United States Patent

[11] 3,616,074

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[45] Patented **Oct. 26, 1971**

[54] **BINDING MACHINE**
19 Claims, 15 Drawing Figs.

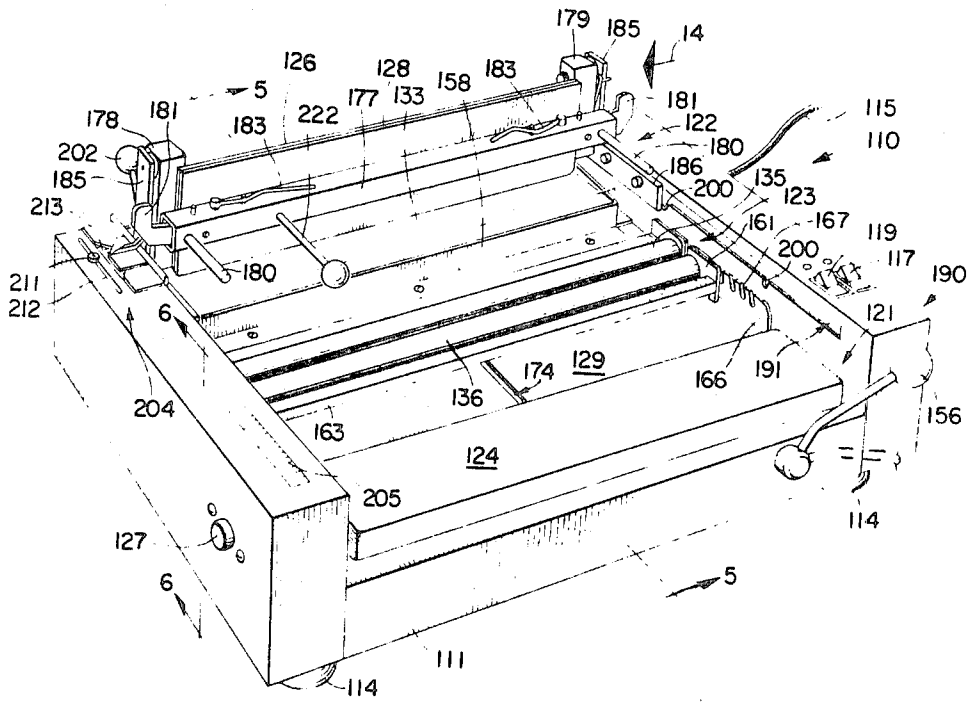
[52] **U.S. Cl.** ..... **156/477 B,** 156/212
[51] **Int. Cl.** **B42c 9/00**
[50] **Field of Search** 156/212, 216, 477, 556, 558, 559, 565, 573, 202

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Assistant Examiner—Harold Tuder
Attorney—George A. Rolston

ABSTRACT: A binding machine has three operating stations and a paper clamp mounted on a transporting means for guidingly moving a clamped stack of sheets between these stations. At the first station, the sheets are supported on their spine edges on a supporting plate with a jogging motor for vibrating the plate in turn to urge the sheets into mutual spine edge alignment. At the second operating station, a heated platen is elevated to apply a strip of spine-binding material having a hot-melt adhesive coating under pressure against the spine surface of the stack of sheets. Finally, at the third operating station, the stack of sheets engages a second pressure means comprising a pair of spring-loaded rolls to press the outer marginal portions of the strip against the outermost sheets of the stack for adhesive bonding.



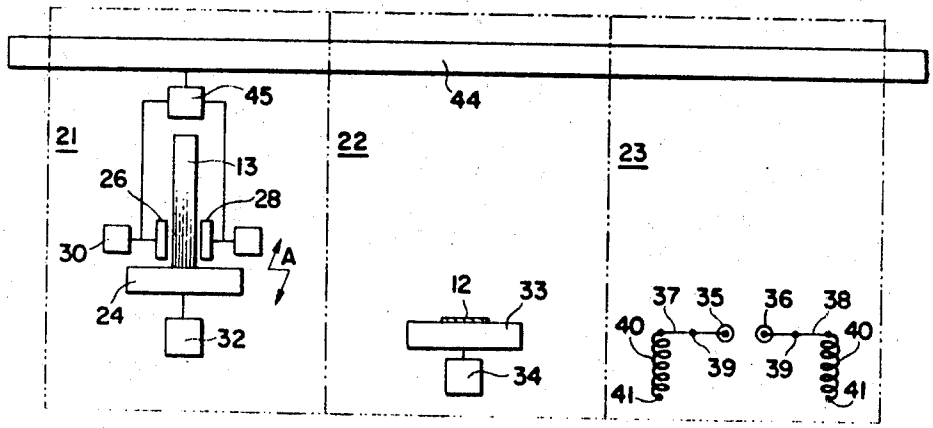


FIG. 1

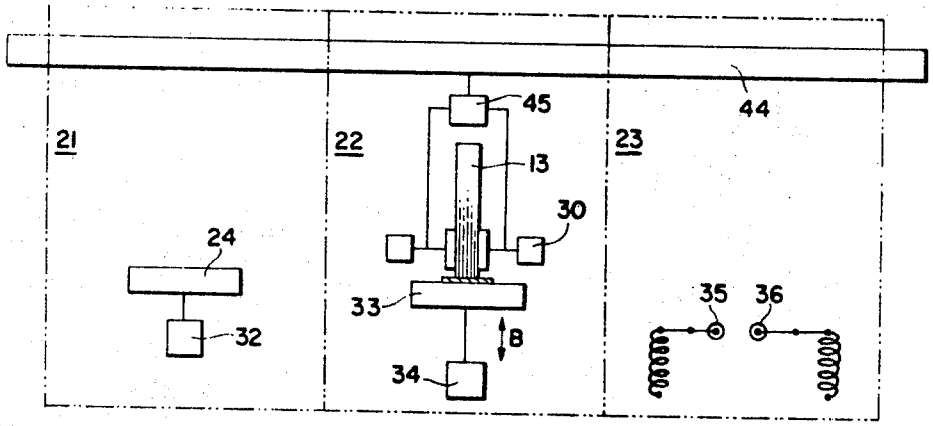


FIG. 2

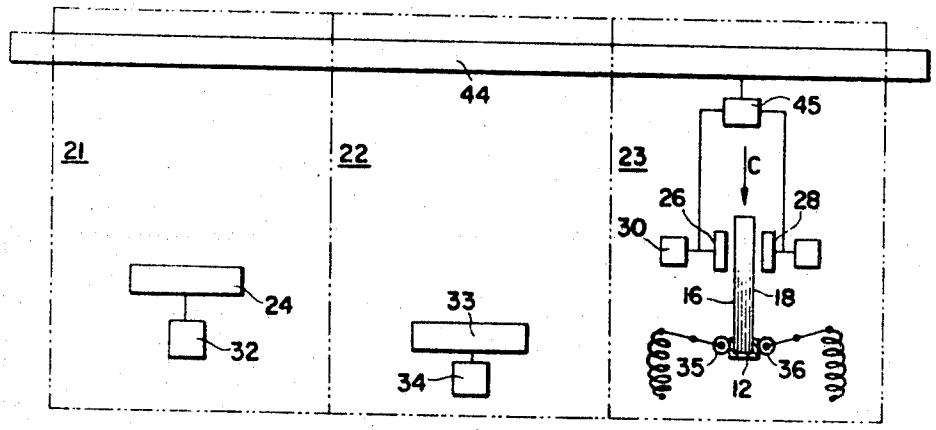


FIG. 3

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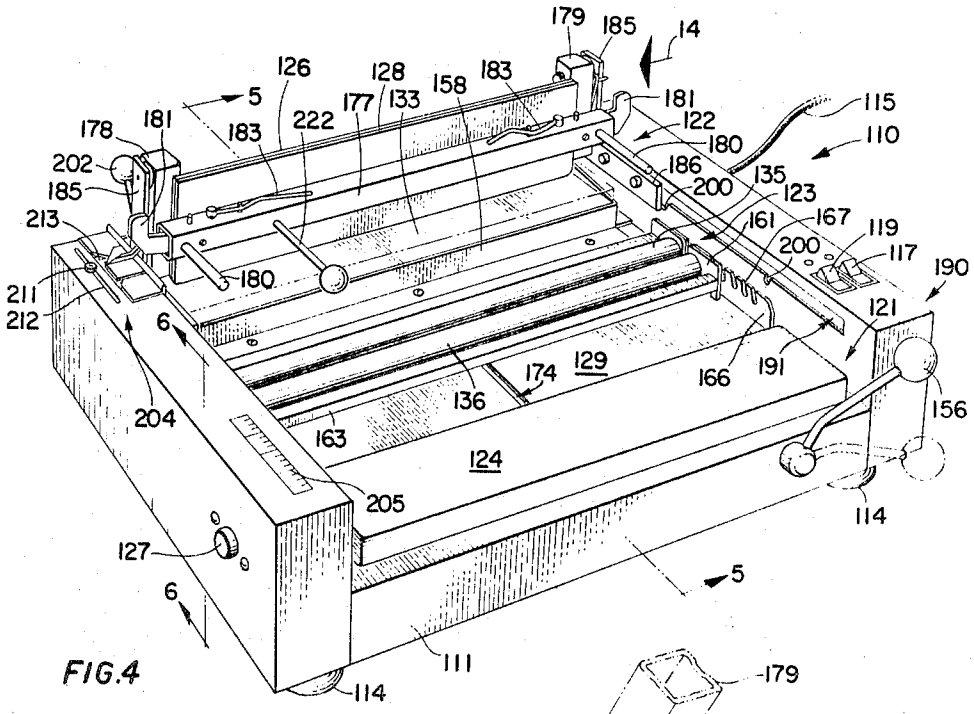


FIG.4

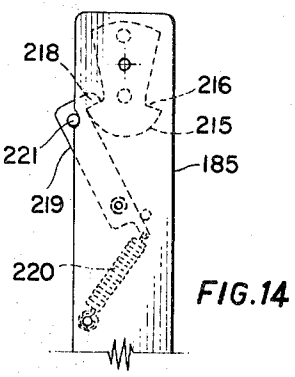


FIG.14

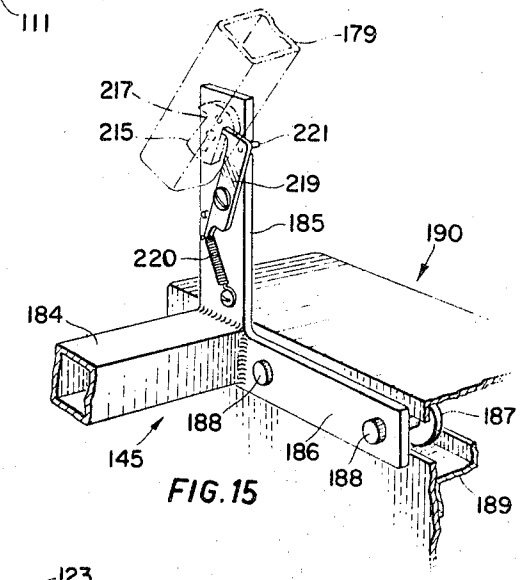


FIG.15

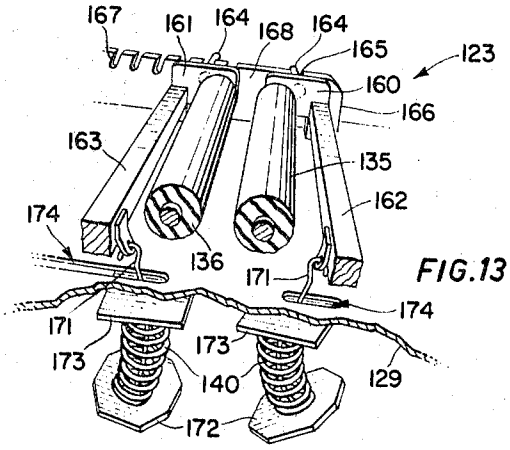


FIG.13

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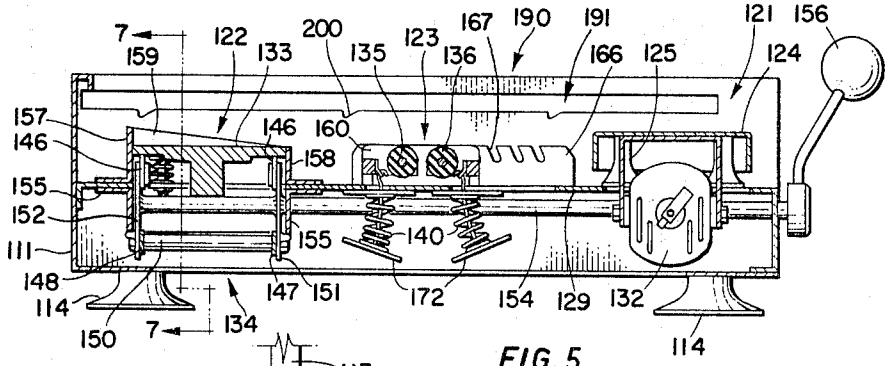


FIG. 5

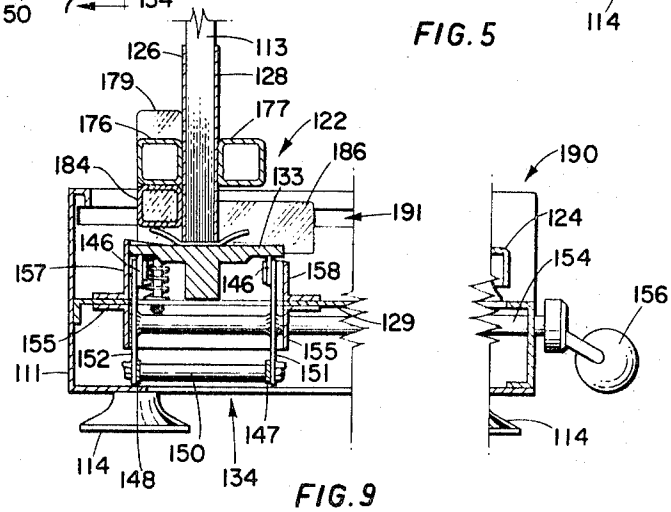


FIG. 9

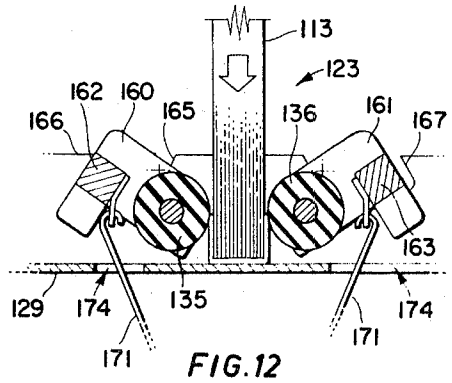


FIG. 12

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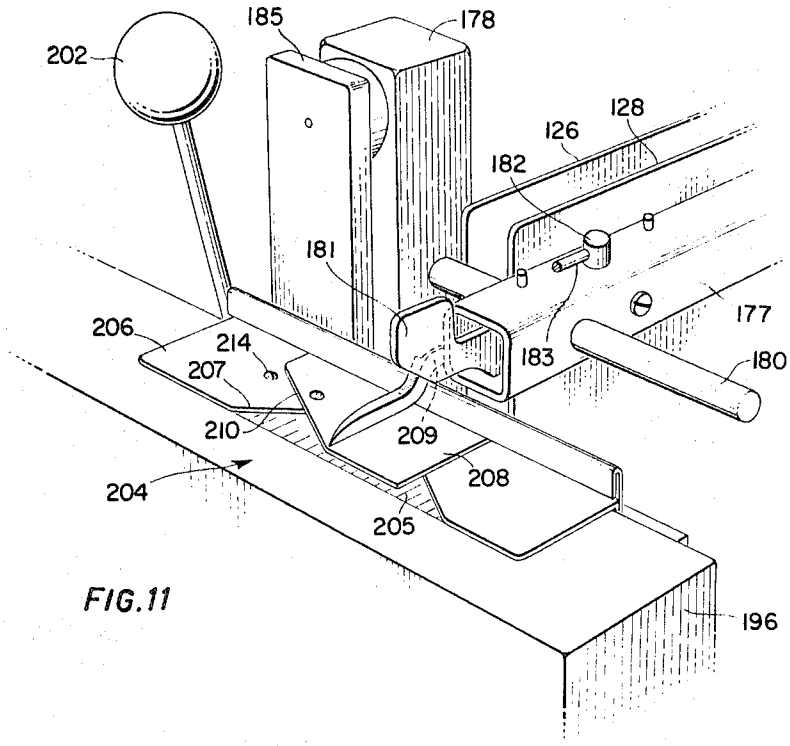


FIG. 11

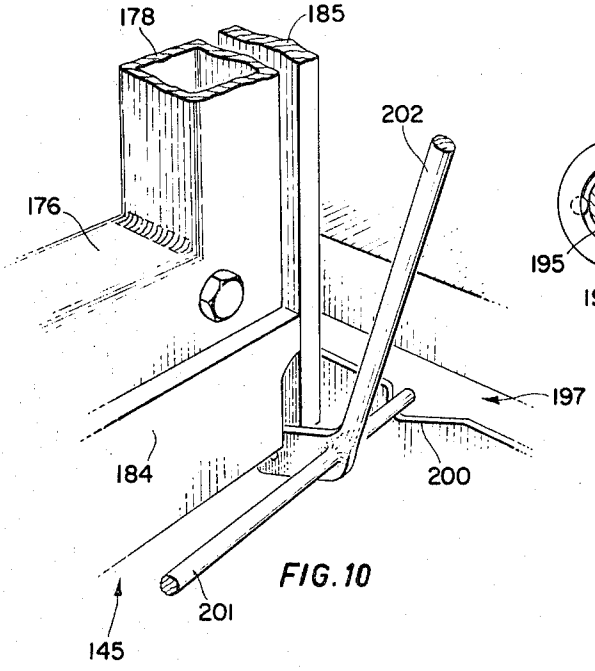


FIG. 10

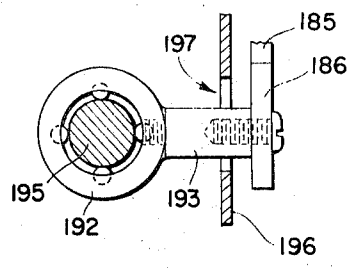


FIG. 6

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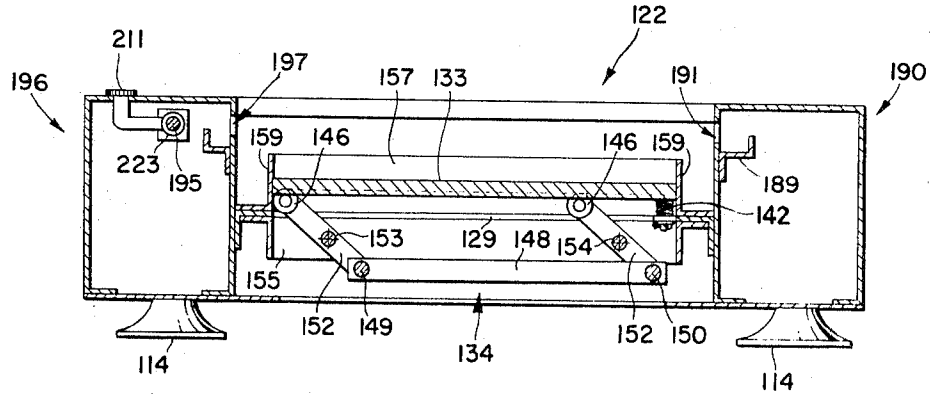


FIG. 7

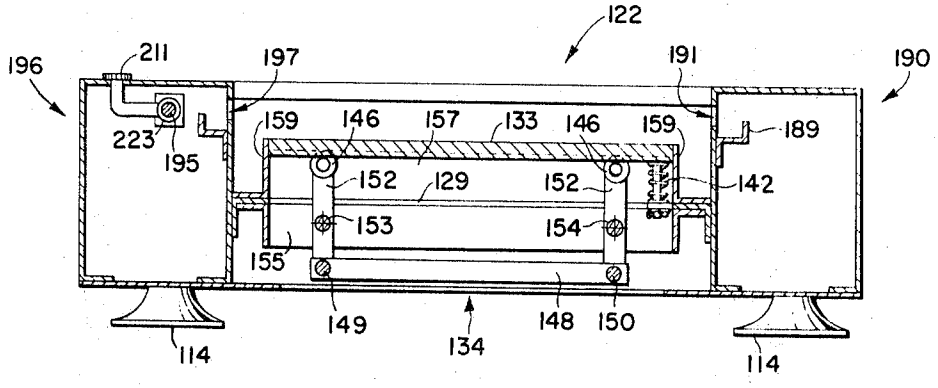


FIG. 8

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BINDING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to binding machines and more particularly to binding machines especially suited for use in binding stacks of paper sheets by the application to the spine surface of such a stack of sheets of an elongated strip or tape of spine-binding material having an adhesive coating thereon.

It is a principal object of the present invention to provide a binding machine of the aforementioned type which machine is relatively simple in its construction, relatively inexpensive to manufacture and particularly reliable and versatile in its operation.

Another object of this invention is to provide a binding machine particularly suited for use in offices for binding reports and the like.

Yet another object of this invention is to provide a binding machine in which elongated strips of spine-binding material having a hot-melt adhesive coating thereon can effectively be bonded by pressure application to the spine surface of a stack of sheets clamped in the machine.

A further object of the invention is to provide a binding machine of the type described in which machine rasping of the spine surface is facilitated prior to the application of the strip of spine-binding material so as to permit improved 'injection' of the adhesive into the edges of the sheets making up the stack.

A still further object of this invention is to provide a binding machine in which the positioning of a stack of sheets to be bound with respect to an elongated strip of adhesive spine-binding material is considerably facilitated.

Yet another object of the present invention is to provide a binding machine of the type indicated and incorporating a novel mechanism for bonding outer marginal portions of a strip of spine-binding material to the outermost sheets of the stack subsequent to effecting positive binding of the strip to the spine surface itself.

Another object of this invention is to provide a binding machine which can be adjusted in a very simple manner so as to facilitate the carrying out of multiple binding operations.

Other objects of the invention will become apparent as the description herein proceeds.

SUMMARY OF THE INVENTION

In its broadest scope, the present invention provides a binding machine which comprises a first operating station adapted to support a stack of sheets in mutual spine edge alignment to define a spine surface, a clamping means adapted releasably to clamp such a stack of sheets in such mutual edge alignment, a second operating station, a transporting means adapted guidingly to move said clamping means between said first and second operating stations with a stack of sheets clamped thereby in mutual spine edge alignment, a first pressure means at said second operating station and adapted to apply an elongated strip of spine-binding material wider than said spine surface and having an adhesive coating on one surface thereof under pressure against the spine surface of a stack of sheets clamped in mutual edge alignment by said clamping means whereby said spine surface is adhesively bonded to said elongated strip of spine-binding material to leave marginal outer portions of said elongated strip unbonded, and a second pressure means adapted to engage said marginal outer portions of said elongated strip of spine-binding material outwardly of said spine surface and to press said marginal outer portions against both outermost ones of said stack of sheets for adhesive bonding thereto.

Other features of the invention will become apparent as the description herein proceeds, such further description being given merely by way of illustration with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described merely by way of illustration with reference to the accompanying drawings in which:

FIG. 1 is a somewhat schematic illustration of a binding machine in accordance with the present invention showing a stack of paper sheets which are to be bound disposed at a first operating station of the machine during an initial step in an operating cycle of the machine;

FIG. 2 is a similar schematic illustration to that of FIG. 1 but showing the stack of paper sheets at a second operating station of the machine at which station an elongated strip of spine-binding material is adhesively bonded to the spin surface of the stack of sheets disposed in the machine;

FIG. 3 is a similar schematic illustration to those of FIGS. 1 and 2 but showing the stack of paper sheets at a third operating station of the machine at which station the outer marginal portions of the elongated strip of spine-binding material are pressed against outermost sheets of the stack and adhesively bonded thereto;

FIG. 4 is a general perspective view of one useful embodiment of a binding machine in accordance with the invention;

FIG. 5 is a vertical sectional view through the machine of FIG. 4 when viewed along the line 5—5 of that figure with certain parts omitted for the sake of clarity;

FIG. 6 is an enlarged fragmentary sectional view of a detail of the machine of FIGS. 4 and 5 in the direction of the arrows 6—6 of FIG. 4 and showing a particularly useful form of bearing incorporated in the machine;

FIG. 7 is a vertical sectional view through the machine of FIG. 4 when viewed as indicated by the arrows 7—7 of FIG. 5 and showing the heating platen of the machine in its lowered position;

FIG. 8 is a similar sectional view to that of FIG. 7 but showing the heating platen of the machine in its raised operative position;

FIG. 9 is a fragmentary vertical sectional view similar to that of FIG. 5 but showing the heating platen in its raised operative position of FIG. 8;

FIG. 10 is an enlarged fragmentary perspective view of a useful means incorporated in the machine of FIG. 4 for retaining the transporting carriage of that machine in desired positions at the various operating stations of the machine;

FIG. 11 is an enlarged fragmentary perspective view of an indicating means incorporated in the binding machine of FIG. 4 for the purpose of indicating the spine center line of a stack of sheets clamped in the machine;

FIG. 12 is a fragmentary vertical sectional view through the third operating station of the machine of FIG. 4 showing a stack of sheets disposed at that operating station and having the outer marginal portions of an elongated strip of spine-binding material bonded to the spine surface of the stack of sheets in the process of being adhesively bonded to the outermost sheets of the stack of sheets;

FIG. 13 is a fragmentary perspective view partly in section through the third operatng station shown in FIG. 12 but showing the pressure rolls of that station in their non-operative positions;

FIG. 14 is an enlarged fragmentary side elevation when viewed in the direction of the arrow 14 of FIG. 4 showing the mechanism provided in the machine for moving the stack of sheets disposed therein from the normal upright position shown and for temporarily clamping such a stack in a position in which rasping of the spine surface of the stack is facilitated; and

FIG. 15 is an enlarged fragmentary perspective view of the mechanism shown in FIG. 14 with the structural components thereof disposed in their rasping positions.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 to 3, there is shown therein somewhat schematically and generally at 10 a binding machine intended in accordance with the present invention adhesively to bond an elongated strip 12 of spine-bindng material to the spine surface of a stack 13 of paper sheets and ahdesively to bond outer marginal portions of such a strip 12 to the outermost sheets 16 and 18 of the stack of sheets 13.

The binding machine 10 comprises three operating stations generally indicated at 21, 22 and 23. The first operating station 21 includes a supporting plate 24 for supporting the stack of sheets 13 in mutual spine edge alignment while the stack is being clamped between first and second clamping plates 26 and 28, the movements of which are controlled by clamp control means 30. In accordance with a useful feature of the invention, the supporting plate 24 usefully has associated therewith a jogging means 32 adapted to vibrate the supporting plate 24 as indicated by the arrow 'A' before the clamping plates 26 and 28 are moved firmly against the stack of sheets 13. Such vibration serves to urge the individual sheets of the stack 13 into individual spine edge alignment with each other on the supporting plate 24.

The second operating station 22 of the binding machine 10 shown schematically in FIGS. 1, 2 and 3 accommodates a first pressure means which is shown as comprising an electrically heated platen 33 and an associated elevating means 34 for moving the platen 33 between the positions shown in FIGS. 1 and 2 as indicated by the double-headed arrow 'B.' The machine illustrated in FIGS. 1 to 3 is intended to be used with the elongated strip 12 of spine-binding material which has a hot-melt adhesive coating on its upper surface. Such adhesive is melted by heat applied through the strip 12 from the platen 33 and is applied under pressure against the spine surface of the stack of sheets 13 when the platen 33 is moved upwardly by the elevating means 34, the stack of sheets 13 being firmly clamped at this time between the clamping plates 26 and 28 as actually shown in FIG. 2. It will be noted particularly from FIG. 2 that the elongated strip 12 of spine-binding material has a width greater than that of the spine surface of the stack of sheets 13 so as to leave outer marginal portions of the strip unbonded after bonding of the central portion of the strip to the spine surface of the stack of sheets 13 at the second operating station 22.

At the third operating station 23, the stack of sheets 13 is released from between the clamping plates 26 and 28 by operation of clamp control means 30 so as to be free to be moved downwardly between a pair of pressure rolls 35 and 36 constituting a second pressure means and operative to press the aforementioned marginal outer portions of the strip 12 of spine-binding material under pressure against the outermost sheets 16 and 18 of the stack of sheets 13 for adhesive bonding thereto.

In the somewhat schematic arrangement shown in FIGS. 1, 2 and 3, the pressure-applying rolls 35 and 36 are shown as being carried on opposed ends of a pair of lever arms 37 and 38 each of which is centrally pivoted as shown at 39. Each of the arms 37 and 38 is associated with a spring means shown as a helical tension spring 40 anchored as at 41 and adapted to urge the rolls 35 and 36 to resist nip-opening pivotal movements about the axes 39 to the positions shown in FIG. 3. During downward movement of the stack of sheets 13 in the direction of the arrow 'C' of FIG. 3 from between the clamping plates 26 and 28, the rolls 35 and 36 engage the outer marginal portions of the elongated strip 12 of spine-binding material and apply such portions under pressure against the outermost sheets 16 and 18 of the stack of sheets 13 to complete the binding operation.

The machine shown in FIGS. 1 to 3 also comprises a guide means 44 for guidingly moving the clamping plates 26 and 28 between the several operating stations 21, 22 and 23 and a carriage or transporting means 45 guided by the guide means 44 and appropriately linked to the clamping plates 26 and 28 and to the clamp control means 30.

The essential features and some of the more important optional features of the machine 10 shown in FIGS. 1 to 3 having been described, it might usefully be noted at this juncture that the binding machine 10 can advantageously incorporate other structural components for facilitating its use. Many such features will be described hereinafter with reference to the particular embodiment shown in the remaining figures of the accompanying drawings but, merely by way of illustration, it can be indicated that the machine 10 may be provided, for example, with means for accurately positioning the stack of sheets 13 at each of the operating stations 21, 22 and 23 and for centering the stack of sheets 13 with respect to the elongated strip of spine-binding material 12 at the second operating station 22.

Referring now to the binding machine indicated generally as 110 in FIGS. 4 to 15 of the accompanying drawings, it will be noted that this machine comprises a structural frame generally indicated at 111 with supporting legs 114 and having a first operating station 121, a second operating station 122 and a third operating station 123. These operating stations 121, 122 and 123 correspond in their structures and operations to the operating stations 21, 22 and 23 respectively of the binding machine 10 shown in FIGS. 1, 2 and 3.

The first operating station 121 is provided with a supporting plate 124 resiliently mounted on rubber legs 125 and corresponding to the supporting plate 24 of the machine 10 of FIGS. 1 to 3, the legs 125 being supported on a generally horizontal member 129. An electrically operated 'jogging' motor 132 of any conventional type is mounted on the undersurface of the supporting plate 124 for vibrating that plate and a push button control 127 is provided for actuating the motor 132. Since the motor 132 is conventional and forms no part of the present invention, it will not be described herein in greater detail. An electrical supply cord 115 serves to provide electrical power to the machine and a main'on-off' switch 117 controls the supply of electricity to the pushbutton control 127.

At the second operating station 122, the machine 110 is provided with an electrically heated platen 133, the energization of which is manually controlled by an 'on-off' switch 119. The various electrical connections are conventional and will not be described herein in greater detail.

Referring now in greater detail to FIGS. 5, 7, 8, and 9, it will be seen that the platen 133 is supported for generally vertical movement on rollers 146 of a parallelogram-linkage elevating means generally indicated at 134. During such vertical movement, the platen 133 is guided by upstanding angle members 157, 158 and 159 mounted on the top surface of the generally horizontal member 129. The elevating means 134 comprises front and rear lower traverse members 147 and 148 respectively, which are pivotally interconnected at their ends by rods 149 and 150, each of which is in turn pivotally carried at the lower ends of front and rear upright linkages 151 and 152 respectively. The upright linkages 151 and 152 are themselves pivotally supported by shafts 153 and 154 respectively intermediate their upper and lower ends on brackets 155 mounted on the undersurface of the generally horizontal member 129. The right-hand shaft 154 is secured to its associated upright linkages 151 and 152 and extends forwardly through the machine 110 and forwardly thereof it is secured to a control handle 156 by means of which the shaft 154 may be rotated and the platen 133 may be moved between the position shown in FIGS. 5 and 7 and that shown in FIGS. 8 and 9. The undersurface of the platen 133 is maintained in engagement with the rollers 146 of the elevating means 134 by a helical tension spring 142 extending between the platen 133 and the generally horizontal member 129 as will best be seen by reference to FIGS. 5 to 9.

It should be noted that, when the platen 133 is in its lowered position as shown in FIGS. 5 and 7, the platen 133 itself and the forward angle member 158 are both disposed below the level of the top surface of the supporting plate 124 of the first operating station 121 to permit the transfer from the latter to the former of a stack of sheets as will more readily be understood when the operation of the machine 110 is described hereinafter. Furthermore, the elevating means 134 is designed so that the platen 133 can be moved between a lowered position and a raised operative position in which position its top surface is lower and somewhat higher respectively than that of the supporting plate 124 so as to apply the necessary pressure in its raised position to the elongated strip of spine-binding material.

Referring now to the third operating station 123 with particular reference to FIGS. 4, 5, 12 and 13 of the accompanying drawings, it will be seen that this operating station 123 comprises a pair of transversely disposed pressure rolls 135 and 136, each of which is axially mounted between a pair of end plates 160 and 161 which are also interconnected by elongated members or rods 162 and 163 respectively. Each of the pressure rolls 135 and 136 is pivotally mounted eccentrically with respect to its own axis about pivot pins 164 extending transversely outwardly from respective ones of the end plates 160 and 161 intermediate the axes of the rolls 135 and 136 and the associated elongated members 162 and 163.

The pins 164 of the roll 135 are supported in forwardly sloping slots 165 formed in transversely spaced apart upstanding flanges 166 mounted on the top surface of the generally horizontal member 129 while the pins 164 of the roll 136 can be disposed in any one of a number of pairs of rearwardly sloping slots 167 in the flanges 166 to provide a pressure nip 168 between the rolls 135 and 136.

The rolls 135 and 136 are normally urged into the position shown in FIG. 13 by helical springs 140 disposed below the generally horizontal member 129. For this purpose, each of the elongated members 162 and 163 is connected by a wire 171 to a bottom plate 172 secured to the lower end of the respective compression spring 140 while a top plate 173 secured to the upper end of the spring 140 allows the latter readily to move along the undersurface of the generally horizontal member 129 as required. Each wire 171 extends freely through a hole in the respective top plate 173 and, to permit movement of the springs 140 along the undersurface of the generally horizontal member 129, each of the wires 171 extends through a respective slot 174 formed in the generally horizontal member 129.

It should also be noted at this time, that the pressure rolls 135 and 136 are disposed below the level of the top surface of the supporting plate 124 of the first operating station 121 for a reason which will be more readily understood as the description herein proceeds.

As in the case of the binding machine 10 illustrated in FIGS. 1 to 3, the machine 110 of the remaining figures of the drawings also comprises first and second clamping plates 126 and 128 between which a stack 113 of sheets will be clamped for spine binding in the machine 110. The rearward clamping plate 126 is suitably secured to the front face of a rearwardly disposed and transversely extending member 176 of square cross section while the forward clamping plate 128 is secured to the rear face of a forwardly disposed and transversely extending member 177 of square cross section. The rear square member 176 is terminally secured to upright posts 178 and 179 while the front square member 177 is supported on rods 180 extending forwardly from the posts 178 and 179 and passing through appropriate openings in the ends of the front square member 177.

With this construction, the front clamping plate 128 may be moved along the rods 180 to accommodate a stack of sheets 113 between the clamping plates 126 and 128, braking members 181 being provided within the ends of the front square member 177 as shown in FIG. 11. Each such member 181 includes a hole through which the appropriate one of the rods 180 passes. Springs (not shown) are provided within the front square member 177 to urge the braking members 181 into braking engagement with the rods 180. Cam members (not shown) on shafts 182 are provided for locking the braking members 181 in tight engagement with the rods 180 when handles 183 on the upper ends of the shafts 182 are moved to the positions shown in FIG. 4. The outward extensions of the braking members 181 permit manual release of the braking engagement of the braking members 181 and the rods 180.

Each of the aforementioned upright posts 178 and 179 is mounted in a manner to be explained hereinafter in greater detail on a carriage 145 comprising a transverse member 184 terminally secured to upright plates 185 and forwardly extending flanges 186. The forwardly extending flange 186 of the right-hand end of the carriage 145 (when viewed as in FIG. 4) has a pair of nylon rollers 187 mounted thereon by shafts 188 (FIG. 15) and these rollers 187 are guided in a track 189 provided within a right-hand sidewall structure indicated generally at 190 in FIGS. 4 and 15. An extended slot 191 is provided in the inner surface of the right-hand sidewall structure 190 and the shafts 188 extend through this slot 191.

On the left-hand side of the machine 110, the carriage 145 is usefully supported by a sleeve bearing 192 (FIG. 6) mounted on the outer end of a shaft 193 connected to the left-hand flange 186. The sleeve bearing 192 is slidably mounted on a shaft 195 suitably supported within a left-hand sidewall structure generally indicated at 196 in FIGS. 7 and 8. A slot 197 in the inner surface of the left-hand sidewall structure 196 receives the shaft 193. It will now be understood that the clamping plates 126 and 128 can be guidingly supported and moved on the carriage 145 between the first, second and third operating stations 121, 122 and 123 respectively for a purpose yet to be described in detail.

In accordance with a particularly useful feature of the invention, the machine 110 as shown in FIGS. 4 to 15 comprises means for temporarily locking the carriage 145 in correct position in both the first and third operating stations 121 and 123. This means comprises appropriately positioned notches 200 formed in the lower edges of the slots 191 and 197. A transversely extending rod 201 pivotally mounted on the transverse member 184 (FIG. 10) is terminally received in the aforementioned notches 200 for holding the carriage 145 in a desired position while a handle 202 is provided for raising the rod 201 when it is desired to move the carriage 145 between the several operating stations.

Another useful feature incorporated in the machine 110 comprises an indicating means generally indicated at 204. This indicating means 204 comprises a scale 205 suitably mounted on the upper surface of the left-hand sidewall structure 196 and intended to indicate in any suitable manner the required width for the elongated strip of spine-binding tape which must be used for binding a stack of sheets 113 of a given thickness so as to obtain an adequate width for each of the outer marginal portions of such a strip as has already been explained with reference to FIGS. 1 to 3. To this end, the indicating means 204 usefully comprises a first plate 206 secured to the upright plate 185 and disposed above the top surface of the left-hand sidewall structure 196 as will best be understood by reference to FIG. 11. This first plate 206 has a forwardly and inwardly sloping front edge 207. The rearward and outer end of this edge 207 is aligned with the forward surface of the rear clamping plate 126 and cooperates with a second such plate 208 slidably mounted on the first plate 206 and having a transversely inwardly extending finger 209 adapted to abut the left-hand end of the front square member 177 on the rearward surface thereof. This second plate 208 has a rearwardly and inwardly extending sloping rear edge 210 of the same angle as the edge 207 of the first plate 206 and having an outer end aligned with the rear surface of the front clamping plate 128 when the second plate 208 is moved forwardly so that its finger 209 abuts the front square member 177. It will be seen that the sloping edges 207 and 210 define a V-shaped recess, the angle of which will then be positioned in alignment with the spine center line of a stack of sheets 113 clamped between the clamping plates 126 and 128. Corresponding dimples 214 are provided in the plates 206 and 208 for retaining the second plate 208 in its most rearward position when not in use.

At its second operating station 122, the machine 110 is provided with an adjustable stop member for limiting rearward movement of the carriage 145. This stop member usefully comprises a sleeve 223 surrounding the shaft 195 (FIG. 6) to restrict rearward movement of the carriage 145 by abutment with the sleeve bearing 192. In the machine illustrated, such a stop sleeve 223 is connected to a knurled bushing 211 adapted to be secured in a required position along a slot 212 provided in a suitable position in the top surface of the left-hand

sidewall structure **196** in proximity to the rearward end thereof as shown in FIG. 4. A second scale **213** is provided on this same top surface of the left-hand sidewall structure **196** and is used with the indicating means **204** to permit the carriage **145** to be moved into such a position that the spine center line of a stack of sheets **113** clamped between the clamping plates **126** and **128** is centrally disposed with respect to an elongated strip of spine-binding material disposed in a predetermined position on the platen **133** as will be described hereinafter in greater detail.

In accordance with another useful feature of the invention, the machine **110** is provided with means for pivoting a stack of sheets after they have been clamped between the clamping plates **126** and **128** into a position in which the spine surface so formed faces forwardly and upwardly to facilitate its rasping.

For this purpose, each of the aforementioned upright posts **178** and **179** is pivotally mounted on a respective one of the upright plates **185** while the right-hand post **179** has secured on its outer surface a cam ratchet member **215** with notches **216** and **217** adapted to be engaged by a pawl **218** of a plate **219** pivotally mounted on the inner surface of the right-hand upright plate **185** and urged into abutment with the cam ratchet member **215** by a spring **220** as will readily be understood by reference to FIGS. 14 and 15. A pin **221** extends outwardly from the plate **219** to permit the pawl **218** to be manually released.

Another useful feature of the machine **110** illustrated in the drawings is a stop member for facilitating transverse positioning of the sheets to be bound when such sheets are of a relatively small size. This stop member is in the form of a rod **222** (FIG. 4) suitably secured on the rear clamping plate **126** and extending forwardly therefrom freely through the front clamping plate **128** and through the front square member **177**. Preferably, this rod **222** is threadingly secured to the rear clamping plate **126** to permit its removal when larger sized sheets are to be bound.

It should also be noted that the machine **110** may optionally comprise a timer for ensuring that the application of the elongated strip of spine-binding material to a stack of sheets is continued for a sufficient time. Alternatively, such a timer might usefully be controlled by a thermostat incorporated in the platen **133** and adapted to actuate an alarm or signal light when the temperature of the platen rises to a predetermined value as it will after a certain period of time of contact under pressure with the spine of a stack of sheets thereabove.

Having completed the description herein of the construction of the machine **110**, its manner of operation will now be described. With the electrical supply cord **115** connected to a suitable source of electrical energy and with the main switch **117** in its 'on' position, the handle **202** is moved forwardly to release the rod **201** from the notches **200** and the carriage **145** is moved forwardly so as to be disposed at the first operating station **121** with the rod **201** received in the forward notches **200**.

With the handles **183** in their release positions and by gripping the exposed ends of the braking members **181**, the front clamping plate **128** is moved forwardly along the rods **180** to separate the clamping plates **126** and **128**. Depending on the size of the sheets to be bound, the rod **222** will either be left in position as shown or removed from the machine.

The stack of sheets **113** to be bound is next placed between the clamping plates **126** and **128** with the spine edges of the sheets resting on the supporting plate **124**. The front clamping plate **128** is next moved rearwardly towards the rear clamping plate **126** so as to support the stack of sheets **113** therebetween but not to such an extent that the sheets are clamped immovably between the clamping plates. If the rod **222** has been left in position, the sheets will be placed with their left-hand edges abutting that rod. Otherwise, the sheets will be positioned so that such left-hand edges will abut the left-hand rod **180**.

The push button jogging motor control **127** is next depressed to actuate the motor **132** to vibrate the supporting plate **124** in turn to urge the spine edges of all the sheets into mutual spine edge alignment and the right-hand edges of the sheets are pushed gently by hand towards the left-hand side of the machine to ensure mutual side edge alignment.

When the jogging is complete, the push button **127** is released and the stack of sheets **113** is firmly clamped between the clamping plates **126** and **128** by moving the handles **183** as already explained.

It is desired to rasp the spine surface of the clamped stack of sheets **113**, the pin **221** is now released and the clamping plates **126** and **128** with the sheets firmly clamped therebetween are pivoted so that the spine surface faces forwardly and upwardly. This is made possible by the pivotal mounting of the posts **178** and **179** on the upright plates **185** of the carriage **145**. The stack of sheets **113** is retained in this inverted position during the rasping operation by engagement of the pawl **218** in the notch **216** as actually shown in FIG. **15**.

When the rasping is completed, the stack of sheets **113** is returned to its generally vertical position by moving the pin **221** to release the ratchet cam member **216** and to allow the clamping plates **126** and **128** to be returned to their original upright positions.

With the carriage **145** and the associated structure still disposed at the first operating station **121**, the second plate **208** of the indicating means **204** is moved forwardly so that its finger **209** abuts the rear surface of the front square member **177**. The required width for the spine-binding tape is then read from the scale **205** in the manner already described.

An appropriate length of spine-binding tape is now obtained and placed in a suitable position on the platen **133**. For example, the tape or strip may be placed so as to be in edge abutment with the rear upstanding angle member **157** and against the left-hand upstanding angle member **159**. Alternatively, such a length of tape may be positioned along guide lines scored or otherwise provided on the top surface of the platen **133**. The handle **202** is now moved to lift the rod **201** out of the notches **200** at the first operating station **121** and the carriage **145** is pushed rearwardly to the second operating station **122** until the angle of the V-shaped recess defined by the sloping edges **207** and **210** of the indicating means **204** is correctly positioned with respect to the rear scale **213**. If it is intended to use the machine **110** for binding a number of stacks of sheets of the same size, for example, for binding a number of copies for a single report, the knurled bushing **211** will be moved along the slot **212** so that rearward movement of the carriage **145** beyond its correct position at the second operating station **122** is prevented. In such multiple binding operations, it is subsequently necessary only to push the carriage **145** rearwardly until it rests against the stop member connected to the bushing **211**.

With the carriage **145** correctly in position at the second operating station **122** as actually shown in FIG. **4** and with the platen switch **119** in its 'on' position, the handle **156** is moved into the position shown in phantom lines in FIG. **4** to raise the platen **133** by means of the parallelogram linkage already described and to press the elongated strip of spine-binding material **112** supported by the platen **133** under pressure against the spine surface of the stack of sheets **113**. During this operation, the sheets remain firmly clamped between the first and second clamping plates **126** and **128** respectively and the adhesive on the upper surface of the binding strip is melted by heat from the platen. The molten adhesive is forced into the spine edges of the sheets and this positive 'injection' of the liquid molten adhesive into the actual material of the individual sheets is greatly facilitated by the aforementioned rasping operation of the spine surface. It will be understood that, in order to obtain the desired pressure application, the potential height of the platen should be slightly above the top surface of the supporting plate **124** at the first operating station **121**.

After a required period with the platen 133 raised as possibly indicated by the aforementioned thermostatically controlled alarm or signal light, the handle 156 is moved so as to lower the platen 133 to its original position.

The handle 202 is next moved to release the carriage 145 and the latter is moved forwardly to the third operating station 123 in which it is correctly positioned by engagement of the rod 201 in the appropriate notches 200. With the pivot pins of the front pressure roll 136 supported in an appropriate pair of notches 167 depending upon the thickness of the stack of sheets 113 being bound, the clamping plates 126 and 128 are now released by moving the handles 183. The stack of sheets 113 is next pushed manually downwardly from between the clamping plates 126 and 128 into the nip 168 between the rolls 135 and 136. During this movement, the rolls 135 and 136 are urged by the compression springs 140 to resist downward and outward nip-opening movement as will best be understood by reference to FIG. 12. Since the function of this operation has already been described in detail with reference to FIG. 3, it is considered unnecessary to expound further thereon.

Finally, the nip 168 is readily opened by lifting one of the elongated transverse members or bars 162, 163 to permit the bound stack of sheets 113 to be removed upwardly from within the nip 168.

It will be appreciated that numerous variations are possible within the scope of the invention as defined by the claims appended hereto.

What I claim is:

1. A binding machine which comprises:

a first operating station; a supporting plate at said first operating station for supporting a stack of sheets in mutual spine edge alignment to define a spine surface;

a second operating station spaced apart from said first operating station;

a guide means extending between said first and second operating stations;

a transporting means carried by said guide means for movement between said first and second operating stations;

a clamping means carried by said transporting means and comprising first and second clamping members, at least one of which is adjustably mounted on said transporting means for adjustment of the separation between said clamping members, and releasable locking means for releasably securing said clamping members in desired spaced apart positions with the stack of sheets clamped therebetween in mutual edge alignment;

a first pressure means at said second operating station for applying an elongated strip of spine-binding material which strip is wider than said spine surface and has an adhesive coating on one surface thereof, under pressure against the spine surface of a stack of sheets clamped in mutual edge alignment by said clamping means whereby said spine surface is adhesively bonded to said elongated strip of spine-binding material to leave marginal outer portions of said elongated strip unbonded; and

a second pressure means for engaging said marginal outer portions of said elongated strip of spine-binding material outwardly of said spine surface and to press said marginal outer portions against both outermost ones of said stack of sheets for adhesive bonding thereto.

2. A binding machine as claimed in claim 1, in which said second pressure means is disposed at a third operating station, in which said guide means extends between said first, second and third operating stations whereby said clamping means carried by said transporting means can be moved between said first, second and third operating stations with a stack of sheets clamped in mutual spine edge alignment between said first and second clamping members.

3. A binding machine as claimed in claim 2, which additionally comprises heating means disposed at said second operating station for heating an elongated strip of spine-binding material having a hot melt adhesive on one surface thereof so as to melt said adhesive prior to application of said strip under pressure by said first pressure means against the spine surface of a stack of sheets clamped in mutual spine edge alignment by said clamping means.

4. A binding machine as claimed in claim 3, which additionally comprises jogging means disposed at said first operating station and associated with said supporting plate for vibrating a stack of sheets loosely supported between said clamping members of said clamping means at said first operating station so as to urge said sheets into mutual spine edge alignment prior to clamping of such a stack of sheets between said clamping members of said clamping means.

5. A binding machine as claimed in claim 4, which additionally comprises first indicating means associated with said clamping means for indicating a center line of the spine of a stack of sheets firmly clamped between the clamping members of said clamping means, and a second indicating means at said second operating station for indicating a center line of an elongated strip of spine-binding material disposed in a predetermined position thereat, so that when said first indicating means is disposed in predetermined relationship with respect to said second indicating means said spine is then disposed generally centrally with respect to said elongated strip.

6. A binding machine as claimed in claim 5, which additionally comprises an adjustable limiting means disposed at said second operating station to limit movement of said clamping means beyond a position in which said spine is disposed generally centrally with respect to the elongated strip.

7. A binding machine as claimed in claim 6, in which said first pressure means comprises an electrically heated platen having an upper surface for supporting an elongated strip of spine-binding material in a predetermined position thereon and elevating means for moving said platen between a lowered retracted position and a raised operative position for applying said elongated strip of spine-binding material under pressure against the spine surface of said stack of sheets clamped in mutual edge alignment by said clamping means when said clamping means is disposed at said second operating station.

8. A binding machine as claimed in claim 7, in which said second pressure means comprises a pair of spaced apart rolls for engaging respective ones of said marginal outer portions of said elongated strip of spine-binding material when said clamping means supporting the stack of sheets is disposed at said third operating station.

9. A binding machine which comprises:

a first operating station;

a generally horizontal and transversely disposed supporting plate disposed at said first operating station;

a clamping means comprising a first transversely extending clamping plate and a second transversely extending clamping plate mounted for movement towards and away from said first clamping plate and releasable locking means for releasably securing said first and second clamping plates in desired spaced apart positions whereby, said clamping means is effective both loosely to support and firmly to clamp between said first and second clamping plates thereof a stack of sheets having a spine surface resting on said supporting plate;

a jogging means associated with said supporting plate for vibrating said supporting plate for urging said sheets of said stack when they are loosely supported between said clamping plates of said clamping means into mutual spine edge alignment;

a second operating station disposed rearwardly of said first operating station;

a third operating station;

a guide means extending between said first, second and third operating stations;

a transporting means supported by said guide means to carry said clamping means between said first, second and third operating stations with said stack of sheets in mutual spine edge alignment firmly clamped between said first and second clamping plates thereof;

a first pressure means at said second operating station and comprising a vertically reciprocable, heating platen having a horizontal top surface for supporting and heating an elongated strip of spine-binding material disposed thereon, said elongated strip being wider than said spine surface of said stack of sheets and having a hot melt adhesive on a top surface thereof, and elevating means for moving said heating platen upwardly to apply said elongated strip under pressure against said spine surface when said clamping means is disposed at said second operating station whereby said spine surface is adhesively bonded to said elongated strip to leave marginal outer portions of said strip unbonded; and

a second pressure means at said third operating station and comprising spaced apart pressure members for engaging said marginal outer portions of said elongated strip of spine-binding material and for pressing said marginal outer portions thereof under pressure against outermost ones of said stack of sheets for adhesive bonding thereto.

10. A binding machine as claimed in claim **9**, in which said third operating station is disposed intermediate said first and second operating stations.

11. A binding machine as claimed in claim **10** in which said clamping means is pivotally mounted about a transversely extending horizontal axis for movement of said stack of sheets when firmly clamped between said first and second clamping plates of said clamping means to a position in which said spine surface of said stack of sheets faces forwardly and upwardly for rasping thereof prior to adhesive bonding thereon of said elongated strip of spine-binding material at said second operating station.

12. A binding machine as claimed in claim **11**, in which said first and second clamping plates of said clamping means are associated with first and second indicating members respectively extending transversely outwardly therefrom said first and second indicating members cooperating with each other to indicate a spine center line position of said stack of sheets when said sheets are firmly clamped between said clamping plates and in which means are additionally provided at said second operating station for indicating a center line position of said elongated strip of spine-binding material when said strip is disposed on said platen in a predetermined position thereon, whereby said clamping means may readily be moved into such a position that said spine center line essentially coincides with said center line of said elongated strip.

13. A binding machine as claimed in claim **12**, in which an adjustable stop member is disposed at said second operating station whereby said stop member can be set as required to prevent movement of said clamping means rearwardly beyond a position in which said spine center line of said stack of sheets generally coincides with said center line of said elongated strip of spine-binding material disposed on said platen in said predetermined positions whereby in turn a plurality of identical stacks of sheets may be bound with automatic alignment of their spine center lines with the center lines of successive elongated strips of spine-binding material disposed at said predetermined position on said platen by moving said clamping means during each binding operation to a rearmost position as defined by said stop member.

14. A binding machine as claimed in claim **13**, which additionally comprises at said first operating station a scale which cooperates with said first and second indicating members associated with said clamping plates so as to indicate the width of said stack of sheets clamped therebetween and to indicate the width of said elongated strip of spine-binding material required to be used for such a stack of sheets to provide a predetermined width for each said outer marginal portion.

15. A binding machine as claimed in claim **10**, in which said second pressure means comprises first and second transversely disposed pressure-applying rolls eccentrically mounted about respective transversely disposed axes to define a transversely disposed nip, and first and second spring means cooperating with respective ones of said first and second pressure-applying rolls to urge said rolls to resist downward, nip-opening movement about said axes whereby, when said stack of sheets is moved downwardly from between said clamping plates of said clamping means disposed at said third station, said rolls apply an upward and inwardly compressive force against said marginal outer portions of said elongated strip of spine-binding material adhesively bonded to said stack of sheets.

16. A binding machine as claimed in claim **15**, in which at least one of said pressure-applying rolls is adjustably mounted so that the width of said nip can be adjusted to accommodate varying thickness of stacks of sheets.

17. A binding machine as claimed in claim **16**, in which each said pressure-applying roll is associated with a transversely extending bar disposed on the opposite side of the transversely disposed axis of rotation thereof and in which each said bar is connected to a spring acting to resist upward movement of said bar about said axis.

18. A binding machine as claimed in claim **17**, in which each said transversely extending bar is connected to a free lower end of a helical compression spring by a pin extending downwardly through a slot in a generally horizontal member disposed below said bar and having an underface and in which an upper end of each said spring slidingly engages said undersurface of said horizontal member whereby said pin may move along said slot and said upper end of said spring may slide along said undersurface of said horizontal member when said pressure-applying roll is moved to adjust said nip.

19. A binding machine as claimed in claim **15**, in which said elevating means at said second operating station is operative to move said heating platen between a lowered position below said supporting plate at said first operating station and a raised operative position above said supporting plate at said first operating station, and in which said pressure-applying rolls at said third operating station are disposed below said supporting plate at said first operation station.