

592255 For Regulation

APPLICATION FOR A STANDARD PATENT

We BINDOMATIC AB, a Swedish Joint-Stock Company, of Tengdahlsgatan 22, S-102 72 Stockholm, SWEDEN hereby apply for the grant of a Standard Patent for an invention entitled

"METHOD AND APPARATUS FOR BINDING LOOSE SHEETS IN A FOLDER PROVIDED WITH BINDING AGENT"

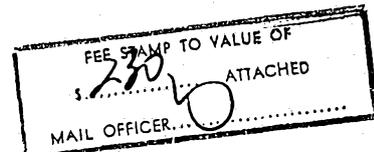
which is described in the accompanying specification.

For a Convention application - details of basic application(s) -

Table with 3 columns: NUMBER, COUNTRY, DATE OF APPLICATION. Row 1: SE 8700867-8, SWEDEN, 2nd March, 1987

APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 26-10-89



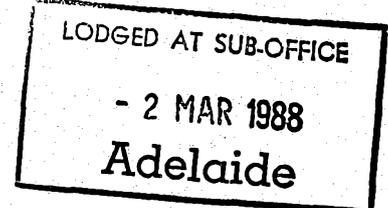
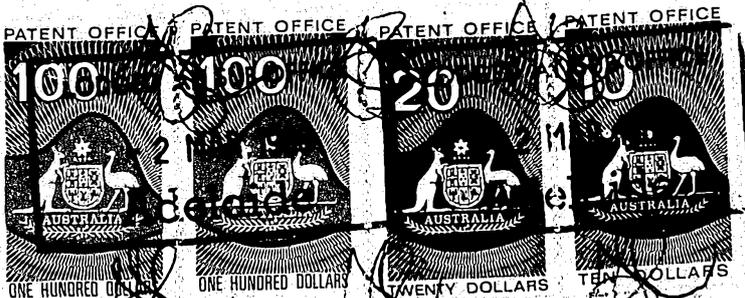
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Dated this 2nd day of March, 1988.

BINDOMATIC AB, By their Patent Attorneys, COLLISON & CO.

(Signature)

G.E. HABEL



To: THE COMMISSIONER OF PATENTS

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(54) Title
METHOD AND APPARATUS FOR BINDING LOOSE SHEETS IN A FOLDER PROVIDED WITH BINDING AGENT

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(56) Prior Art Documents
US 4678386
AU 567839 67063/86 B42C 11/02
AU 28888/77 B42C 11/04 B42D 3/00

(57) Claim

1. Method of binding sheets in a folder provided with binding agent with the aid of a thermal binding apparatus, wherein

(a) one or more folders, each containing sheets which are to be bound, are inserted through an opening (4) at a time hereinafter called the "insertion instant" in the binding apparatus into contact with a heating plate (2) which has a heating element (20), characterized in that

(b) the insertion in the opening (4) of the folder or folders (F) actuates a starting circuit (15, 16) which activates a timer (18) at the insertion instant,

(c) said timer keeping the heating element (20) supplied with power from the insertion instant to a pre-determined time which is dependent on the starting temperature of the heating element and the total thickness of the folder/folders.

4. Apparatus intended for binding sheets in a folder (F) provided with binding agent, and including a casing (1) enclosing a heating plate (2) and having an opening (4) above the heating plate for insertion of one or more folders with sheets which are to be bound, said opening being restricted by a rear support means (5) and a forward support means (6), the heating plate

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including an electrical heating element (20) connected to an electrical control circuit for the power supply to the heating element, characterized in that the control circuit includes a timer (18) activated by a starting circuit (15, 16) which is activated by the insertion of the folder (F) or folders into the opening (4), the timer keeping the heating element (20) supplied with power from the insertion instant and during a pre-determined time interval which is responsive to the starting temperature of the heating element and the total thickness of the folder/folders.

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COMPLETE SPECIFICATION (ORIGINAL)

FOR OFFICE USE:

Class

Int. Class

Application Number :
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Complete Application No. :
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Priority:

Related art:

This document contains the amendments made under Section 49 and is correct for printing.

TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

"METHOD AND APPARATUS FOR BINDING LOOSE SHEETS IN A FOLDER PROVIDED WITH BINDING AGENT"

The following statement is a full description of this invention, including the best method of performing it known to ~~one~~ us:

METHOD AND APPARATUS FOR BINDING LOOSE SHEETS IN A FOLDER
PROVIDED WITH BINDING AGENT.

Technical Field

5. The present invention relates to an improved method and improved apparatus for thermally binding sheets in a folder provided with binding agent, as is disclosed in the preamble to the following claims 1 and 4 respectively.

Background Art

To avoid some drawbacks with older binder apparatus technique such as uncertainty in judging the length of time to be set for attaining a proper binding, a new technique was presented in the U.S. Patent No. 4,367,116 "Binding Apparatus". By this technique the heating element was supplied continuously with power for maintaining a desired working temperature. Since the binding apparatus described in the patent was formed to cater for folders with a different number of pages by having an adjustable opening there was a demand for different operation times which were dependent on the actual folder thickness. This was solved by having a set of buttons for pre-setting the length of the operating time.

25. The known binding apparatus according to the mentioned US patent is indeed simple to operate but relatively energy-demanding since it operates with a continuous power supply.

It has also been proposed to have intermittent power supply of the heating element in a binding apparatus, for example in the German patent 3 514 201. In this case a heat detector is arranged for sensing the temperature of

the heating element, the power supply to which is interrupted after each binding operation. The heat detector output signal is used to control the start of the time switch so that the pre-set operating time is counted from and including the time when the heating element has reached its pre-determined working temperature, stated to be at least 90°C.

There has indeed been achieved that the power consumption is reduced to a certain extent, but the power consumption is still unnecessary, since it has been found during undertaken investigations that the binding operation can also utilize the time when the heating element has a lower temperature. Accordingly, the energy consumption could be brought to an absolute minimum if the time count on the time switch could be caused to take into account what starting temperature the heating element has when the folder is inserted in the opening of the binding apparatus.

Disclosure of Invention

According to one aspect of the present invention the improved binding apparatus includes a casing with a heating plate with an opening situated above the plate, the width of the opening being settably limited by a forward and a rear support means. The forward support means can also be movable for regulating the width of the opening with relation to the number and/or the thickness of the folders which are to be inserted into it. The outer surface of the heating plate is heated by a heating element when the folder (folders) engage against the outer surface for acting on the heat sensitive binding agent in each folder, wherewith the loose sheets inside the folder (folders) are



5 bound. The electrical supply circuit feeding the heating element has a control means.

10 According to one form the invention could be said to reside in a method of binding sheets in a folder provided with binding agent with the aid of a thermal binding apparatus, wherein a) one or more folders, each containing sheets which are to be bound, are inserted through an opening at a time hereinafter called the "insertion instant" in the binding apparatus into contact with a heating plate which has a heating element, characterized in that b) the insertion in the opening of the folder or folders actuates a starting circuit which activates a timer at the insertion instant, c) said timer keeping the heating element supplied with
15 power from the insertion instant to a pre-determined time which is dependent on the starting temperature of the heating element and the total thickness of the folder/folders.

20 According to another form the invention could be said to reside in an apparatus intended for binding sheets in a folder provided with binding agent, and including a casing enclosing a heating plate and having an opening above the heating plate for insertion of one or more folders with sheets which are to be bound, said opening being restricted by a rear support means and a forward support means, the heating plate including an electrical heating element
25 connected to an electrical control circuit for the power supply to the heating element, characterized in that the control circuit includes a timer activated by a starting circuit which is activated by the insertion of the folder or folders into the opening, the timer keeping the heating element supplied with power from the insertion instant and during a pre-determined time interval which is responsive to the starting temperature of the heating element and the total thickness of the folder or folders.
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Characteristic for one aspect of the method according to the invention is that the insertion of the folder (folders) energizes a starting circuit which _____



actuates the timer from the insertion time, so that the heating element is kept supplied with power from the insertion time and during a pre-determined time interval, the length of which is dependent on the opening width and/or the starting temperature of the heating element.

By having the current control means depending on the number of inserted folders or on the total thickness of the folders there is obtained a definite power supply for the binding agent of the folders, independent of the number of pages which are included in the binding operation.

By having a temperature detector which continuously senses the temperature of the heating plate or heating element, it is possible to compensate for different starting temperatures of the heating plate. When the apparatus has been out of use for some time, and the heating plate is at room temperature the output signal of the detector can be used for setting the timer to a longer pre-determined time interval than when the apparatus is restarted after a short while, since the heating plate then has a temperature which is then closer to the normal working temperature.

An extremely well-adapted, optimum solution for reducing the energy consumption is to form the starting circuit with a computer circuit, preferably a microcomputer, the inputs of which are connected to a) a light detector with a ray path extending over the opening above the heating



5. plate and which is broken when the folder (folders) is inserted in the opening, b) a width detector which senses the width of the opening and c) a heat detector which senses the starting temperature of the heating plate. The computer circuit determines with the aid of fed-in detector signals the actual length of time that the timer shall hold the electrical power supply of the heating element connected from the time of the insertion of the folder (folders) until a satisfactory bond has been obtained.

10. In a preferred embodiment of the binding apparatus, there is a manually switchable time control circuit, which can similarly activate the computer circuit and has the function of extending the normally set time periods of the timer by a pre-determined value. Switching in the time control circuit is intended to be performed, e.g. when the material thickness of the folder or folders is greater than the thickness normally used, when a glue type other than the normal one is used, etc.

15. Another advantageous embodiment of the binding apparatus control circuit includes a time delay circuit, which is connected to the computer circuit for delaying interruption of the power supply to the heating element by a pre-determined time after the folder or folders have been taken out from the opening or after the timer has reached its in-circuit time determined by the computer circuit.

20. Preferred Embodiments

25. The above objects, properties and advantages of the present invention will be understood better from the preferred embodiments described below, which are not to be regarded as restricting for the invention but only as illustrating examples thereof. A description of the embodiments is given in conjunction with the accompanying drawings, where

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the heating plate 2 is supplied with power, which takes place with the aid of a relay means 31 (Figures 4 and 5). The signal lamp 12C is intended, when it is illuminated, to indicate that the heating plate 2 operates at increased power, which can be switched on with the aid of a button (not shown) on one side of the main switch 11 on the rear side of the apparatus.

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The signal lamp 33 comprises a series of LED's situated side by side, which symbolically denote the length of time which has been determined for an actual binding-operation. The LED's 33 are extinguished one after the other as the binding operation proceeds, so that when the last LED 33 is extinguished the binding is ready, which can also be denoted by other signal means, e.g. by an audible signal. Of course, the LED's 33 can be replaced by other time indication means, e.g. a digital marker which counts down the time for the binding operation.

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Figure 2 is a section along the line II-II in Figure 1, the forward, displaceable support means 6 being illustrated in two different positions, where the chain dotted position is the one which gives the greatest opening 4 and thereby room for the thickest folder which can be bound or for the greatest number of thinner folders which can be bound at the same time. At the bottom of the casing 1 there are a pair of rails 13 attached for mounting the displaceable support means 6. The latter has on its bent-over portion 7 two parallel flanges 14 intended to run in the rails 13. The edges of the flanges 14 are coated with easily sliding material, e.g. in the form of TEFLON tape.

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The bottom of the casing 1 also carries the heating plate 2, which will be described in more detail in conjunction

with Figure 3 below.

There is also a light source 15 arranged on the bottom of the casing 1 for illuminating a photocell 16 via a reflector 17. The reflector 17 can be formed as a bright surface on the fixed support means 5, which is bent to a suitable angle and attached to the rear end wall of the casing 1. The photocell 16 is suitably a phototransistor connected directly to or via a microcomputer (MP) 19 to a timer 18, the phototransistor being mounted at the end of the opening 4 situated on the opposite side of the fixed support means 5. A thermistor 28 is arranged in the immediate vicinity of the heating plate 2 and is similarly suitably connected to the microcomputer 19. The electrical circuit will be described in more detail in conjunction with Figures 4 and 5.

As will also be seen from Figure 2, a detector for sensing the width of the opening 4 can be formed as a fixed coil 30 with a movable magnetic core 29. The core 29 is moved by the displaceable support means 6, on the flange 14 of which the core 29 is attached. The changed magnetic field which affects the detector coil 30 at different insertion lengths of the core 29 is utilized to generate an output signal indicating the actual width of the opening 4, i.e. the number of folders or the total thickness of the folder or folders which can be inserted in the opening 4.

The coil 30 and core 29 illustrated in Figure 2 can also be connected to the supply circuit for the heating plate 2 analogous with what is shown in Figure 5. Thus, there is obtained regulation of the power supply to the heating plate in relation to the number of inserted folders or the total thickness thereof.

The above-discussed width detector and/or effect regulating means 29, 30 can also be realized in other ways, e.g. with the aid of a transformer with a fixed primary winding and a movable secondary winding which is mechanically connected to the displaceable support means 6. Additional means for realizing this width detector are described in conjunction with Figures 4 and 5.

Figure 3 illustrates in more detail the construction and mounting of the heating plate 2. Accordingly, the heating plate includes a heating foil 20 which is inserted between two surfaces 21, 22 of heat conductive material, e.g. aluminium. The upper surface 21 constitutes the support surface of the heating plate 2, against which the folder to be bound will rest. The lower surface 22 forms a holding plate intended to urge the heating foil 20 into intimate contact with the under side of the support surface 21. This is achieved by the support surface 21 being formed with flanges 23 in which threaded holes are made for screws 24. The ends of the screws 24 act on the holding plate 22, either directly on its under side or on flanges which are formed on the holding plate 22, in correspondence with the flanges 23 on the support surface. The thermistor 28 is shown arranged between both surfaces 21 and 22.

25. The heating plate 2 is mounted on the bottom of the casing 1 with the aid of bushes 25 which are fastened to the flanges 23 of the support surface 21 and to the bottom of the casing 1. This fastening is preferably carried out with screws 26, 27, which do not go straight through.

30. The function of the binding apparatus insures that it is always ready for a binding operation, i.e. at the start of the working day the apparatus is started by the main

switch 11 being depressed. As will be seen from Figures 4 and 5, the signal lamp 12A is illuminated as well as the light source 15. The microcomputer 19 is also activated. The apparatus is thus prepared for its function when one or more folders F are to be bound. The folders may be of the kind described in conjunction with Figure 4 in the US patent 4 367 116.

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When the operator desires to bind a folder, he only needs to put the folder F (or the folders if there are more than one) into the opening 4. No presetting of the binding time or temperature needs to be made.

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The basic principle of the function of the binding apparatus is illustrated by the circuit diagram in Figure 4.

When the folder F or the folders are to be inserted into the opening 4 (Figures 1 and 2) the displaceable support means 6 is displaced so that an opening width is obtained suitable to the number of folders or the total folder thickness. The width detector then sends a signal corresponding to the position of the support means 6 to the

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microcomputer 19. In Figure 4 the width detector is illustrated by three light sources 34 connected in parallel

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which are supplied with power from the power source 10, and a corresponding number of photodiodes 35. The light sources 34 and photodiodes 35 are situated on either side of the path of the bent over portion 7 on the displaceable support means 6. Accordingly, one or more of the photodiodes 35 will be screened from its associated light source 35 in response to the position of the support means 6, i.e. in response to the width of the opening 4.

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The folder F or the folders are inserted in the opening 4 into engagement against the heating plate 2, the actual temperature of which is sensed by the heat detector 28,

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which preferably constitutes a thermistor and is connected to the microcomputer 19. On insertion of the folder/folders F the light beam from the light source 15 towards the photodiode 16 is interrupted, which causes a signal to be sent to the timer 18 and to the relay means 31, which closes the power supply circuit of the heating plate 2. The illustrated relay means 31 can also comprise transistor switching, a relay, or the like.

10. The timer 18 thus immediately starts counting a pre-determined time interval when the folder or folders F are inserted in the opening 4. The starting value of the pre-determined time interval is in response to the signals from the temperature and width detectors 28, 35, which are processed in the microcomputer 19, the latter in turn sending a signal to the timer 18.

20. The timer 18 is also connected to the LED's 33, all of which illuminate for maximum length of the pre-determined time interval, i.e. when the temperature of the heating plate 2 is equal to room temperature and the width of the opening 4 is at a maximum. For higher temperatures of the heating plate 2 and/or lesser opening widths a smaller number of LED's are illuminated. The number of illuminated LED's 33 decreases in time with the timer 18 counting down as described above in conjunction with Figure 1.

25. When the timer 18 has counted down to zero, i.e. the binding is ready, the last LED 33 is extinguished, an optional audible signal is sent and the power supply to the heating plate 2 is broken off by the timer 18 sending a return signal to the relay means 31.

30. For certain purposes there may be a need of an increased temperature in the heating plate 2, or an extended time.

interval for binding. For example, the material in the folders which are to be bound may be thicker than normal and therefore require more energy for achieving a fully satisfactory binding. For this purpose, there is suitably arranged a time control circuit (not shown) which can be manually switched in, and which is connected to the timer 18 for extending the normal counting periods of the reckoner by a pre-determined value. Alternatively, the same increase in energy can be achieved by a temperature compensator which can be manually switched into the signal circuit of the temperature detector 28 for reducing the signal from the detector 28 by a pre-determined value. This energy-increasing compensation is controlled by a push button (not shown) as mentioned in conjunction with Figure 2.

On certain occasions there may be a need of a delayed switching-off of the power supply to the heating plate 2, after the folder or the folders F have been taken from the opening 4 or after the timer 18 has reached its given ON time, i.e. it has reached the count value zero. This need can be satisfied by a delay circuit (not illustrated) which is suitably connectable to the microcomputer 19 or the relay means 31.

As mentioned above, the width detector illustrated in Figure 4 in the form of the photodiodes 35 can instead comprise the coil 30 and core 29 or a transformer with a fixed primary winding and movable secondary winding. It is also conceivable to implement the width detector as a rheostat 32, the central terminal of which is connected to the displaceable support means 6.

A further modification of the basic idea of the present invention is illustrated in Figure 5, namely that the

width detector, here depicted as the above mentioned rheostat 32 is connected in parallel to the heating element 20 of the heating plate 2. In this case the output signal of the photodiode 16 is connected to the microcomputer 19 for controlling, together with the output signal from the temperature detector 18, the time interval of the timer 18.

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Accordingly, the light beam from the light source 15 is interrupted when the folder F is inserted in the opening 4 (Figures 1 and 2), and the photodiode 16 generates a starting signal which is fed to the microcomputer 19. The starting signal activates the microcomputer 19 to simultaneously start the timer 18 and close the power supply to the heating plate 2 via the relay means 31. The power supply to the heating plate 2 is responsive to the number and/or total thickness of the inserted folders F. When the timer 18 has counted down to zero, it gives an output signal to the microcomputer 19, which, via the relay means 31 interrupts the power supply to the heating plate 2 and possibly activates other signal means in correspondence with what has been stated in conjunction with Figure 4. The circuit depicted in Figure 5 can also be built out with further functions of the kind disclosed in conjunction with Figure 4.

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As will be understood on studying the above mentioned, exemplifying embodiments of the binding apparatus in accordance with the invention, it can be realized in different ways within the scope of the invention. In the description and on the drawing certain components have been depicted as "mechanical", e.g. the relay means 31 and power regulating means/width detectors 29, 30 and 32, but these can very well be implemented using semiconductor techniques. The timer 18 which is depicted as a separate

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

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1. Method of binding sheets in a folder provided with binding agent with the aid of a thermal binding apparatus, wherein
(a) one or more folders, each containing sheets which are to be bound, are inserted through an opening (4) at a time hereinafter called the "insertion instant"
10 in the binding apparatus into contact with a heating plate (2) which has a heating element (20), characterized in that
(b) the insertion in the opening (4) of the folder or folders (F) actuates a starting circuit (15, 16) which activates a timer (18) at the insertion instant,
(c) said timer keeping the heating element (20) supplied with power from the
15 insertion instant to a pre-determined time which is dependent on the starting temperature of the heating element and the total thickness of the folder/folders.

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2. Method as claimed in claim 1, characterized in that the width of the opening (4) is set in correspondence to the number of folders or to the thickness of the folder which is to be bound by displacement of at least one of support means (5, 6) restricting the opening behind and in front of the folder or folders.

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3. Method as claimed in claim 2, characterized in that the time interval for the transference of energy from the heating element (20) to the folder or folders (F) is increasable by a pre-determined value by manual switching in of a temperature compensator or time regulating circuit when folders with, e.g. greater material thickness are to be bound.

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4. Apparatus intended for binding sheets in a folder (F) provided with binding agent, and including a casing (1) enclosing a heating plate (2) and having an opening (4) above the heating plate for insertion of one or more folders with sheets which are to be bound, said opening being restricted by a rear support means (5) and a forward support means (6), the heating plate



5 including an electrical heating element (20) connected to an electrical control
circuit for the power supply to the heating element, characterized in that the
control circuit includes a timer (18) activated by a starting circuit (15, 16) which is
activated by the insertion of the folder (F) or folders into the opening (4), the timer
keeping the heating element (20) supplied with power from the insertion instant
and during a pre-determined time interval which is responsive to the starting
10 temperature of the heating element and the total thickness of the folder/folders.

15 5. Apparatus as claimed in claim 4, characterized in that at least one support
means is displaceable for setting the width of the opening to suit the number of
folders and their thickness.

20 6. Apparatus as claimed in claim 5, characterized in that the starting circuit
(15, 16) includes a computer circuit (19), preferably a microcomputer, with one
input connected to a heat detector (28) adapted for sensing the starting
temperature of the heating element and preferably an input connected to a
detector (30; 32; 35) for sensing the width of the opening (4), the computer circuit
including said timer (18), said timer adapted to transfer an output signal to a
power supply relay means (31) in the electrical power supply of the heating
element (20), so as to effect a switching of said electrical power supply of the
heating element.

25 7. Apparatus as claimed in claim 6, characterized in that the width detector
includes a plurality of photodiodes (35) disposed along the displacing path of
the displaceable support means (6) such that in response to the assumed
position of the support means one or more of the photodiodes are screened from
30 one or more illuminating sources adapted to illuminate said one or more of the
photodiodes (34) and in correspondence thereto send a signal to the width
detector input on the computer circuit (19).

35 8. Apparatus as claimed in claim 7, characterized by a common illumination
source (34) for all photodiodes (35).



5 9. Apparatus as claimed in claim 6, characterized in that the width detector includes an electrical coil (30) with a movable core (29) which is mechanically connected to a movable support means (6).

10 10. Apparatus as claimed in claim 6, characterized in that the width detector includes a rheostat (32).

15 11. Apparatus as claimed in claim 10, characterized in that the rheostat (32) is electrically connected in parallel with the heating element (20), the power supply to the heating element being given a value corresponding to the width of the opening (4).

20 12. Apparatus as claimed in claim 6, characterized in that the width detector includes an electric transformer, the primary winding of the electrical transformer is electrically connected to the power supply (10) and the secondary winding of the electric transformer is electrically connected to the heating element (20) and mechanically connected to the movable support means (6) so as to be movable into and out of the primary winding.

25 13. Apparatus as claimed in claim 6, characterized in that the heat detector (28) includes a thermistor arranged in mechanical contact with the heating plate (2) or its heating element (20).

30 14. Apparatus as claimed in claim 6, characterized in that the starting circuit (15, 16) includes a light detector (16), adapted to detect light from a ray path which extends over the opening (4) above the heating plate (2) and is interrupted when the folder (F) or folders are inserted in the opening.

35 15. Apparatus as claimed in claim 6, characterized by a time control circuit which can be activated manually and which is connected to the timer (18) for extending the normal timing periods of the timer by a pre-determined value and which is intended for use, inter alia with folders having greater material thickness.



16. Apparatus as claimed in claim 6, characterized by a temperature compensator which can be manually switched and which is connected to the signal circuit of the temperature detector (28) to the computer circuit (19) for reducing the signal value from the temperature detector and is intended to be used, inter alia for folders with greater thickness.

17. Apparatus as claimed in claim 6, characterized by a delaying circuit connected to the computer circuit (19) for delaying interruption of the power supply to the heating element (20) by a pre-determined time period after the folder (F) or the folders have been taken out from the opening (4) or the time (18) has reached its given switching-in time.

18. Apparatus for binding sheets in a folder substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

DATED this 17th day of May 1989.

BINDOMATIC AB,
By their Patent Attorneys,
COLLISON & CO.



Fig. 1

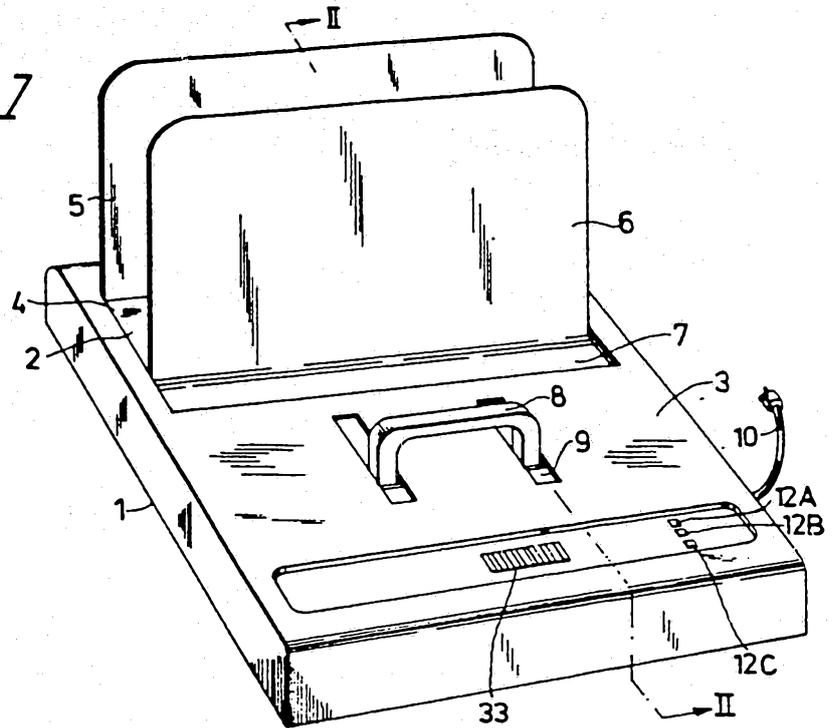
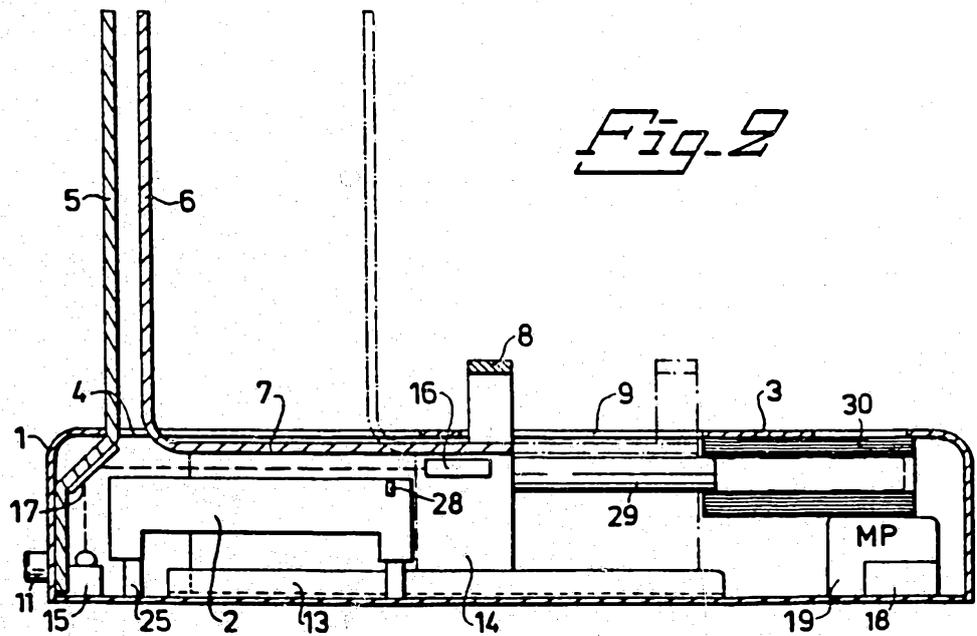


Fig. 2



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Fig. 3

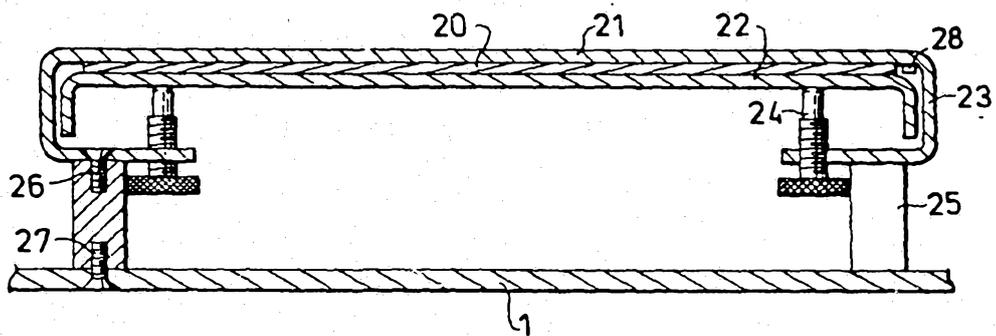


Fig. 4

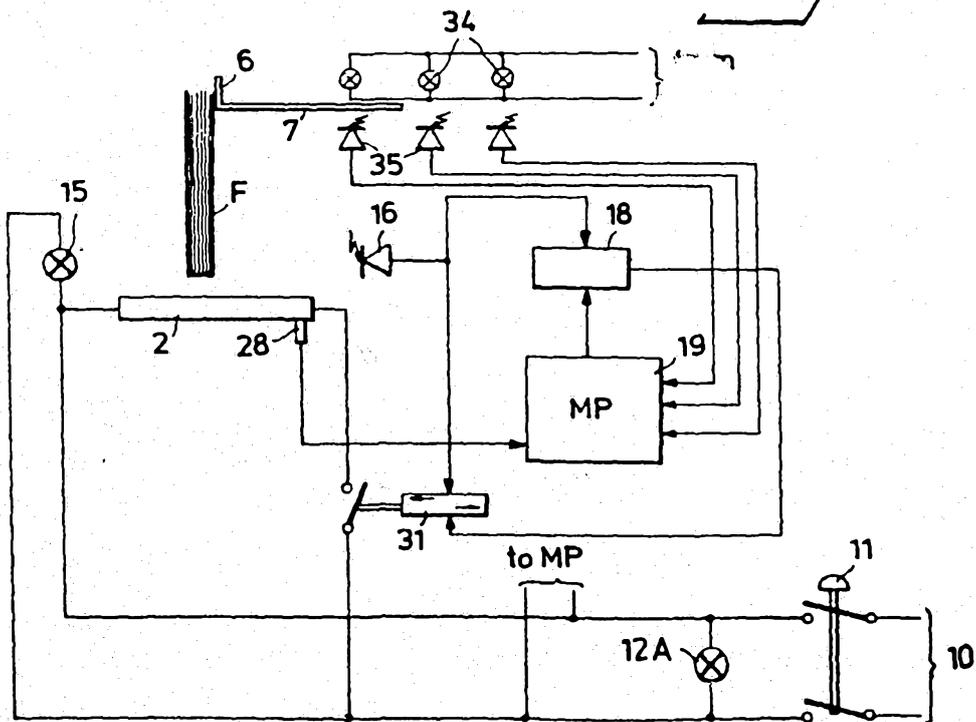


Fig. 5

