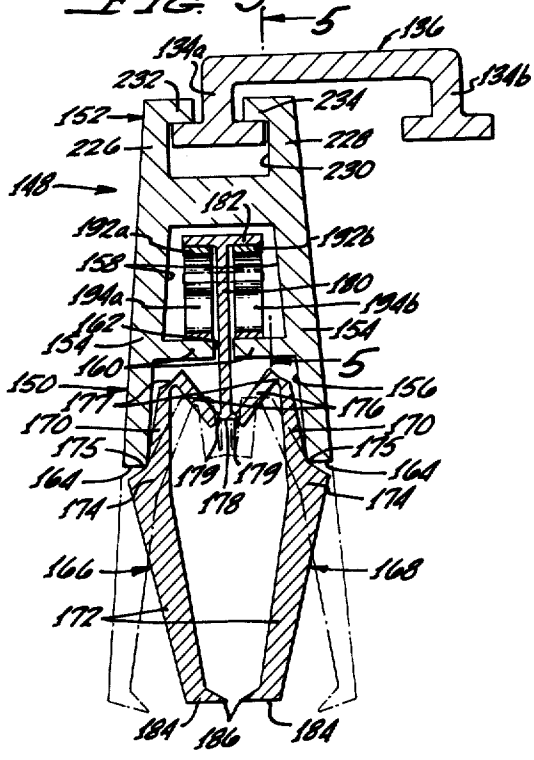


FIG. 3



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SHEET 2

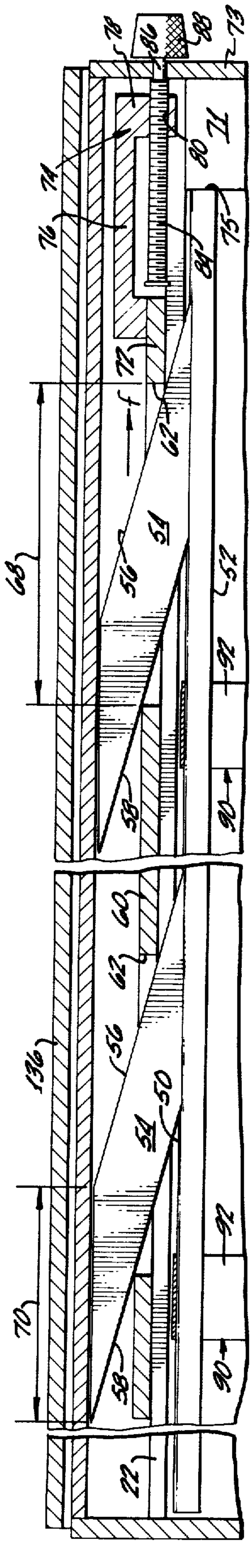

FIG. 4.

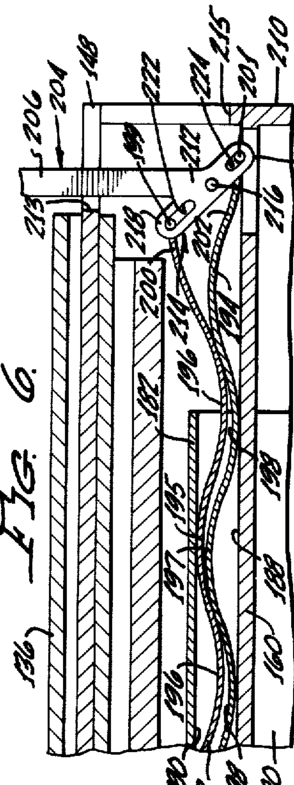

FIG. 6.

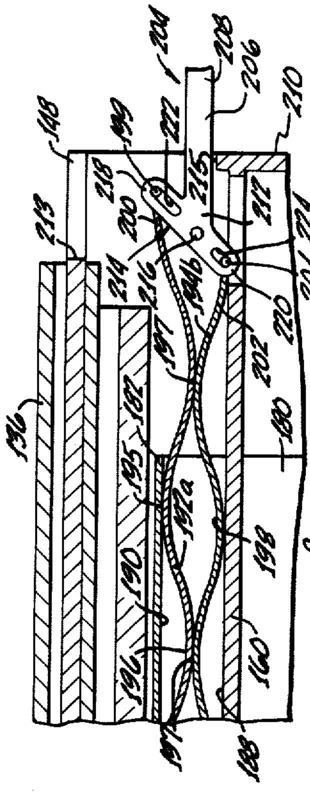

FIG. 5.

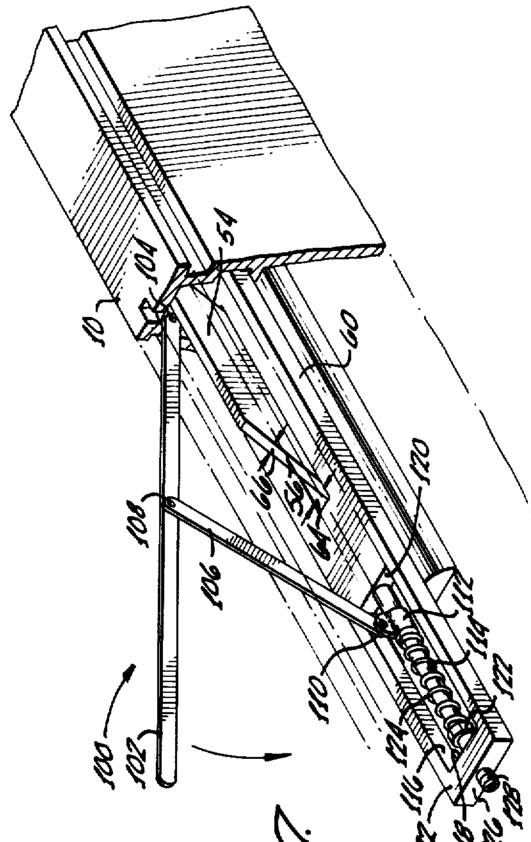

FIG. 7.

CLAMPING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to the field of clamp binders for holding sheet material such as maps, blueprints, engineering drawings, etc. These types of binders are used to provide not only convenient storage, but also convenient access for easy review of the sheets. This type of arrangement of large sheets has proved to be very desirable and advantageous as opposed to the more cumbersome and annoying process of folding the sheets.

The art of providing a binder for the hanging and storage of such sheets is well established; however, certain disadvantages remain which require solution. In one common type of clamp binder the control for the operation of the clamp mechanism consists of a plurality of manually operated nut and bolt combinations. Consequently, each time an individual wishes to remove one or more of the large sheets from the binder, he must manually loosen each nut or bolt in order to release the clamp pressure. This type of operation is very time consuming and, therefore, a source of wasted time to the professional and high salary personnel, utilizing these blueprints, engineering drawings, etc.

A few prior art binders reflect the concept of a clamp mechanism, having its control mechanism at a single point. However, the configuration of these devices if awkward and does not provide the ease of one hand operation, because the usual turning mechanism to operate the clamp requires a significant amount of force. This is due to the fact that prior art devices utilize a shifting pivot axis for the gripping clamp for movement into a fixed channel, requiring significant force because of the effect of the weight and bulk of the group of sheets in moving the pivot axis. To help alleviate the need for the application of considerable force to operate the clamp some devices have incorporated the use of a cam mechanism; however, the necessary force to operate the clamp remains too high to provide convenient and easily operable single point control.

Commonly, a group of clamping devices of this type are suspended by suitable brackets to provide adequate support for heavy sheet material. However, in actual practice the sheet material frequently is small and relatively light, and the typical binder is too large for various lighter sheet materials and occupies too great a space. A need exists for the ability to interchange binders on the same support brackets to handle both heavy and light sheet material.

SUMMARY OF THE INVENTION

The invention disclosed herein provides a binder to hold and support numerous sheets of varying sizes. The device includes an elongated channel member with a pair of clamping jaws which pivot on fixed axes attached to the channel member. The clamping jaws are angled; and the attachment of each clamping jaw to the channel member is at the vertex of the angle, forming a pair of gripping legs and a pair of bearing legs. A cam mechanism is used to open and close the gripping legs and is operated from a single point on the channel member. This single point of operation greatly reduces the time required to remove and replace sheets.

The pivoting of the clamping jaws around a fixed axis rather than a shifting axis promotes the ease in the effect necessary to operate the gripping legs, because there is no lost effort in having to vertically raise the heavy weight or bulk of the sheets in order to facilitate the closing of the gripping legs. The clamping jaws are simply rotated to the closed position and, therefore, the amount of force necessary to bind the sheets is minimal.

An embodiment of the invention allows the interchangeability of support members for connection with the attachment members of a support bracket. If there are particular sets of lighter sheet material covering different subject matter it would be advantageous to maintain them in separate binders. The device presented herein allows the use of two separate support members to be suspended from one support bracket by utilization of each of the two attachment members on support brackets.

The present invention also incorporates an embodiment which has the advantage of being a single piece, formed by the extrusion of a plastic-like material.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a preferred form of the clamp in its normal hanging position;

FIG. **2** is a sectional view of the clamp of FIG. **1**;

FIG. **3** is a sectional view of a second embodiment of the invention;

FIG. **4** is a sectional view taken along the lines **4—4** in FIG. **2**, showing the cam mechanism for moving the clamping jaws;

FIG. **5** is a sectional view taken along the lines **5—5** in FIG. **3**, showing the cam mechanism for moving the clamping jaws with the lever handle in the close clamp position;

FIG. **6** is a sectional view taken along the lines **5—5** of the phantom position in FIG. **3** with the lever handle in open clamp position;

FIG. **7** is a perspective view of a lever mechanism for operating the cam mechanism in the clamping device of FIGS. **1** and **2**.

DETAILED DESCRIPTION OF INVENTION

Referring first to FIGS. **2** and **4**, there is shown an elongated, downwardly opening channel-like support member **10** having a lower section **12** and an upper section **14**. The lower section **12** comprises a pair of lower walls **16** and **18** extending downward and slightly angled outward away from each other. In the approximate middle of the inside surface **20** of each lower wall is a guide flange **22**, extending inward toward each other. Located between the guide flanges **22** is a slot **24**. Formed on the bottom edge **26** of each lower side of the support member **10** is a pivot bar **28** and connected to each pivot bar **28** respectively is a first jaw or holding member **30** and a second jaw or holding member **32**. Each holding member or clamp member **30** and **32** has an interior flange or pivot leg **34** and a gripping leg **36**. The pivot or bearing leg **34** and gripping leg **36** meet at an angle, forming a rigid junction **38**, which comprises a longitudinal cylindrical section, having a semicircular cross section as shown in FIG. **2** with an inner surface **40** designed to receive the pivot bar **28**. The lower end **42** of each gripping leg **36** terminates in a gripping edge **44**.

Situated below and contacting the lower surface **46** of the pivot legs **34** is a cam rod **48**, which has a curved upper surface **50** and a flat lower surface **52**. As shown in FIG. **4**, attached edgewise to the upper surface **50** of the cam rod **48** are two cam blades **54** of trapezoidal

shape, having parallel inclined front **56** and rear **58** edges. Slideably engaging the cam blades **54** is an actuator element or slide element **60** having two cam slots **62**. The actuator element **60** is an elongated flat member which is slideably supported within the support member **10** by the guide flanges **22**. Each cam slot **62** respectively receives a cam blade **54**. The width **64** of the cam slots shown in FIG. **7** is slightly larger than the lateral width **66** of each cam blade **54** while the length **68** of the cam slots as shown in FIG. **4** is larger than the longitudinal length **70** of each cam blade **54**. Since the cam rod **48** is freely suspended on the actuator element **60** by the cam blades **54**, the restraining member **71** is attached behind the front end **73** of the support member **10** in order to restrain the front end of the cam rod **48** from moving forward which would result in the cam rod **48** slipping downward.

Attached to the front end **72** of the actuator element **60** is a control mechanism, shown generally at **74** in FIG. **4**, which has a bracket **76**, extending forward from the actuator element **60**. At the extreme forward end of the bracket is a holding flange **78** having a threaded hole **80**. Threadably received into the hole **80** is a threaded shaft **84**, having one end **86** extending through the front end **73** of the support member **10** and connected to a control knob **88**.

With respect to FIG. **2**, mounted around the upper surface **50** of the cam rod **48** are two leaf springs **90** having two downward extending leaves **92** and **94**. One leaf **92** is biased against the inside surface **96** of the gripping leg **36** of the first holding member **30** and the second leaf **94** is biased against the inside surface **98** of the gripping leg **36** of the second holding member **32**.

Referring to FIG. **2**, an elongated mounted bracket or support hangar **136** is shown, having an inverted U-shape forming two inverted T-shaped attachment members **134***a* and **134***b*. Each attachment member has a pair of horizontal flanges **144** and **146**, extending outwardly from opposite sides of the lower end of a vertical portion **138**. The upper portion **14** of the support member **10** has a pair of side channels or elongated grooves **130** and **132**, which open outwardly on opposite sides of the member **10**. The respective side channels are designed to slideably receive the attachment members **134***a* and **134***b*.

A second embodiment of the control mechanism is shown in FIG. **7** generally at **100** and has a lever arm **102** having one end **104** connected to the support member **10**. A linkage member **106** is pivotally attached at its first end **108** to the lever arm **102** at a point approximately at the middle of the lever arm **102**, but slightly toward the one end **104** connected to the support member **10**. The second end **110** of the linkage member **106** is pivotally attached to a slide ram **112** comprising a circular ring **112** mounted on a slide bar **114** which is connected within the forward end **72** of the actuator or slide element **60**. The forward end **72** of the actuator element **60** has an elongated slot **116** having first and second end surfaces **118** and **120**. Connected between these end surfaces is the slide bar **114**. The slide ram **112** is loosely mounted on the slide bar **114** to allow sliding of the slide ram **112**. Located on the slide bar adjacent the first end **118** surface of the elongated slot **116** is a compression nut **122** threadably mounted on the slide bar and situated around the slide bar **114** between the slide ram **112** and the compression nut **122** is a compression spring **124**. The slide bar **112** extends through the first end surface **118** of the elongated slot **116** and out the front edge **126** of the actuator element **60** forming a compression spring adjustment knob **128**.

A second embodiment of the invention is reflected in FIGS. **3**, **5** and **6**. A support member **148** has a lower portion **150** and an upper portion **152**. The lower portion **150** is comprised of a pair of lower walls **154** forming an open channel **156**. Approximately midway down the lower walls **154** extending inwardly from the inside surface **158** of the lower walls are a pair of support flanges **160** defining a slot **162** between them. Attached to the bottom edge **164** of the lower walls of the lower portion **150** are a pair of holding members--a first holding member **166** and a second holding member **168**. Each holding member or jaw **166** and **168** has a pivot leg or interior flange **170** as well as a gripping leg **172**. The pivot leg **170** and gripping leg **172** of each holding member **166** and **168** intersect, forming a rigid junction **174**, which is integrally connected to the bottom edge **164** of each lower wall **154**, forming a living hinge **175**. Integrally attached by a living hinge **178** to each pivot leg or actuating end **170** of each holding member or gripping arm **166** and **168** is a hinge member **176**. The hinge member of each actuating end **170** is integrally attached by a living hinge **179** to the bottom **178** of a push rod **180**, which extends up through the slot **162** formed by the pair of support flanges **160**. The push rod **180** has a top flange **182**. At the lower extremity **184** of each gripping leg **172** is an inward extending gripping edge **186**.

As shown more clearly in FIGS. **5** and **6**, located between the upper surface **188** of the support flanges **160** of the lower walls and the lower surface **190** of the top flange **182** of the push rod **180** are a pair of elongated top spring members or actuator elements **192***a* and **192***b* and a pair of elongated bottom spring members or cam members **194***a* and **194***b*. The pair of top spring members have a series of hills **195** and valleys **196**, and the pair of bottom spring members have a series of hills **197** and valleys **198**. The series of hills and valleys of each pair of spring members are sinusoidally identical. Connected to the respective front ends **200** and **202** of each pair of the elongated spring members **192** and **194** is a connecting pin **199** and **201** which attach each of the spring members to a lever mechanism **204**, which has a lever handle **206** with one end **208** extending out of the front **210** of the support member **148** through an operating slot having an upper end **213** and a lower end **215**. The other end **212** of the lever handle **206** is attached to the middle of a linkage member **214**. The linkage member **214** is pivotally attached to the support member **148** by a pivot pin **216** extending through the middle of the linkage member. The linkage member **214** has a top end **218** and a bottom end **220** with each end having a slide slot **222** and **224** respectively. Slideably positioned within the slide slot **222** of the top end **218** is the connecting pin **199** of the elongated pair of top spring members or slide elements **192** and slideably positioned within the slide slot **224** of the bottom end **220** is the connecting pin **201** of the pair of elongated bottom spring members or cam members **194**.

Referring to FIG. **3**, located in the upper portion **152** of the support member **148** are two upper walls **226** and **228** forming an open attachment channel or elongated slot **230**. At the top end of each upper wall **226** and **228** is a respective inward hanging flange **232** and

234. Mounted within the attachment channel is an attachment member 134, as discussed previously.

OPERATION

Referring to the operation of the embodiment shown in FIGS. 2 and 4 with the first controlling mechanism, a person may readily operate the opening and closing of the gripping legs 36 and edges 44 by the rotation of the control knob 88. By rotating the knob 88 in the clockwise direction the actuator element 60 is brought forward in the direction of arrow f and as a result of this movement the cam blades 54 will ride up on their inclined front 56 and rear 58 surfaces into the cam slots 62. This will cause the cam rod 48 to raise vertically to the lock position, as shown in the solid lines of FIG. 2, forcing the pivot legs 34 to pivot upward. Consequently, the gripping legs 36 and gripping edges 44 will pivot toward each other, compressing the leaf springs 90 and will clamp onto the sheets 236 to be held.

Rotation of the control knob 88 in the counterclockwise direction will move the actuator element 60 to the rear, allowing the cam blades 54 to ride down their inclined surfaces 56 and 58. The cam rod 48 will drop vertically to the position shown in dashed lines in FIG. 2, allowing the pivot legs 34 to pivot downward, resulting in the leaf springs 90 forcing open the gripping legs 36. The opening of the gripping legs 36 facilitates the removal of all or any number of the sheets 236.

Using the second control mechanism 100 shown in FIG. 7, the operation of the gripping legs 36 is by the manipulation of a lever arm 102. When the lever arm 102 is rotated to the lower position, in the direction of the arrow, the slide ram 112 moves forward on the slide bar 114 compressing the compression spring 124 against the compression nut 122 to the point where the actuator element 60 moves forward, causing the cam blades 54 to ride up their inclined surfaces etc., as discussed previously. When the lever arm is in the lower position, the force of the spring 124 on the linkage member 106 keeps the gripping legs 36 in the locked position as shown in the solid lines of FIG. 2. Movement of the lever arm 102 to the upper position slides the actuator element 60 to the rear, allowing the gripping legs 36 to separate, releasing the sheets 236 as shown in the dashed lines of FIG. 2.

The upper section 14 of the support member 10 is connected to the mounting bracket 136 by utilizing two adjacent attachment members 134*a* and 134*b* slideably attached to the support member 10. The second flange 146 of one attachment member 134*a* is received in the first side channel 130 of the support member 10 and the first flange 144 of the adjacent attachment member 134*b* is received in the second side channel 132 of the support member 10. Removal of the support member 10 from the attachment members 134*a* and 134*b* is possible by sliding the support member 10 forwardly endwise the entire length of the attachment members 134*a* and 134*b*. This removal may be convenient in order to leaf through the sheets 236 while they are still bound together, avoiding disarrangement. To reattach the support member 10, the side channels 130 and 132 are aligned with the flanges 146 and 144 of the respective attachment members 134*a* and 134*b*.

With respect to the operation of the second embodiment of the invention reference is made to FIGS. 3, 5 and 6. The lever handle 206 controls the opening and closing of the gripping legs or ends 172. With the lever handle 206 in the horizontal position as shown in FIG. 5 the valleys 196 of the pair of elongated top spring members 192 are contacting the hills 197 of the pair of bottom elongated spring members 194. This offset orientation of the spring members results in the hills 195 of the top spring members 192 to bias against the lower surface of the top flange 182 of the push rod 180, forcing the push rod in the upper position shown in FIG. 3. To lock the spring members in this offset orientation the valleys 196 of the top spring members 192 are slightly forward of the hills 197 of the bottom spring members 194 in the forward direction of the arrow *f*. Therefore, the hills 197 of the bottom spring members 194 will prevent the rear movement of the top spring members 192. Since the lower end 215 of the operating slot in the front end 210 of the support member 148 prevents any further downward motion of the lever handle 206, the top spring members 192 cannot move forward.

When the push rod 180 is moved to the upper position of FIG. 3, the hinge members 176 are raised by the living hinges 179, causing the pivot legs 170 to come up by the connection to the living hinges 177. As a result, the gripping legs 172 are rotated around the living hinges 175 to the closed position for holding sheets. In order to open the gripping legs 172 the push rod 180 must be lowered to the position shown in the dashed lines of FIG. 3. This is accomplished by rotating the lever handle 206 to the up position as shown in FIG. 6. This movement of the lever handle 206 will not only cause the top spring members 192 to move toward the rear, but also cause the bottom spring members 194 to move toward the front, resulting in the mating of the valleys 196 of the top spring members with the valleys 198 of the bottom spring members.

As reflected in FIG. 3, the upper section 152 of the support member 148 has an attachment member 134a, having the same configuration as that discussed above in conjunction with the preferred embodiment of the invention and shown in FIG. 2. The attachment channel 230 of the support member 148 slideably receives the attachment member 134*a*. The inward hanging flanges 232 and 234 in the upper section 152 of the support member 148 extend over the first and second flanges 144 and 146 of the attachment member 134*a*. Therefore, two support members 148 of the second embodiment of the invention may be connected to the mounting bracket 136 instead of only one of support members 10 of the clamping device shown in FIG. 2. This is accomplished by placement of the second support member in connection with the adjacent attachment member 134*b*.

The support member 10 of the first embodiment of the clamping device as shown in FIGS. 1 or 2 is designed to be manufactured from extruded aluminum or other lightweight material. The remaining elements of this first embodiment are separately made also from various lightweight materials such as aluminum or plastic-like compounds.

The second embodiment of the clamping device is designed to be extruded except for the separate elongated spring members 192 and 194 in a single piece from any of a number of various plastic-like compounds. This single piece construction results in the formation of the various living hinges 175, 177 and

179, ... allows more simplified ... ing processes.

What is claimed is:

1. A clamping device for holding sheet material comprising:
- a support member having an upper portion and a lower portion;
- a pair of clamp jaws pivotally attached to said lower portion of said support member and having a pair of interior flanges;
- an actuator element slideably mounted within said support member and having a cam slot;
- means located between said actuator element and said pair of clamp jaws for pivoting said pair of clamp jaws in response to the slideable movement of said actuator element, said means for pivoting said pair of clamp jaws comprises a cam rod mounted below said interior flanges of said pair of clamp jaws and a cam blade attached to said cam rod, said cam blade having an inclined cam surface and slideably extending into said cam slot; and
- means attached to said actuator element for controlling said slideable movement of said actuator element.

2. A clamping device for holding sheet material comprising:
- a support member having an upper portion and a lower portion;
- a pair of clamp jaws pivotally attached to said lower portion of said support member and having a pair of interior flanges;
- an actuator element slideably mounted within said support member;
- means located between said actuator element and said pair of clamp jaws for pivoting said pair of clamp jaws in response to the slideable movement of said actuator element, said means for pivoting said pair of clamp jaws comprises a push rod, having its lower end in contact with said actuator element, a cam member attached to said support member and located between said lower end and said upper end of said push rod, and a cam surface on said actuator element in slideable contact with said cam member for moving said push rod to pivot said pair of clamp jaws; and
- means attached to said actuator element for controlling said slideable movement of said actuator element.

3. A clamping device for holding sheet material comprising:
- a support member having an upper portion and a lower portion;
- a pair of clamp jaws pivotally attached to said lower portion of said support member;
- an actuator element slideably mounted within said support member;
- means located between said actuator element and said pair of clamp jaws for pivoting said pair of clamp jaws in response to the slideable movement of said actuator element; and
- means attached to said actuator element for controlling said slideable movement of said actuator element, said controlling means comprising a control knob rotatably mounted on the end of said support member, a threaded shaft extending from said knob through said support member, and a connecting bracket threadably mounted on said shaft and ... element, so that as said knob is rotated, said actuator element will move longitudinally.

4. A clamping device for holding sheet material comprising an elongated support member having an upper portion and a lower portion;
- a pair of clamp jaws pivotally mounted to said lower portion of said support member;
- an actuator element slideably mounted along the longitudinal axis of said support member;
- cam means is responsive contact with said actuator element for pivotally moving said pair of clamp jaws;
- a lever, having one end pivotally attached to said support member;
- a linkage member having one end pivotally attached to said lever and the other end pivotally attached to said actuator element; and
- means located between said linkage member and said actuator element for slideably moving said actuator element in response to the movement of said lever.

5. A clamping device for holding sheet material comprising:
- a support member having an upper portion and a lower portion;
- a pair of clamp jaws pivotally attached to said lower portion of said support member;
- an actuator element slideably mounted within said support member;
- means located between said actuator element and said pair of clamp jaws for pivoting said pair of clamp jaws in response to the slideable movement of said actuator element; and
- means attached to said actuator element for controlling said slideable movement of said actuator element, said controlling means comprises a lever having one end pivotally attached to said support member, a linkage member having one end pivotally attached to said lever and the other end pivotally attached to said actuator element, and means located between said linkage member and said actuator element for slideably moving said actuator element in response to the movement of said lever, said means for slideably moving said actuator element comprises a slide shaft attached to said actuator element, a slide ram mounted on said slide shaft, an adjustable restraining ring mounted on said slide shaft, and a spring mounted on said slide shaft between said slide ram and said adjustable ring, so that as said lever is rotated in a downward direction, said linkage member will cause said slide ram to compress said spring against said restraining ring, causing said actuator element to move longitudinally.

6. A clamping device comprising:
- a support member;
- a first holding member, having a pivot leg and a gripping leg, the lower end of said pivot leg being connected at an angle to the upper end of said gripping leg, forming a rigid junction;
- a second holding member, having a pivot leg and a gripping leg, the lower end of said pivot leg being connected at an angle to the upper end of said gripping leg, forming a rigid junction, said rigid junction of said first holding member and said rigid junction of said second holding member being pivotally attached to said support member; and

means located in said support member for urging the movement of said pivot legs of said holding members, so that the lower ends of said gripping legs will move toward each other, said means for urging the movement of said pivot legs of said holding members comprises a slide element slideably mounted for longitudinal movement within said support member, above said holding members, said slide element having a cam slot, a cam rod located under said pivot legs of said holding members, said cam rod having a cam blade with an inclined cam surface extending into said cam slot, so that said longitudinal movement of said slide element causes vertical movement of said cam rod to pivot said holding members, and means for controlling said longitudinal movement of said slide element.

7. A clamping device as defined in claim **6**, wherein said means for controlling said longitudinal movement of said slide element comprises:

a control knob rotatably mounted on said support member;

a threaded shaft extending from said knob through said support member; and

a connecting bracket threadably mounted on said shaft and attached to said slide element, so that as said knob is rotated, said slide element will move longitudinally.

8. A clamping device as defined in claim **6**, wherein said means for controlling said longitudinally movement of said slide element comprises:

a lever, having one end pivotally attached to said support member;

a linkage member having one end pivotally attached to said lever and the other end pivotally attached to said slide element; and

means located between said linkage member and said slide element for slideably moving said slide element in response to the movement of said lever.

9. A clamping device comprising:

a support member;

a first holding member, having a pivot leg and a gripping leg, the lower end of said pivot leg being connected at an angle to the upper end of said gripping leg, forming a rigid junction;

a second holding member, having a pivot leg and a gripping leg, the lower end of said pivot leg being connected at an angle to the upper end of said gripping leg, forming a rigid junction, said rigid junction of said first holding member and said rigid junction of said second holding member being pivotally attached to said support member; and

means located in said support member for urging the movement of said pivot legs of said holding members, so that the lower ends of said gripping legs will move toward each other, said means for urging the movement of said pivot leg of said holding members comprises, a push rod, having a lower end and an upper end, said lower end being attached to said pivot legs of said first and second holding members, such that vertical movement of said push rod pivots said holding members, a cam member attached to said support member and located between said lower end and said upper end of said push rod, a slide element slideably mounted within said support member, a cam surface on said slide element, said cam surface being in slideable contact with said cam member, so that the longitudinal movement of said slide element will cause the vertical movement of said push rod, and means for controlling said longitudinal movement of said slide element.

10. A clamp device comprising:

a channel member, having an upper section and a lower section;

an actuator element slideably mounted longitudinally within said channel member and having a cam slot;

means attached to said actuator element for controlling the movement of said actuator element;

a pair of clamp members, having a bearing leg and a gripping leg and being pivotally attached to said channel member at the rigid angular junction of said bearing leg and said gripping leg;

a cam rod located between said bearing legs of said pair of clamp members, said cam rod being wider than the distance between the upper ends of said bearing legs;

means for biasing said gripping legs in the open position; and

a cam blade attached to the upper side of said cam rod and extending slideably into said cam slot of said actuator element, said cam blade having an inclined cam surface, so that, as said actuator element is longitudinally moved, said cam rod will move vertically, causing said bearing legs to move down or up, resulting in said gripping legs opening or closing.

11. A clamp device as defined in claim **10**, wherein said means for controlling the movement of said actuator element comprises:

a control knob rotatably mounted on said channel member;

a threaded shaft extending from said knob and through said channel member; and

a connecting bracket threadably mounted on said shaft and attached to said actuator element, so that, as said knob is rotated, said actuator element will move longitudinally.

12. A clamp device as defined in claim **10**, wherein said means for controlling the movement of said actuator element comprises:

a lever, having one end pivotally attached to said channel member;

a linkage member, having one end pivotally attached to said lever and the other end pivotally attached to said actuator element; and

means located between said linkage member and said actuator element for slideably moving said actuator element in response to the movement of said lever.

13. A clamp device as defined in claim **10**, wherein said means for biasing said gripping legs in the open position comprises a spring biased against the interior sides of said gripping legs of said pair of clamp members.

14. A clamping device comprising:

a channel member;

a first leg extending downward from said channel member;

a second leg extending downward from said channel member, forming an open channel with said first leg;

a pair of support flanges respectively attached to the interior surfaces of said first and second legs, said support flanges in alignment with each other, forming a longitudinal slot;

a pair of gripping jaws pivotally attached to respective lower ends of said first and second legs; and

camming means located on the upper surface of said support flanges, movement of said gripping jaws responsive to said camming means.

15. A clamping device comprising:

a channel member;

a first leg extending downward from said channel member;

a second leg extending downward from said channel member, forming an open channel with said first leg;

a pair of support flanges respectively attached to the interior surfaces of said first and second legs, said support flanges in alignment with each other, forming a longitudinal slot;

a pair of gripping jaws pivotally attached to respective lower ends of said first and second legs; and

means located on the upper surface of said support flanges and attached to said gripping jaws for pivoting said gripping jaws, said means for pivoting said gripping jaws comprises:

a push rod, having a top flange, said push rod connected to said gripping jaws;

an elongated bottom spring member located on said upper surface of said support flanges and below said top flange of said push rod, said bottom spring member having a series of hills and valleys;

an elongated top spring member located between said bottom spring member and said top flange of said push rod, said top spring member having a series of hills and valleys, so that, as said top spring member is longitudinally slid over said bottom spring member, said push rod will be in the upper position when said valleys of said top spring member contact said hills of said bottom spring members and said push rod will be in the lower position when said valleys of said top spring member contact said valleys of said bottom spring member; and

means for controlling said longitudinal movement of said elongated top spring member.

16. A clamp apparatus comprising:

a support member, having an upper portion and a lower portion;

a pair of pivoting gripping arms attached to said lower portion of said support member, said gripping arms having a gripping end and an actuating end;

a push rod mounted within said support member and attached to said actuating ends of said pair of gripping arms; and

means located within said support member for vertically moving said push rod, causing said pivoting movement of said gripping arms, said means for vertically moving said push rod comprises:

a cam mounted within said support member;

an actuator element slideably mounted longitudinally within said support member between said push rod and said pair of gripping arms, said actuator element having a cam surface, so that as said actuator element is longitudinally moved, the contact of said cam of said support member and said cam surface of said actuator element will cause said push rod to move vertically; and

means attached to the end of said actuator element for controlling said longitudinal movement of said actuator element.

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