

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **82303958.1**

51 Int. Cl.³: **G 07 F 9/02, G 07 F 11/38**

22 Date of filing: **27.07.82**

30 Priority: **07.08.81 GB 8124157**

71 Applicant: **GÜTERMANN & CO.,
AKTIENGESELLSCHAFT,
Postfach 8023 Claridenstrasse 25, Zurich (CH)**

43 Date of publication of application: **16.02.83**
Bulletin 83/7

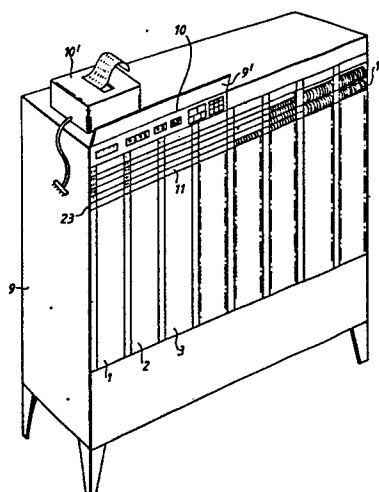
72 Inventor: **Heldmann, Helmut, i.Fa-Gutermann & Co.,
D-7809 Gutach-Breisgau (DE)**

84 Designated Contracting States: **CH DE FR GB LI**

74 Representative: **Grundy, Derek George Ritchie et al,
CARPMAELS & RANSFORD 43, Bloomsbury Square,
London WC1A 2RA (GB)**

54 **Storage cabinet with display system for indicating the contents of the cabinet.**

57 A storage cabinet, which is useful for storing columns of spools containing sewing thread of different colours and colour shades and of different lengths, provides a column-by-row matrix of dispensing mouths so that articles can be removed, one at a time, from a selected magazine. The articles in each magazine are advanced by a spring-loaded position transducer which provides position data signals representing the content of the magazine. The position data signals are supplied to a microprocessor-controlled display which is connected to a control panel for selecting three modes of operation and for entering keyboard data. In a first mode, a display is provided of any magazine, in a selected column, which has a minimum or less than a minimum content of articles. In a second mode, a serial number of an article is entered on the data keyboard and a display is provided of the contents of a corresponding magazine. In a third mode, a printout is provided which represents an inventory of the contents of each magazine.



STORAGE CABINET WITH DISPLAY SYSTEM FOR INDICATING
THE CONTENTS OF THE CABINET.

This invention relates to a storage cabinet having a display system for indicating the contents of the cabinet.

5 The invention may be used, for example, to indicate how many spools of thread remain at a particular location in a storage cabinet, particularly when only a few spools of a certain type are remaining.

Display cabinets for sewing thread spools are known
10 in which the spools are stored in adjacent columns according to the colour and the shade of the colour of the thread and/or the length of thread on the spool. Spools containing thread of the same shade of colour and of the same length occupy a certain position on the front of the display
15 cabinet, for example, they are located in a particular row position in a particular column. Only the first spools can be seen, because the spools are loaded into a magazine which extends rearwardly of the front face of the cabinet. A spring in the magazine urges the spools towards a dispensing
20 mouth situated on the front face of the cabinet so that they can be removed, one at a time, by a customer. Stops on each side of the dispensing mouth engage the front spool and this prevents spools from being ejected from the magazine. However, the stops do not prevent removal of the
25 first spool and, when it has been removed, the other spools move forward in the magazine so that the second spool engages the stops. When only two spools remain in any magazine, an indicating tongue becomes visible at the dispensing mouth of the magazine. This tongue extends even
30 further when only one spool remains in the magazine. Whilst these indicating tongues, which can be coloured red, serve to indicate that two or less spools remain in a particular magazine they may not be easily noticed, especially in a cabinet containing several hundred spools of thread of
35 different colours and shades and different lengths. Moreover, it is difficult to check the contents of each magazine in order to provide an inventory of the number of different types of spools in the storage cabinet. The present invention seeks to solve these problems.

According to the present invention, a storage cabinet includes a display system for indicating at least some of the contents of the cabinet, the cabinet comprising a plurality of magazine which are each provided for

5 receiving a plurality of articles of a given sort or type, each magazine having advancing means for advancing the articles towards a dispensing mouth; the magazines being arranged in adjacent columns whereby the dispensing mouths of each magazine in any one of the columns are situated

10 adjacent one another, each of the dispensing mouths being provided with stop means enabling direct access to the leading article in the associated magazine, whilst preventing ejection of the articles from the dispensing mouth, the advancing means in each magazine including a

15 position transducer which senses the position of the advancing means, and which thereby enables a position signal to be derived which represents the position of the advancing means relative to the dispensing mouth, and which thereby also represents the number of articles remaining in the

20 magazine, and microprocessor-controlled readout means programmed, according to a first operating mode, to respond selectively to the position transducers of a selected column so as to provide a readout of any magazine therein which contains a predetermined minimum number, or less than said predetermined

25 minimum number of the articles.

Preferably, the microprocessor-controlled readout means is housed in the cabinet and is connected to a control panel which is situated, for example, on the same side of the cabinet as that on which the dispensing mouths are located.

30 The control panel enables any particular column to be selected to determine which magazines, in that column, contain only the predetermined number or less than the predetermined number of articles (these numbers will be hereinafter referred to as "the minimum content"). The

35 readout is preferably a central display in that, with a selected column, it will indicate which magazines, taken one at a time, have a minimum content. Thus, if column 1 is selected, the first reading on the display would correspond to the first magazine which is found, by scanning from the

top to the bottom of the column, which has a minimum content.
A push button may then be depressed to cause the display to
indicate the next, in turn, magazine which has a minimum
content. The control panel and the numerical displays are
5 preferably mounted on the cabinet behind the removable cover.

As the magazines are arranged in columns, with the
dispensing mouths in each column adjacent to one another, only
the front or leading article can be seen at the dispensing
mouth. Where the articles are elongated sewing thread spools
10 which are delivered, one at a time, to the dispensing mouth
of each magazine, the rotary axis of the front spool extends
across the dispensing mouth so that the colour of the thread
is visible. In the latter case, various shades of a given
colour of thread may be visible from the top to the bottom
15 of a particular column. Where spools of the same size are
stored in adjacent columns, the spools are also visible as
rows of different colours of a given shade. However, some
columns may contain for example, larger spools having thread
of certain colours in various shades. Having regard to storing
20 several hundred spools of thread in the same cabinet, for
example, in a column and row matrix, an advantage of the
invention is that it enables a rapid determination of which
magazines are nearly empty. This avoids confusion and the
possibility of error, for example, where mistakes could be
25 made in identifying which spools need to be ordered to
maintain the contents of the storage cabinet. Sewing thread
spools usually bear a serial number, which identifies the
shade of the thread colour and this number may be indicated
on the read-out of the display system, together with the
30 minimum content of the associated magazine.

Preferably, the microprocessor-controlled display is
also operable in a second mode, whereby any magazine may be
interrogated in order to display its content. For example,
the control panel may include a keyboard on which the serial
35 number of the spool is punched (corresponding thread of a
given shade colour) and on which a button is pressed
corresponding to a given thread length whereby the display
then indicates the serial number of the spool and the actual

content of the associated magazine. (The "actual contents" may be more than the minimum content). If the magazine is say half empty, fresh spools, having the same serial number, can then be loaded into the magazine. If the magazine is loaded, whilst the readout displays the serial number of the relevant spools, then the display is indexed, each time a spool is inserted. If the display is not indexed, then the operator knows that the spools are being pushed into the wrong magazine. An audible alarm may be employed to warn the operator if spools are being loaded into the wrong magazine. An optical indicator, such as a flashing light, may also be used to indicate the row and column position of a particular magazine which is under interrogation and which may require to be filled with further spools.

The microprocessor-controlled display is also preferably operable in a third mode to provide an inventory of the contents of the display cabinet. In this case, a printer, which is compatible with the microprocessor, is either plugged into, or forms part of the control panel and the printer is operated so that an inventory of the contents of all the magazines is automatically provided on a printout. The printout may provide, for example, information relating to an invoice number of a spool of a given type, the length of thread on a spool, the colour shade number (i.e. a number which represents a particular shade of a given colour), a column number and the content of the magazine. Such a printout is provided automatically and the operator only needs to start the process and to wait until it has been completed before removing a copy of the inventory, as a strip of paper, from the printer. The printed inventory can then be studied in order to determine which magazines are near to being empty so that a requisite number of spools may be ordered from the manufacturer.

An example of the invention will now be described with reference to the accompanying schematic drawings, in which:

Fig 1 generally illustrates a storage cabinet for storing sewing thread spools in a column-by-row matrix, the cabinet being provided with a display system and a portable printout.

5 Fig 2 is a perspective view which illustrates one of the magazines of the cabinet showing how the spools are stored and how they are ejected by a spring from a dispensing mouth.

10 Fig 3 is an elevational view of a longitudinal section through part of the magazine shown in Fig 2.

Fig 4 is a plan view of a horizontal member which forms the floor of the magazine shown in Fig 2.

15 Fig 5 diagrammatically illustrates the data lines which are mounted on a vertical circuit board (not shown) at the rear of each column of magazines.

Fig 6 diagrammatically illustrates the electrical circuit of conductive and resistive tracks on the horizontal member shown in Fig 4.

20 Fig 7 is a perspective and partly cut away view showing how the horizontal members cooperate with the vertical circuit board, to define the magazines, the vertical circuit board having data line outputs for a multipin plug which is connected to the microprocessor control.

25 Fig 8 is an elevational view, in section, of part of the arrangement shown in Fig 7.

Fig 9 is an enlarged view of a control and display panel which forms part of the microprocessor controlled display system.

30 Fig 10 diagrammatically illustrates the microprocessor controlled display system.

Fig 1 schematically illustrates a storage cabinet 9 having a plurality of magazines 11, 11', which are arranged in adjacent columns numbered 1, 2, 3.... Magazines 11 are of the same size and are provided for storing sewing thread
35 spools of a predetermined length and diameter. Magazines

11" are of a larger size and are provided for storing sewing thread spools having the same axial length, but a larger diameter. Above the columns of magazines, in an uppermost compartment of the cabinet 9, are housed micro-processor controlled display means having a control panel and display unit 10 which is normally hidden by a hinged cover 9'. A portable printout unit 10' stands on top of the cabinet 9 and it may be plugged into a socket on the front of the control panel 10, when required. Alternatively, a printout unit (not shown) is housed in uppermost compartment of the cabinet and is connected, via a switch (not shown) to the control panel and microprocessor system. In the latter case, the printout slot is provided adjacent the control panel and is normally hidden by the hinged cover 9'.

Referring to Fig 2, each magazine 11 is loaded with a series of spools 12 which extend rearwardly of a dispensing mouth 13. Fig 7 illustrates the mouth of one of the magazines which are arranged in one of the columns of the cabinet 9. The floor and the roof of each magazine are formed by respective horizontal members 14 which are spaced apart to accommodate the diameter of the spools 12. As shown in Fig 7, the rear wall of each magazine is formed an insulating board 8 which is backed by a vertical circuit board 15. Boards 8 and 15 rise from the bottom to the top of each column. Board 8 insulates data lines attached to the face of board 15 and it also strengthens the assembly. The front of each of the horizontal members 14 is located in respective openings in the columns 1, 2, 3 on the front face of the cabinet 9.

Referring to Fig 2, the spools 12 are urged towards the mouth 13 of a compression spring 16 which acts between the rear wall of the magazine and a pushing member 17. A front face 18 of the pushing member 17 engages the last spool 12 in the magazine. It also has a tongue 19 integral

therewith which extends from the mouth 13 when only two spools 12 remain in the magazine. The extension of the tongue 19 is thus slightly longer than twice the diameter of the spool 12.

5 The horizontal member 14, which is shown in plan view in Fig 4, is provided with a pair of flexible arms 20, 20' which terminate in protuberances 21, 21'. These protuberances act as stops to prevent the first spool 12 from being ejected from the mouth 13 of the magazine. However, the
10 stops 21, 21' do not prevent the first spool from being removed from the mouth of the magazine, whereupon the line of spools moves forward, under the action of spring 16, so that the second spool is then visible at the mouth.

 The rotary axis of the spool 12 extends across the
15 width of the dispensing mouth 13 of the magazine so that the thread 22 on the spool is visible at the front face of the cabinet 9. Thus, as shown in Fig 1, the spools appear as a column-by-row matrix on the front face of the cabinet 9. Each column 1, 2, 3.....contains thread associated with
20 a primary colour, but the threads in the column are arranged in various shades. For example column 3 may contain thread which is basically blue or green in colour but ranging from a very pale blue at the top of the column, passing through darker shades of blue and green in the middle of the column,
25 towards a very pale green at the bottom of the column. Thus, a customer can see which column contains thread of the required basic colour and can match the shade by comparing for example, a sample of thread with the thread on the spools of a similar shade in a particular colour. To
30 assist identification, each spool contains a serial number which represents a particular shade of thread colour. This will be referred to herein as the "colour number". The colour numbers are also printed in zones 23 at the side of each magazine in each of the columns 1, 2, 3.... Thus, a
35 customer can also locate the correct column and row position

by comparing the colour number of a previous spool with the colour number in zones 23.

Referring in Figs 2 and 3, spring 16 is part of means for advancing the spools, one at a time, to dispensing mouth 13. The spring 16 can be compressed so that the magazine 11 can be loaded with, for example, 10 spools. It is also capable of expanding so as to eject the last spool from the dispensing mouth 13. The spring 16 is electrically insulated, for example, by means of an insulating coating. The leading end of the spring 16 is received in a recess 23 in the push member 17, as shown in Fig 3. A sliding contact 24 is fixed to the underside of the push member 17. The slider 24 forms a bridging contact between a conductive track 25 and a resistive track 26, which are shown in plan view in Fig 4. Alongside the resistive track 26 is a conductive track 27 which is connected (at the right hand end) to the resistive track and which serves as a signal output line 27. The tracks 25, 26 are not connected to each other, at either end, but the slider 24 connects one track to the other. Thus, as the spools are removed from the magazine, the pushing member 17 moves forward, whereby the slider 24 occupies discrete positions along the length of the tracks 25, 26. As described below, this arrangement provides a position transducer whereby the position of the pushing member 17 relative to the mouth 13 can be determined and hence also the number of spools remaining in the magazine.

Fig 6 diagrammatically illustrates the electrical function of the position transducer. In this diagram, a cell 28 has been shown for convenience, but the voltage which is supplied across terminals V,C to the resistive track of each magazine is derived, in practice, from a common source (not shown). The resistive track 26 of each magazine has the same resistance per unit length. As the slider 24 is moved up and down the tracks 25, 26

the resistance measured at terminals C,P varies thus providing a position output signal having a value dependent on the position of the pushing member 17 on the tracks.

Fig 5 diagrammatically represents the circuit layout of conductors on one of the vertical circuit boards 15. A pair of parallel continuous conductive tracks 29, 30 are connected to terminals V and C of each of the horizontal circuit boards 14 in the same column. A series of conductive tracks or pads 31, which are spaced from one another in the longitudinal direction, are connected to a series of corresponding terminals designated P. The terminals V, C and P are connected to a multiple socket 33 on the upper edge of the vertical circuit board 15, as shown in Fig 7, and the socket is connected to the micro-processor control and display unit 10 by means of a plug 34. The conductive tracks or pads 31 are not all the same length, because the vertical board can be used to provide connections to either a column of magazines 11 (for small diameter spools), or to a column of magazines 11' (for large diameter spools).

Referring to Fig 7, this shows (in more detail) how the horizontal members 14 cooperate with a vertical circuit board 15 in one of the columns 1, 2, 3.....of the display cabinet. Each horizontal member 14 has side flanges 50 for guiding the spools 12 towards the dispensing mouth of the corresponding magazine. Such a dispensing mouth is provided between upper and lower pairs of protuberances 21, 21' as shown in the drawing. The protuberances are shaped to allow the spool 12 to protrude partly from the mouth, so that it can be grasped and removed from its magazine. The flexible arms 20 (Fig 4) normally occupy positions whereby the protuberances 21, 21' prevent ejection of the spool 12 from the mouth, but they can flex so that the protuberances move apart to allow a spool to be removed.

Each flange 50 is integral with a respective floor portion 51 having slots or cut-outs 52 therein. Integrally attached to the side edges of each floor portion 51 and depending therefrom are spacing fingers 52. The ends of these
5 fingers 52 rest on the side edges of the floor portion of the horizontal member 14 below and thereby space the floor portions by a suitable distance apart to accommodate the spools 12. The floor portion 51 of each magazine is thereby positioned at a predetermined level with respect to the
10 vertical circuit board 15 and insulating board 8. At each of these levels, a window 53 is provided in the board 8. The tracks 25, 26, 27, which are supported by a central section of the floor portion 51 of each horizontal member 14, are arranged to align with the corresponding tracks
15 29, 30 and pads 31 on the vertical circuit board 15. The corresponding tracks 26, 27 and 29, 30 or corresponding track 25 and pad 31, are connected by means of respective U-shaped, conductive, spring clips 54 (see Fig 8). Each clip receives the floor portion 51 of the horizontal member
20 14 and makes electrical contact with the respective track 25, 26 or 27. Each clip 54 is accommodated in the respective window 53 in the board 8 and is urged against the respective track 29, 30 or pad 31 on the vertical circuit board, (i.e. due to fitting the horizontal members 14
25 between the front of the cabinet and the board 8, which both act as rigid stops).

The tracks 29, 30 and pads 31, shown in Fig 5, are not illustrated on the vertical circuit board 15 in Fig 7 (in order to simplify the drawing). However, they may be
30 provided on a surface of the board 15, by printed circuit techniques. The tracks 29, 30 and pads 31 terminate in a socket 33 (which is schematically represented in the drawing). A plug 34 connects the terminals V,C,P (see Fig 5) to a stepping circuit (not shown) in the microprocessor
35 system (see below).

A constant voltage source (not shown) is connected to the terminals V,C of each column 1, 2, 3...by means of the

stepping circuit(which may be of known construction). The stepping circuit thereby supplies each column, in turn, with current which is supplied to the tracks 26, 27 of the corresponding magazines. The stepping circuit is
5 controlled by the microprocessor either so that it supplies current automatically to each column in turn, i.e. during the process of scanning each column in order to take an inventory (see below), or so that it supplies current to
10 a selected column after pushing a column select button (COL) and a button, which corresponds to the number of the column, on a data keyboard of the control panel shown in Fig 9 (which is described below).

A data selecting circuit (not shown and which may be of known construction) is connected to each group of
15 output terminals P of each column of magazines. This circuit selects each of the terminals P in turn, in order to provide a position signal (which represents the number of spools in a selected magazine), which is supplied to the microprocessor control and display means 10. The micro-
20 processor is programmed to ignore, or to skip those terminals P which are not connected to resistive tracks. Thus, each column is interrogated or scanned, from top to bottom, in order to provide a series of discrete data signals for processing and display. As the position signals are analog
25 in form, an analog-to-digital converter (A/D) is connected to each column (as shown schematically in Fig 10) to provide a digital output to the microprocessing unit (MPU) and memory.

Turning now to Figs 9 and 10, the lay-out of the control and display panel will now be described together with
30 the general operation of the microprocessor-controlled system.

The panel shown in Fig 9 includes:-

- 35 (a) a multiple socket 35, for connection to the portable printout unit 10' (Fig 1);
- (b) a four-position numerical display 36, for indicating the colour number of a sewing thread spool (i.e. colour shade);

- (c) a two-position numerical display 37, for indicating the column position of a selected column of magazines;
- 5 (d) a two-position numerical display 38, for indicating the contents of a particular magazine in the selected column (i.e. the magazine housing the serial number shown on display 36;
- 10 (e) a numerical keyboard 40 for entering the column number and/or the colour number of a spool and for entering the length of thread on the spool.

The system has three operating modes:-

- 15 (I) Display colour number of magazines with a minimum spool content and display the spool content.
- (II) Display the spool content of a selected magazine.
- 20 (III) Provide a printout which is an inventory of the spool content of each magazine in the cabinet.

In the first operating mode, a reset button 41 first is depressed to clear the displays 36, 37 and 38. The button 42 marked MIN is then depressed for a 'minimum content' display. Column key 43 is next depressed, and then the number of the selected column is punched on keyboard 40. The display 37 will then show the number of the selected column and the system will automatically scan down each magazine in column 3 until it finds a magazine with a pre-determined 'minimum content'. This minimum content may be, for example, 2 or less spools. The content then appears on display 38. In the example illustrated, the magazine containing spools of colour number 305 are located in column 3 and only 2 spools remain. If STEP button 44 is now depressed, the system will continue scanning down the column until it finds the next magazine with a predetermined minimum content. The colour number, column number and the content of the magazine will then appear in displays 36, 37 and 38. res-

pectively.

In the second operating mode, the reset button 41 is depressed and then one of the 'length' buttons marked '30', '50', '200', and '500' is depressed on the data keyboard 40.

5 This corresponds with a spool having a given length of thread e.g. 30 metres. Clearly, some spools may have the same colour number but may contain different thread lengths. A number is then punched on the data keyboard 40 corresponding with the colour number of a particular spool or magazine. The display 36 then shows the colour number, the display 37 shows the correct column and the display 38 indicates the contents of the magazine. This mode of operation is useful in locating the column of a given colour number (e.g. with reference to the colour number printed on a spool).

15 In the third operating mode, the portable printout 10' is plugged into socket 35. The reset button 41 is then depressed to clear the system. Inventory button 45, marked INV, is then pressed, whereupon the system automatically scans each column in turn and provides a printout of the actual contents of each magazine in the cabinet. Preferably, the printout includes information relating to (a) an invoice number of a spool of a given type (e.g. a 50 metre spool); (b) the length of thread on the spool; (c) the colour number; (d) the column number; and (e) the actual number of spools in the magazine. This information is printed in a line, for each magazine, and the lines may be printed in blocks corresponding with the column numbers.

20 The microprocessor system is schematically illustrated in Fig. 9. The data lines from each column 1, 2, 3...., are connected via analog-to-digital converters A/D to the microprocessing unit (MPU) and memory. The system is programmed to store data in the memory relating to the contents of the magazines and to update the stored data as spools are removed from the cabinet. The manner in which the data is addressed, stored and retrieved may be based on known microprocessing techniques. Similarly, the programming of the system to perform operating modes I, II and III may also be based on known microprocessing techniques.

Instead of using the portable printout 10', a VDU (visual display unit) could be plugged into socket 35 to display, for example, an inventory of the magazine contents. A VDU could also be used to replace the numerical displays 5 36, 37 and 38, in order to display the information in the three operating modes described above. It would also be possible to use a telephone link, which is plugged into socket 35, to provide a remote readout whereby a supplier, for example, could obtain data directly for the purpose of 10 re-ordering spools of thread. The telephone link may be provided in addition to the local displays on the cabinet. An automatically printed invoice may also be provided in any of the above arrangements.

Clearly, the storage cabinet can be used for storing 15 and dispensing articles other than sewing thread spools (e.g. boxes of buttons, or cartons of screws). It may also have different forms of construction, whilst retaining the general concept of the invention.

CLAIMS

1. A storage cabinet including a display system for indicating at least some of the contents of the cabinet, the cabinet comprising a plurality of magazines which are
5 each provided for receiving a plurality of articles of the given sort or type, each magazine having advancing means for advancing the articles towards a dispensing mouth, the magazines being arranged in adjacent columns whereby the dispensing mouths of each magazine in any one of the columns
10 are situated adjacent to one another, each of the dispensing mouths being provided with stop means enabling direct access to the leading article in the associated magazine, whilst preventing ejection of the articles from the dispensing mouth, the advancing means in each magazine including a
15 position transducer which senses the position of the advancing means, and which thereby enables the position signal to be derived which represents the position of the advancing means relative to the dispensing mouth and which thereby also represents the number of articles remaining in the
20 magazine, and microprocessor-controlled readout means programmed, according to a first operating mode, to respond selectively to the position transducers of a selected column so as to provide a readout of any magazine therein which contains a predetermined minimum number, or less than
25 said predetermined minimum number of the articles.
2. A storage cabinet according to claim 1, wherein the microprocessor-controlled readout means is also operable in a second mode, whereby any magazine may be interrogated to display its content.
- 30 3. A storage cabinet according to claim 2, wherein the microprocessor-controlled readout means is also operable in a third mode to provide an inventory of the contents of the display cabinet, said microprocessor-controlled readout means further including printout means to print out information relating to the contents of each magazine.
35
4. A storage cabinet according to any one of the preceding claims, wherein the microprocessor-controlled readout means includes a control panel and one or more numerical displays

which are located in the cabinet behind a removable cover.

5. A storage cabinet according to any one of the preceding claims, wherein the microprocessor-controlled readout means includes a numerical display for indicating a serial number
5 pertaining to the type of article, a numerical display for indicating the column number of the magazine in which the article is located, and a numerical display for indicating the contents of the magazine.

6. A storage cabinet according to any one of the preceding
10 claims, wherein the articles are sewing thread spools.

7. A storage cabinet according to claim 3, wherein the articles are sewing thread spools and wherein the micro-processor-controlled readout means includes keyboard means for selecting the first, second or third operating modes
15 and for entering data corresponding to the colour number of a spool and to the length of thread on the spool.

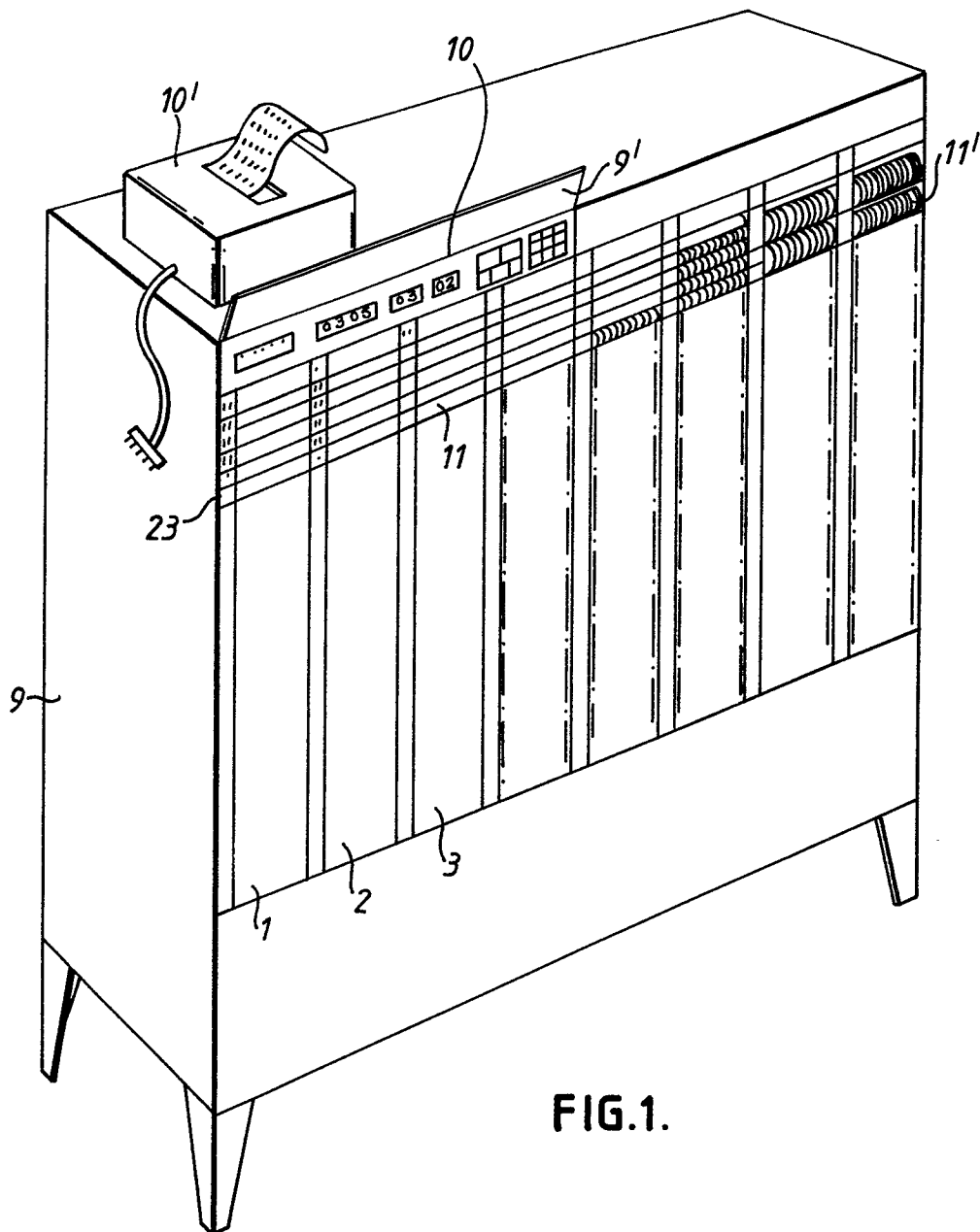


FIG.1.

2/5

FIG. 2.

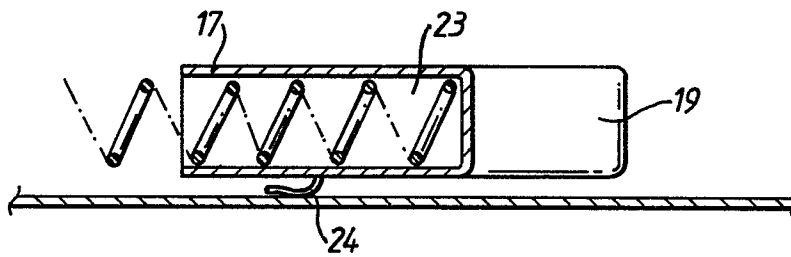
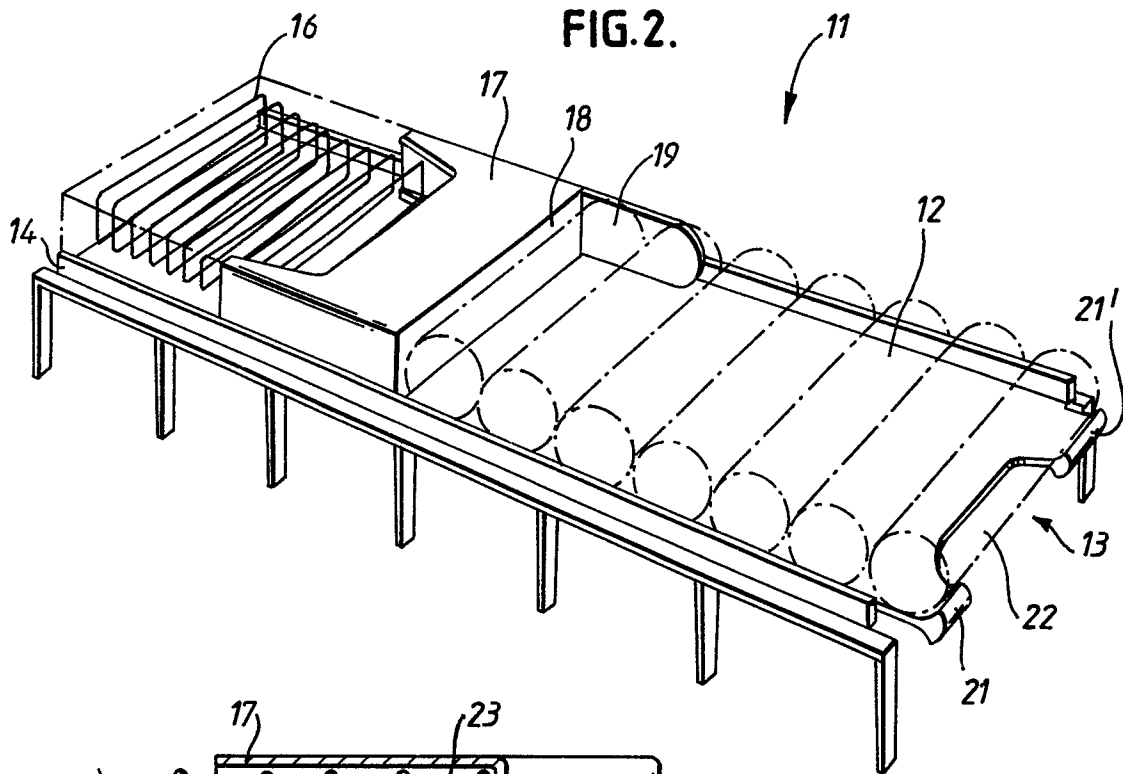


FIG. 3.

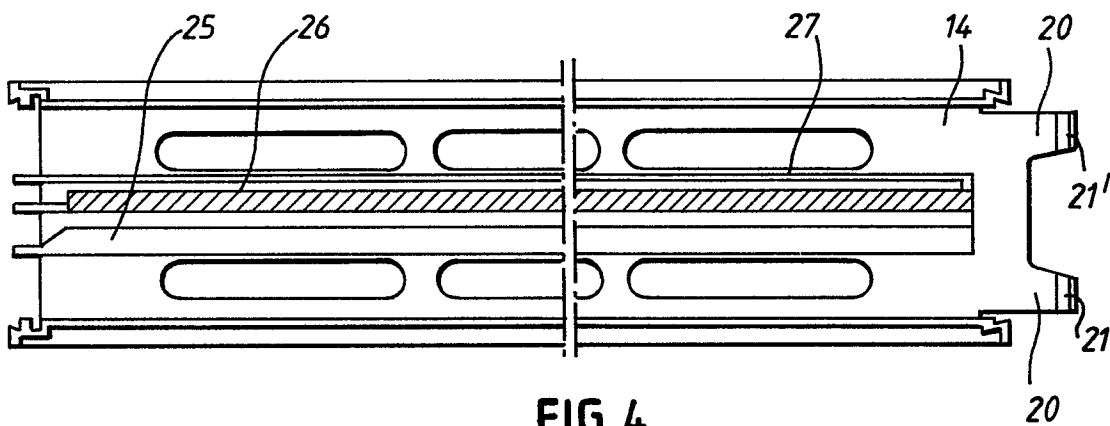


FIG. 4.

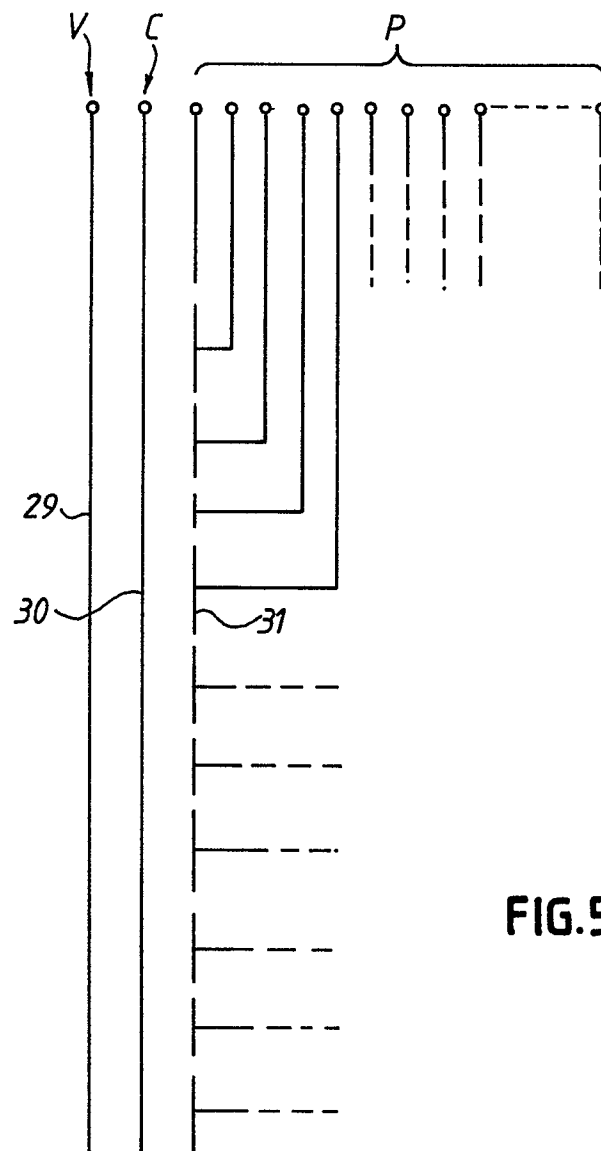


FIG. 5.

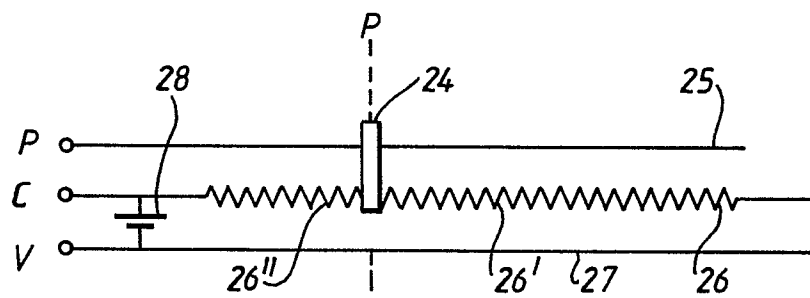


FIG. 6.

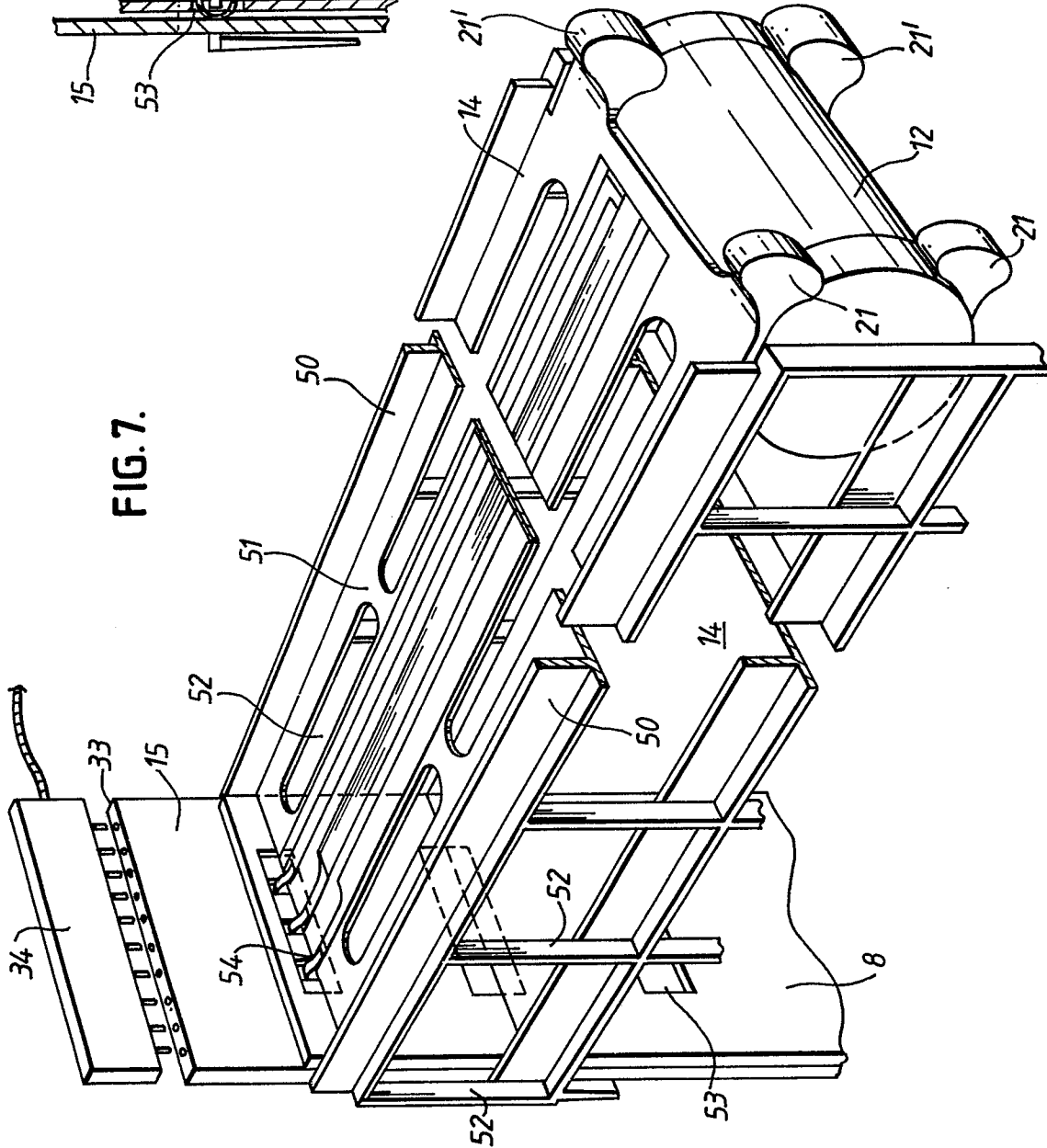


FIG. 7.

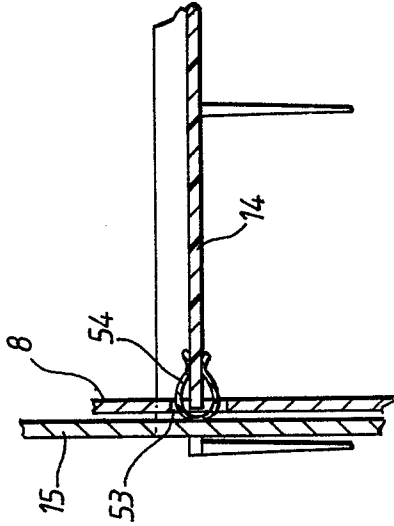


FIG. 8.

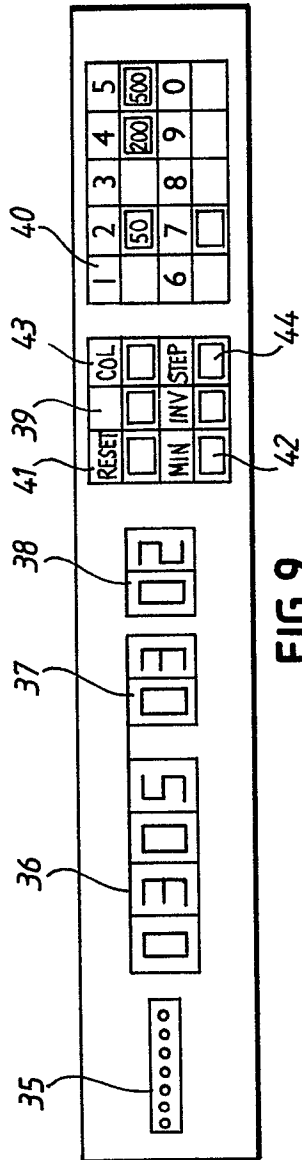


FIG. 9.

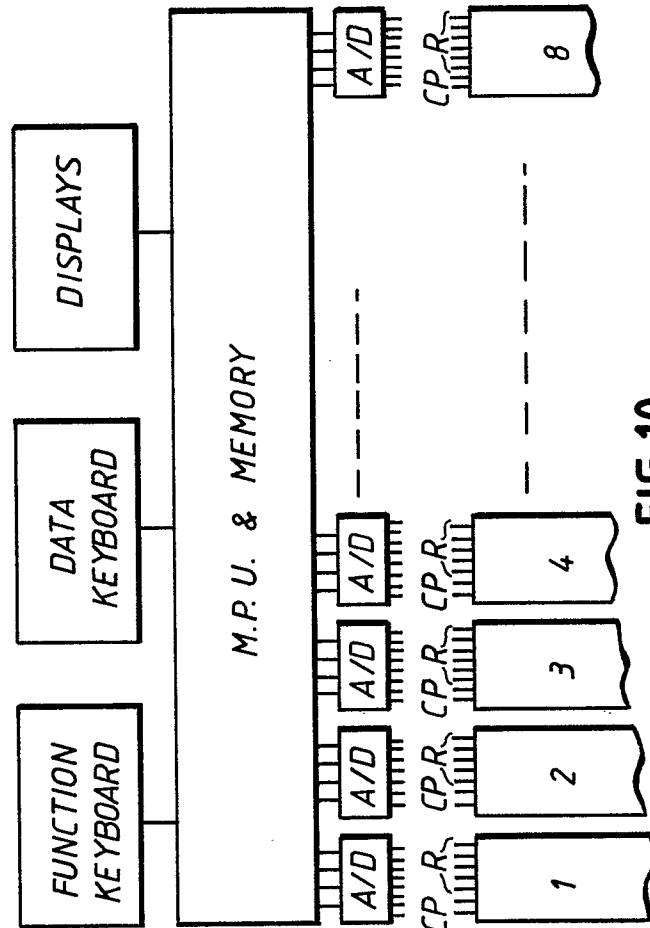


FIG. 10.