United States Patent [19]

Wetzler et al.

[11] **3,926,712**

[45] **Dec. 16, 1975**

[54] **APPARATUS FOR BINDING PILES OF SHEETS OR LEAVES**

[75] Inventors: **Josef Wetzler; Wilhelm Neumann,** both of Rosenheim; **Karlheinz Hesselman,** Au b. Bad Aibling, all of Germany

[73] Assignee: **Fa. Planatolwerk Willy Hesselmann,** Rosenheim, Germany

[22] Filed: **Jan. 30, 1974**

[21] Appl. No.: **437,886**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 284,862, Aug. 30, 1972, abandoned.

[30] **Foreign Application Priority Data**

Sept. 2, 1971 Germany 2144101

[52] **U.S. Cl.** ..... **156/477 B;** 11/1 R; 156/538; 156/583; 281/21 R

[51] **Int. Cl.**[2] **B42C 13/00**

[58] **Field of Search** ..... 156/212, 216, 477 B, 485, 156/492, 360, 538, 583; 11/1 R, 5; 281/21 R

[56] **References Cited**

UNITED STATES PATENTS

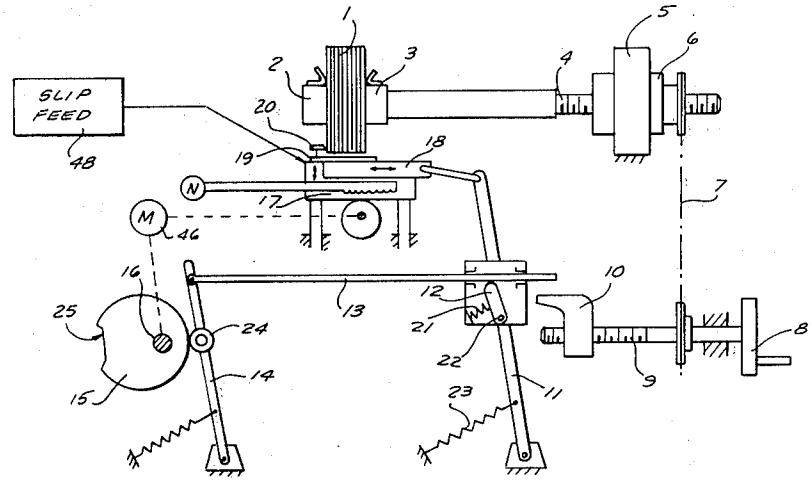
3,330,718	7/1967	James, Jr. et al.	156/477 B
3,531,358	9/1970	Rost et al.	156/216
3,739,412	6/1973	Card et al.	11/5
3,788,921	1/1974	Polit et al.	156/216

Primary Examiner—Charles E. Van Horn
Assistant Examiner—Basil J. Lewris
Attorney, Agent, or Firm—Karl F. Ross; Dubno, Herbert

[57] **ABSTRACT**

An apparatus for binding stacks of sheets or leaves in which a horizontally fixed but vertically movable hot plate is pressed against the spine and a horizontally movable hot plate is displaced horizontally to clamp the flanks of the stack between vertical edges of the two hot plate parts. The clamping device for the stack is adjustable to hold different thicknesses of stacks by a mechanism connected to the movable hot plate part.

5 Claims, 10 Drawing Figures



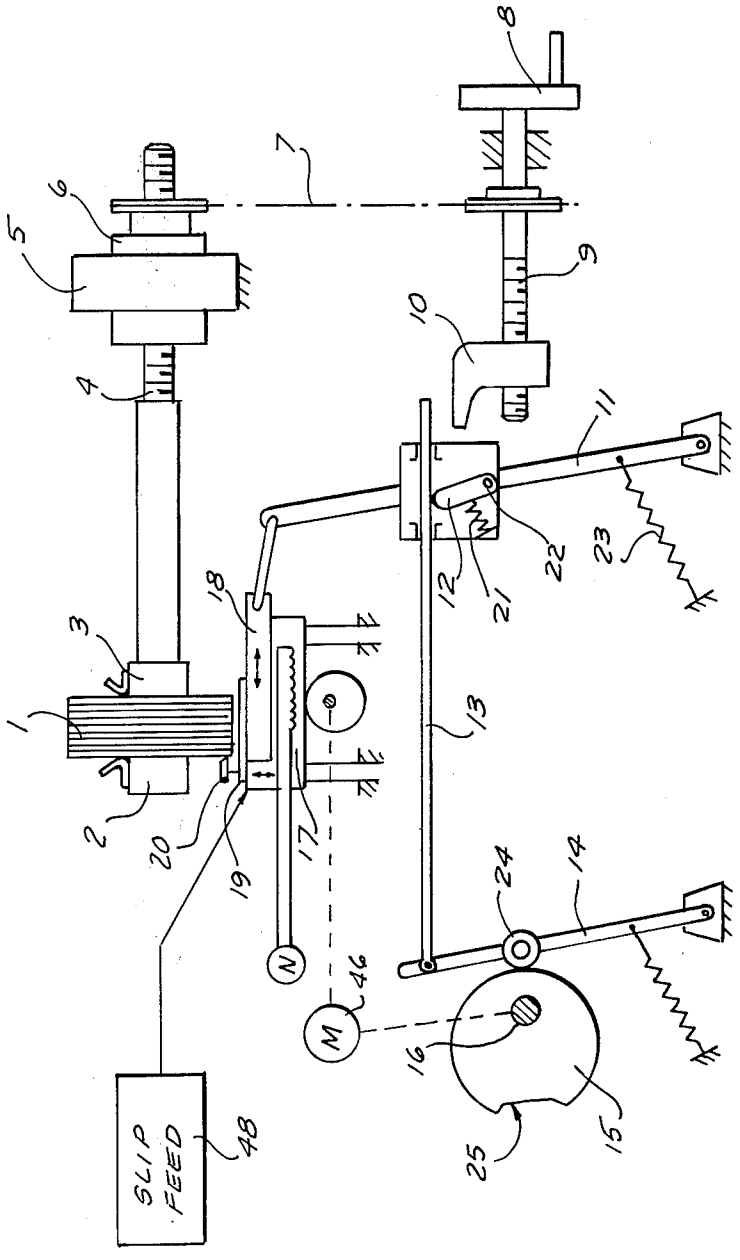
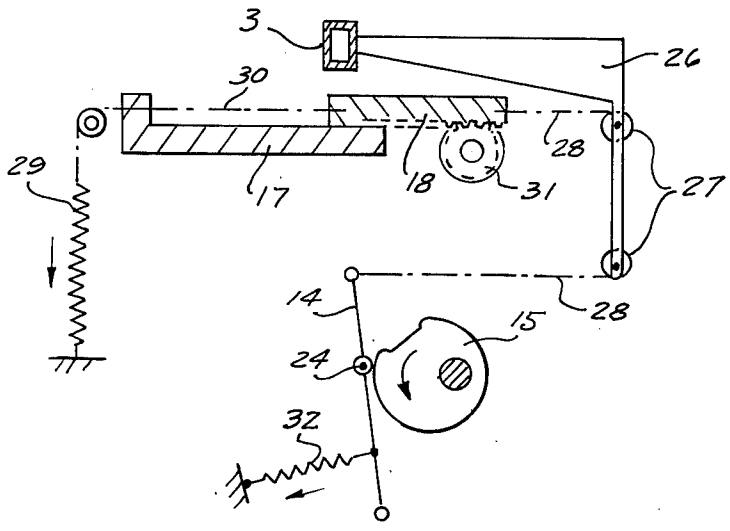


FIG. 1

FIG. 2



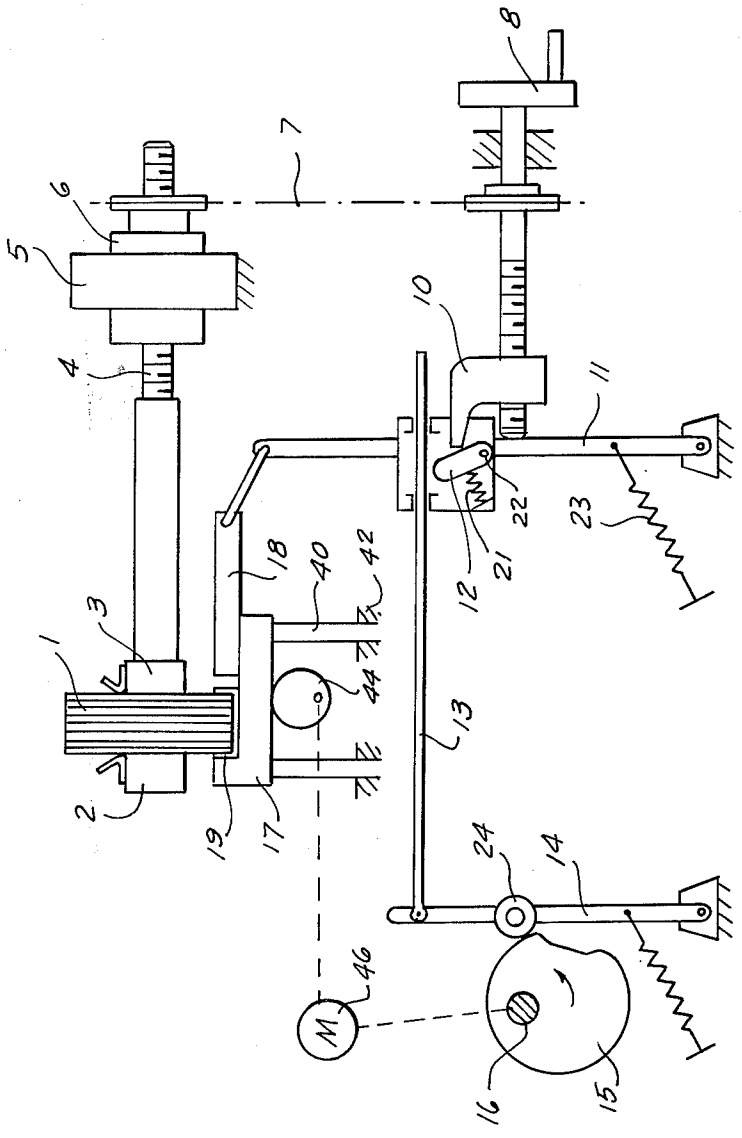


FIG. 3

FIG. 4

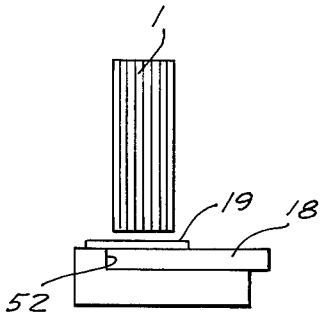


FIG. 5

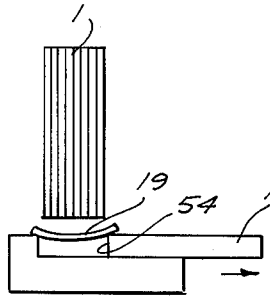
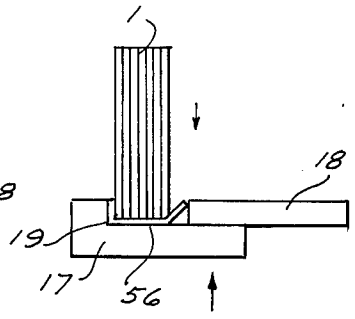


FIG. 6



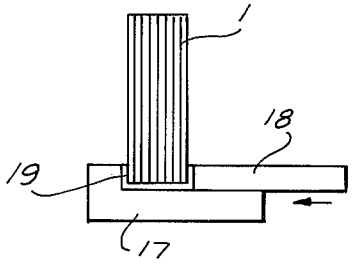


FIG. 7

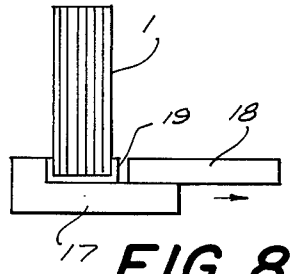


FIG. 8

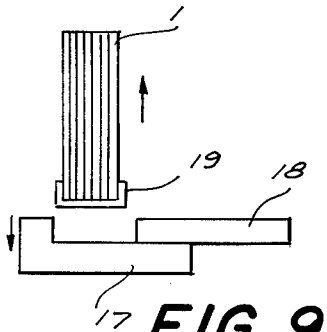


FIG. 9

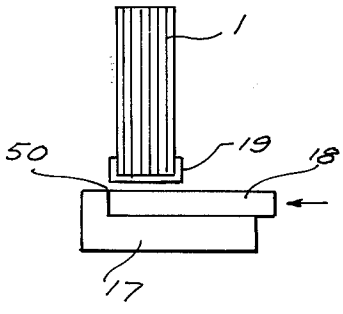


FIG. 10

APPARATUS FOR BINDING PILES OF SHEETS OR LEAVES

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of our co-pending application Ser. No. 284,862 filed on Aug. 30, 1972, now abandoned.

FIELD OF THE INVENTION

The present invention relates to an apparatus for binding piles of sheets into book or pamphlet format. More particularly this invention concerns an apparatus for applying an adhesive-coated strip to the edge of a stack of sheets or leaves.

BACKGROUND OF THE INVENTION

In an apparatus of the above-described general type, as described in the commonly assigned U.S. Pat. No. 3,531,358 issued Sept. 29, 1970 to H. Rost et al, there is described an apparatus wherein a stack of sheets is held in an upright condition above a heated platen on which a tape coated with thermally activatable adhesive. The edge of the stack is set on this tape by lifting the platen. This platen comprises a pair of separable elements having a parting line under the tape so that the book is set down into a gap such that the tape edges are folded up around the stack. The two platen parts are heated and are moved back together on the stack edge to press the tape firmly against it and melt-activate the adhesive.

An adhesive binding apparatus of this kind affords the advantage that the support or slipfold lying on the hot-plate forming the flat jogging surface may be heated within a short time to melt the adhesive, whereupon the support may be pressed by very simple means against the back of the pile of leaves and, when the hot-plate parts have been moved apart, the edges of the support projecting from the edge of the back may, in addition, be bent slipfold fashion to be glued to the book block formed by the slack of sheets or leaves. The adhesive bond between the individual leaves and the fastening of the back by a slipfold are thus brought about by a simple series of operations.

The use of apparatus of this kind in practice involves various problems. One of the problems arises when stacks of leaves of various thicknesses are to be clamped. The actual clamping distance covered by the clamping device should be as constant as possible. However, when stacks of leaves of various thicknesses have to be processed, the clamping distance is insufficient to overcome the difference in thickness between such piles of leaves. The clamping device should thus be adjustable to the thicknesses of stacks of leaves of different sizes without thereby diminishing the actual maximum clamping distance covered by the clamping apparatus.

An additional problem arises from the fact that where stacks of leaves of various thicknesses are used, the stroke of the movable hot plate must also be adjusted. In the closed position, the hot plate must also be adjusted and the hot plate parts must form a flat surface on which the coated support may be placed. In the open position, the hot plate parts have to bend the edge zones of the support, which edge zones project from the back of the stack of leaves, through an angle of 90° and then press them against the edge faces of the stack which edge faces are adjacent the back of the stack.

Thus, the opening movement of the hot plate must always be adjusted to the specific thickness of a pile of leaves to be bound. In such apparatus, these adjustments have hitherto been carried out separately from each other with resulting difficulties when an unskilled operator forgets to carry out an adjustment or makes a faulty adjustment.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved apparatus for adhesively binding a stack of sheets or leaves.

Another object is the provision of an apparatus advancing the principles set forth in the above-named patent and application.

SUMMARY OF THE INVENTION

According to the invention there is provided apparatus for the adhesive binding of stacks of sheets or leaves with the aid of a foil-like support coated with a fusible adhesive, in which the support is initially moved by a multipartite hot plate so as to lie flat against the back of the pile of leaves held by a clamping device and is then pressed by the separated hot-plate sections against the edge zones adjacent the back of the pile of leaves, there being means for the adjustment of the clamping device and simultaneous synchronous adjustment of the distance which one hot-plate part can move from the other hot-plate part.

Thus a synchronization of the adjusting operations is produced, which, separately, produce different results. An adjustment of the clamping device in dependence upon the thickness of a pile of sheets or leaves enables the clamping device to cover a constant and relatively short clamping distance, since it is always assumed that the width of opening of the clamping device only slightly exceeds the thickness of individual piles of sheets or leaves.

The adjustment of the clamping device is thus a criterion of the extent to which the stroke of the movable hot plate part has to be limited in order to ensure that the distance covered by the hot-plate parts actually corresponds substantially to the thickness of the stack of leaves. It will be understood that the maximum stroke of the drive of the movable hot-plate preferably corresponds to a stack of leaves of maximum thickness, any portion of the stroke beyond the thickness of the stack of leaves to be bound being rendered ineffective by the means used. The separated hot-plate parts automatically assume the particular position suitable for an existing thickness of a pile of sheets or leaves and perform a vertical lifting movement for the purposes of pressing the support or slip-fold against the back of the pile of sheets or leaves and of bending the support, faulty bindings being thus completely avoided:

A clamping bar of the clamping device and the hot-plate designed as a base plate or jogging surface associated with the clamping bar on that side of the pile of sheets or leaves may be fixed relative to a plane extending parallel to the back of the pile of sheets or leaves, whereas the other clamping bar and the hot plate guided on the base plate may be of an adjustable construction. The hot-plate may be bi-partite, the base plate being of stepped construction facilitating the insertion and guidance of the movable hot plate part and forming a plane surface therewith when the hot plate is in the closed position. The adjustment of the movable part is thus substantially simplified.

Two parallel spindles interconnected by a gearing and provided with a drive may be mounted in a frame, one of the spindles being adapted to adjust a clamping bar substantially parallel to the back of a pile of sheets or leaves, the other spindle being adapted to adjust a stop against which the gear producing the movement of the hot plate may strike to interrupt the movement.

In this construction, the hot-plate may advantageously be provided with a cam-driven, or crank-driven linkage in which the rocking arm of the linkage is provided with a free running device, for example a resilient, unilaterally operating clamping member which strikes against the stop.

The movable hot-plate may alternately be connected to a stroke generator by flexible tension members pretensioned by springs, rotatable guide pulleys for the flexible tension member being mounted on an adjustable arm carrying the clamping bar, so that an adjustment of the arm may result in a corresponding adjustment of the stroke of the hot plate through the action of the guide pulleys and tension springs and through the action of the flexible tension members upon the stroke generator.

It will be understood that other modifications are possible. Thus, for example, the adjustment of the clamping device may be combined with that of the stroke generator so that the stroke may be initially adjusted to the thickness of a pile of sheets or leaves.

BRIEF DESCRIPTION OF THE DRAWING

Two embodiments of glueing apparatus are diagramatically illustrated in the accompanying drawings, in which:-

FIG. 1 shows a schematic lay-out of one apparatus including an adjusting device;

FIG. 2 shows a second adjusting device;

FIG. 3 is a view similar to FIG. 1 but showing the apparatus thereof in another operative position;

FIG. 4 is a diagram of part of the apparatus of FIGS. 1 and 3 in the position corresponding to FIG. 1 in which a slip has been deposited upon the surface formed by a pair of clamping members;

FIG. 5 is a view similar to FIG. 4 showing the position in which the members for pressing the slip around the spine of the stack have been separated by displacement of the horizontally movable member to the right, the members being in a position spaced below the spine of the stack;

FIG. 6 is another view similar to FIG. 4 showing the members raised and the horizontally movable member still in its extreme right hand position;

FIG. 7 is a view similar to FIG. 4 but showing the members in their raised position with the horizontally movable member having been displaced to the left to press the slip against the edge of the stack now received between confronting edges of the members;

FIG. 8 is a view similar to FIG. 7 in which, however, the horizontally movable member has been partly withdrawn to the right to release the edge of the stack;

FIG. 9 is a view similar to FIG. 7 wherein the members have been displaced downwardly; and

FIG. 10 is a view similar to FIG. 7 in which the members have again been brought into the position shown in FIG. 1 and are now ready to receive a slip, the previous slip being glued to the edge of the stack.

SPECIFIC DESCRIPTION

Referring to the drawings, FIG. 1 shows a stack of sheets or leaves 1 clamped between two clamping bars 2 and 3 forming a clamping device. The clamping bar 2 is stationary in a horizontal direction, the clamping bar 3 being movable in two directions from left to right and vice versa as seen in the figure. The clamping bar 3 is connected to a screw-threaded spindle 4 which, through gearing facilitates an extensive adjustment of the position of the clamping bar 3 to accommodate piles of sheets or leaves 1 of various thickness.

The clamping bar 3 operates, in addition, a drive (not shown), for example of the kind disclosed in German Pat. No. 1,536,500, which causes the pile of sheets or leaves 1 to be compressed under a short stroke. The screw-threaded spindle 4 is longitudinally guided in an adjusting nut 6, which is provided with a sprocket wheel and is unable to move axially in a frame 5, so that rotation of the adjusting nut 6 results in an axial movement of the screw spindle 4.

In the frame 5, a further screw-threaded spindle 9 extends parallel to the screw-threaded spindle 4. The screw-threaded spindle 9, which may be turned by a chain drive 7, is operated by a drive, for example a crank handle or shaft 8. A stop 10 is axially adjustable along the length of the screw-threaded spindle 9. In this synchronization system, the clamping bar 3 and the stop 10 are jointly and uniformly adjusted by operation of the crank handle or shaft 8.

Only two hot plate parts 17 and 18 are required, the hot plate part 17 having a stepped construction in which the horizontally movable hot-plate part 18 may be guided in such a way that the two hot-plate parts form a common plane surface, as shown in FIG. 1 on which a support or slipfold 19 may be placed for heating its adhesive coating and for pressing it against the back of the pile of sheets or leaves 1.

The hot-plate part 18 has to be moved away laterally in the direction indicated by the horizontal double-headed arrow (FIG. 1), so that a front or left hand edge as seen in the Figure of the hot-plate part 18 can lie below the side face of the stack of leaves 1 in slightly laterally offset relation thereto, which side face is engaged by the movable clamping bar 3. When the hot-plate part 17 and the hot-plate part 18 moved laterally away therefrom are lifted vertically in the direction of the vertical double headed arrow towards the pile of sheets or leaves 1, the adjacent end faces of the hot-plate part 17 and of the hot-plate part 18 have to bend the edges of the support or slip-fold 19 around the back of the stack of sheets or leaves and subsequently have to press them against the lateral zones of the pile of sheets or leaves 1. For this reason, the width of the opening between the front edges of the hot-plate parts 17 and 19 exceeds only slightly the thickness of the stack of sheets or leaves 1.

The gearing limits the width of the opening between the hot-plate parts 17 and 18 according to the adjustment of the position of the clamping bar 3 by a central control device comprising the elements 4 to 10, a linkage being used for this purpose in the construction illustrated in FIG. 1. A cam disc 15 mounted on a control shaft 16 operates a crank 14 which, through a link 13, acts upon a rocking arm 11 by which the hot-plate part 18 is displaced. The stroke of the cam disc 15 is adjusted to the maximum thickness of a pile of leaves. The linkage 13 and 14 thus always produces a maxi-

mum movement of stroke. However, in order to utilize only the stroke required for a pile of sheets or leaves **1** of a particular thickness, a spring-loaded free-running clamping member **12** is hinged to the rocker arm **11** and the link **13**; in the position shown in the drawing, the free-running clamping member **12** brings about a closed linkage or frictional connection between the link **13** and the rocking arm **11.** Upon swivelling of the rocking arm **11,** the free-running clamping member **12** strikes against the stop **10** with the result that the clamping member **12** is removed from its friction-locked position against the action of a compression spring **21.** As a result, the link **13** continues to move freely without the rocking arm **11** continuing its swivel motion. The link **13** is guided in suitable manner on the rocking arm **11.**

The clamping member **12** shown in the drawing is mounted on the rocking arm **11** on a pivot bearing **22,** the rocking arm **11** being subject to the action of a tension spring **23.** When the clamping member **12** strikes against the stop **10,** the friction lock with the link **13** is broken. However, the tension spring **23** is unable to produce a return movement of the rocking arm **11,** since this movement would immediately result in a clamping lock between the clamping member **12** and the link **13** supported by the cam disc **15.**

In the aforedescribed position, the hot-plate system **17** and **18** is lifted vertically in the direction of the pile of sheets or leaves **1,** so that the projecting edges of the slip-fold **19** may be folded around the back of the pile of leaves. The cam roller **24** provided on the crank **14** then reaches a recess **25** provided in the cam disc **15.** As a result, the hot-plate part **18** is pressed against the turnedover edge of the slip-fold by the force of the tension spring **23.** Once it has transversed the recess **25** in the cam disc **15,** the cam roller **24** is again forced away outwards and the hot-plate part **18** is thus disengaged from the stack of leaves **1** so that the hot plate **17, 18** may be lowered again. During the following return movement of the crank **14,** the clamping lock is broken and the link **13** and the rocking arm **11** are urged by the spring **23** back to their initial positions.

It will be understood that the hot plate **17** and the fixed clamping bar **2** are fixed in relation to a plane passing through or parallel to the left hand side of the stack of sheets or leaves.

It will also be understood that this system of obtaining a premature limitation of the stroke of the hot-plate part **18** is shown in the drawings merely schematically for the sake of simplification. Constructions other than that of the embodiment illustrated in the drawing but meeting the same purpose may also be used. Thus, for example the principle of an infinitely variable hand-brake lever of the kind used in automotive engineering, a free-running or free-wheeling system or a gearing of the kind used for limiting the working stroke for driving workpieces in printing presses or similar graphic machines may be employed.

In the second embodiment, which is illustrated in FIG. **2,** the adjustable clamping bar **3** is mounted on an angle arm **26** which is adjustable at right angles to the clamping surface by means not shown in the drawing. The arm **26** carries two rotatable guide pulleys **27** for guiding a flexible tension member **28,** one end of which is connected to one side of the movable hot-plate part **18,** its other end being connected to the crank **14.** The other side of the hot-plate part **18** is engaged by a second flexible member **30** connected to a tension spring **29.** The portion of the adjustable hot-plate **18,** which portion is capable of projecting from the other hot-plate part **17,** is guided by a pair of gears **31.** By contrast with the construction illustrated in FIG. **1,** the crank **14** engages a tension spring **32** by which the cam roller **24** is lifted off the cam disc.

An adjustment of this construction to the desired thickness of a pile of leaves requires merely a lateral adjustment of the arm carrying the two pulleys **27.** As a result, the stroke of the hot-plate part **18** is simultaneously adjusted by the guide pulleys **27** and the flexible tension element **28,** since the crank **14** may be moved either towards the cam disc **15** or in a direction away from that cam disc with the aid of the tension spring **32.** It is thus ensured that the stroke of the cam disc **15** is utilized only to the extent actually required for moving the hot-plate **18** a determined distance.

In FIGS. **1** and **3** we show means for vertically displacing the hot plates or members **17** and **18** in the form of vertical rods **40** mounted upon member **17** and received in vertical guides **42.** A cam or eccentric **44,** acting against the gravitational force of the members **17** and **18** is rotatable between drive **46** of the cam **15** to raise and lower the members **17** and **18** in synchronism with the displacement of the horizontally movable member **18.**

The operating sequence is shown in greater detail in FIGS. **4** through **10.**

In FIG. **4,** the confronting vertical edges **52** and **54** of the members **17** and **18** are deposited against one another (see also FIG. **1**) and the slip **19** overlies the surface **50** formed by the two members **17** and **18.**

As previously described, the horizontally movable member **18** is displaced to the right so that the slip **19** bows into the space between the edges **52** and **54** and forms a pocket which is thrust around the edge of the stack **1** when members **17** and **18** are elevated by eccentric or cam **44.** This position is shown in FIG. **6** and brings the surface **56** of plate **17** into contact with the slip **19** and the latter into contact with the edge of the stack. The heating action causes bonding of the slip to the stack as previously described and as mentioned in the Rost et al. patent identified previously.

Movement of member **18** to the left (FIG. **7**) clamps edges **52** and **54** against the flank of the slip and the latter against the flanks of the stack to complete the binding operation. Thereafter, member **18** may be displaced again to the right (FIG. **8**) to release the stack **1** now carrying the slip and members **17** and **18** are lowered (FIG. **9**). The member **18** can now be shifted to the left so that a further slip may be deposited upon the surface **15** by the slip-feed means shown diagrammatically at **48** in FIG. **1.**

We claim:

1. In an apparatus for the adhesive binding of a stack of sheets with a foil coated with a thermally activatable adhesive by depositing the foil upon a hot plate having a stationary member horizontally fixed but vertically movable and a movable member horizontally displaceable relative to the stationary member to receive an edge of the stack between said members and, upon vertical displacement of said hot plate, to fold the foil around said edge, the improvement which comprises:

clamping means engageable with said stack and including two parts separable by the width of said stack; and

means for coupling at least one of said parts with said movable member for positioning said movable mem-

ber in spaced relation relative to said stationary member in dependence upon the spacing of said parts.

2. The improvement defined in claim **1** wherein said means for coupling at least one of said parts with said movable member includes a mechanism for displacing said movable member away from said stationary member, a stop engageable with said mechanism for limiting the displacement of said movable member and means operatively connecting said clamping means with said stop.

3. The improvement defined in claim **2** wherein said clamping means includes a first spindle provided with a thread and rotatable to space said parts apart, said mechanism including a second spindle rotatable for positioning said stop, and transmission means operatively connecting said spindles for joint rotation.

4. The improvement defined in claim **3** wherein said mechanism further comprises a body connected to said movable member and engageable with said stop, a crank cam rotatable for displacement of a rod relative to said body, and friction clamp means in said body engageable with said rod to lock said body with said rod until said body engages said stop and thereafter enabling relative displacement of said rod and said body.

5. The improvement defined in claim **1** wherein said means for coupling at least one of said parts with said movable member includes a flexible element engaging said movable member and a pulley connected to said clamping means for displacing said movable member, said apparatus further comprising means for reciprocating said movable member.

* * * * *