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(54) **Sheet sorting and distributing apparatus**

(57) A sheet sorting and distributing apparatus comprising a frame containing a number of superimposed spaces or drawers 14, and including a conveying mechanism for the sequence conveyance of single sheets to the single drawers or spaces, a deviating member 31 positioned at the drawer or space to be fed and intermittently displaceable from a

drawer or space to the next upper one, first means 58 responsive to the entry of a sheet to be fed, second means 59 responsive to the engagement of the sheet with the said deviating member, is characterized by a first timing means which is adapted to control, after a predetermined time has elapsed from each actuation of the said first responsive means, the return of the said deviating member to the initial position corresponding to the first space or drawer to be fed.

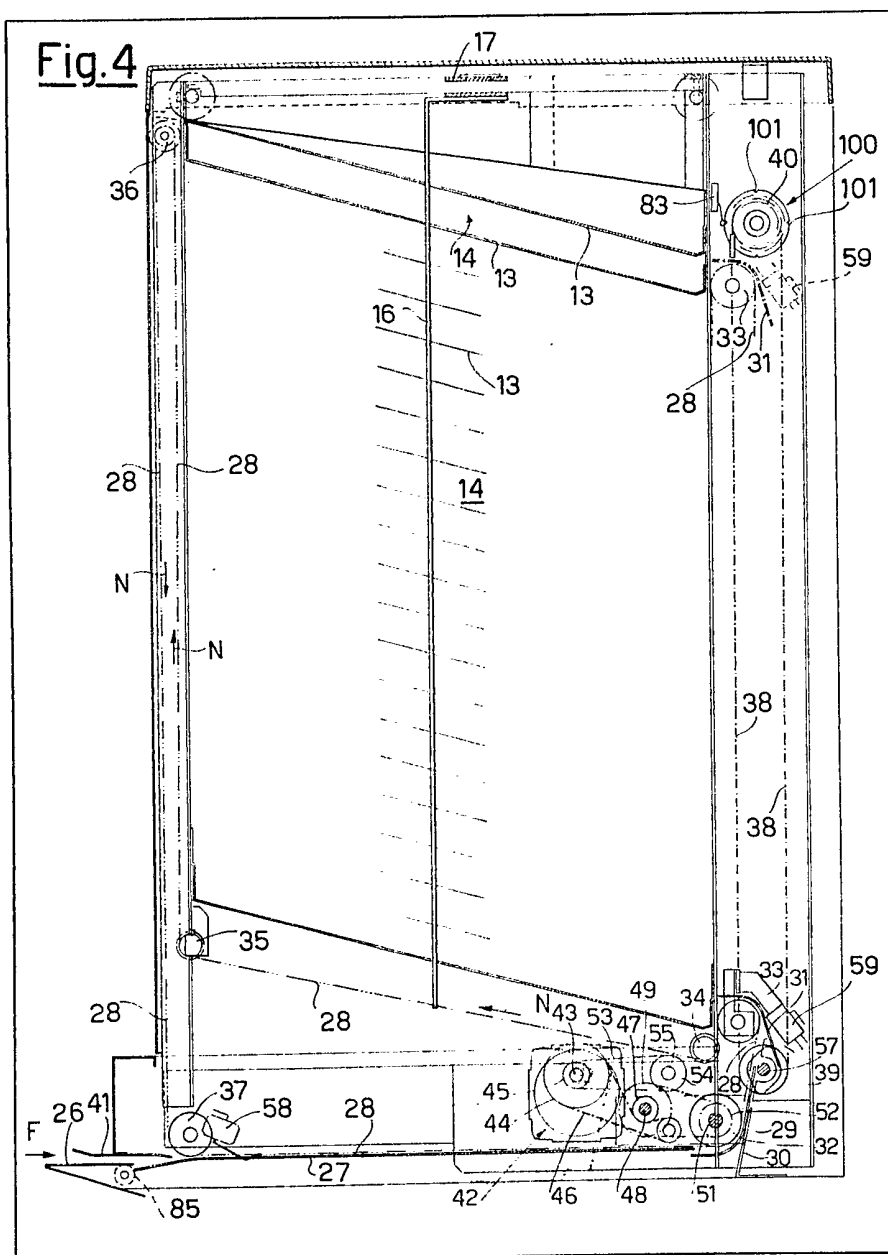
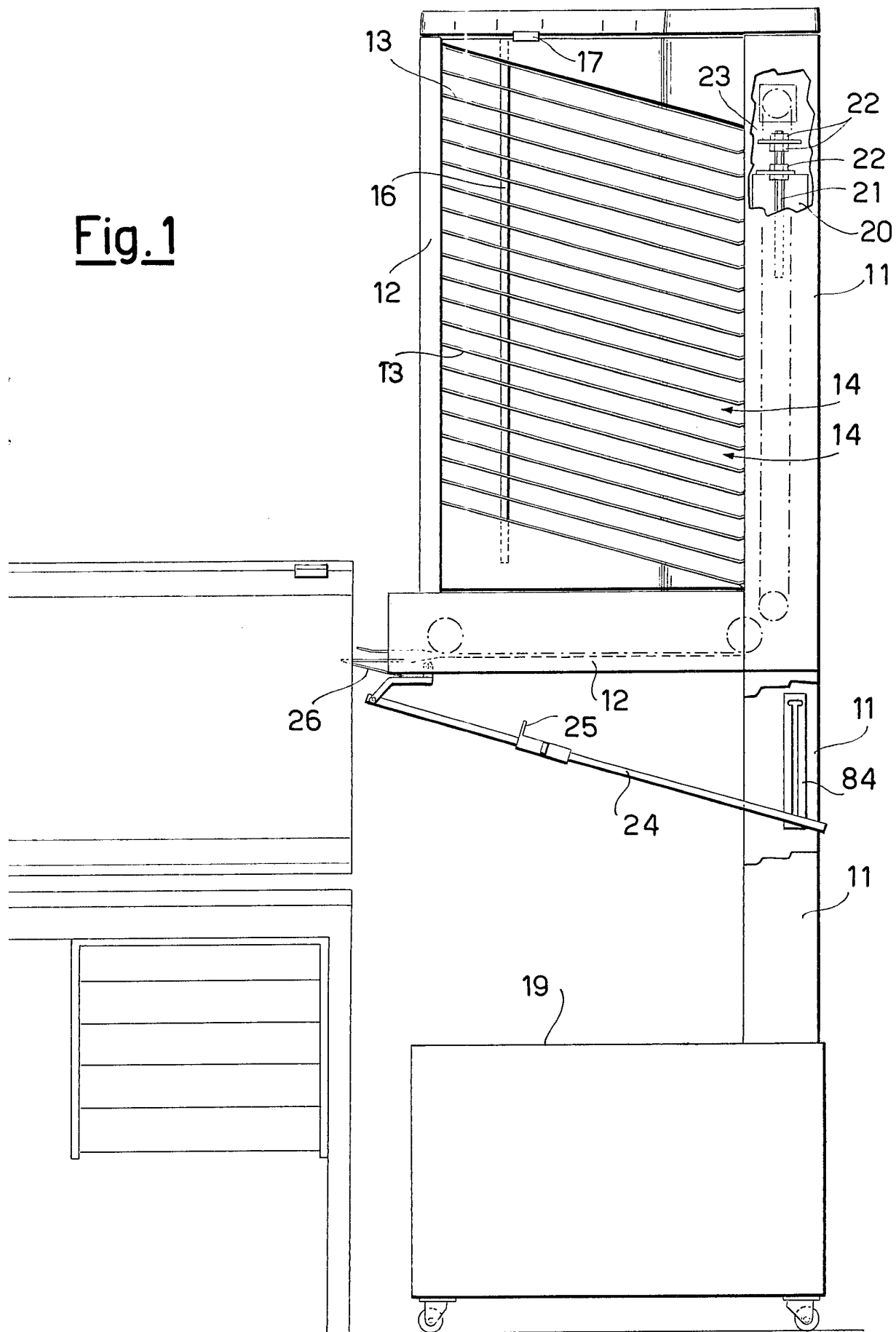


Fig. 1



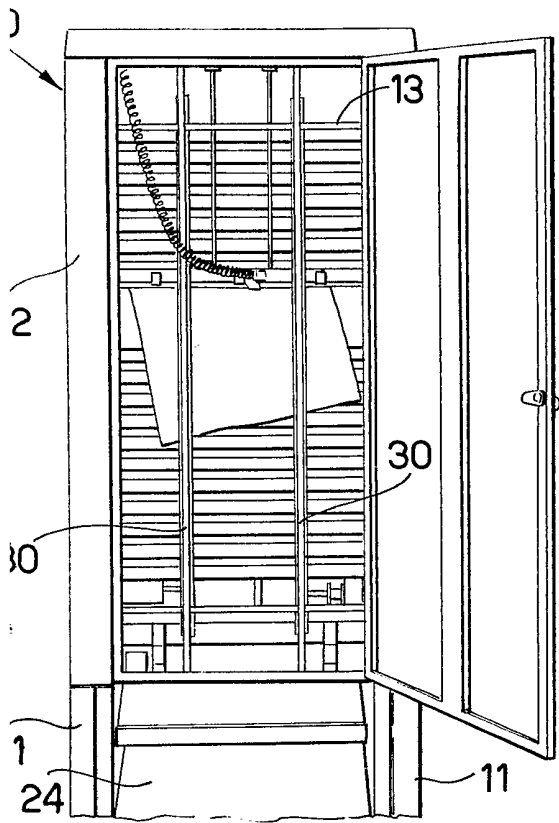


Fig. 2

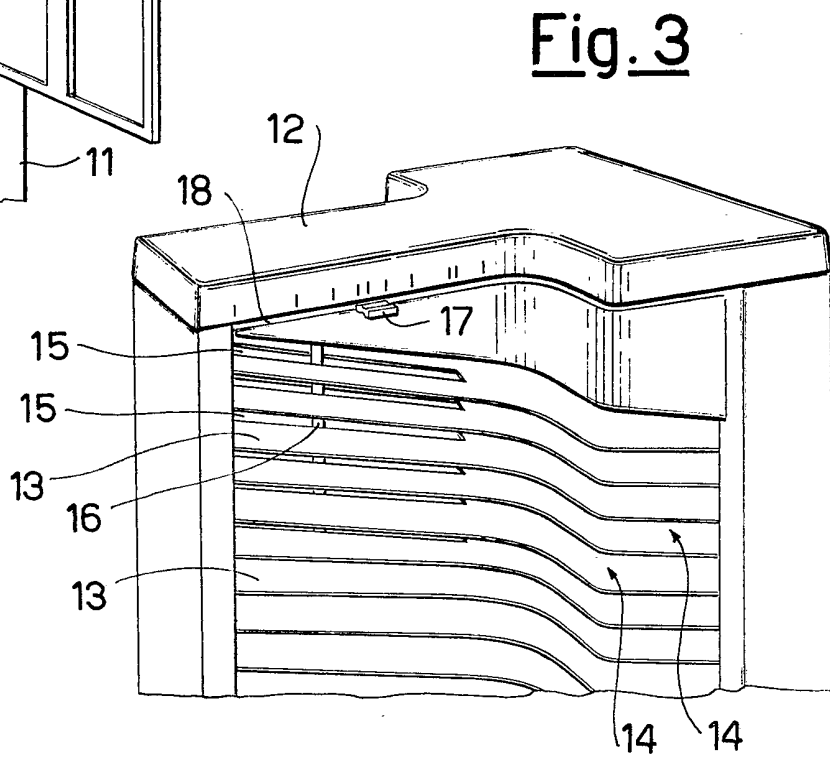


Fig. 3

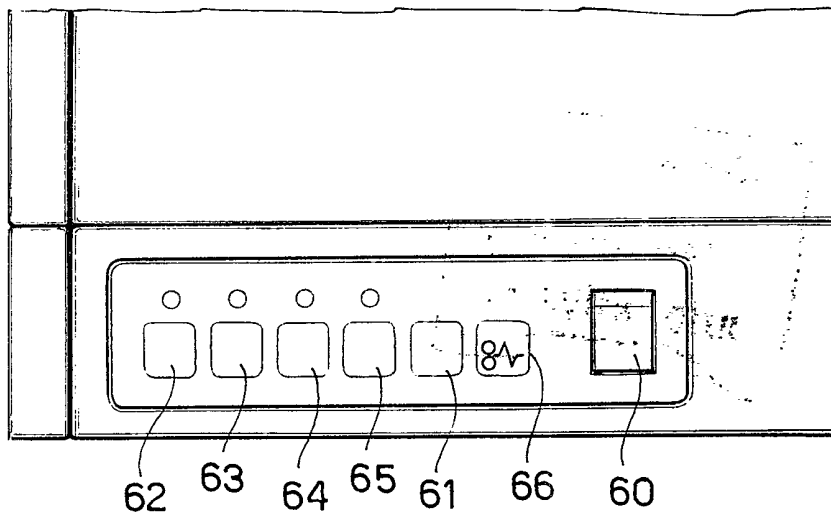


Fig. 6

Fig. 4

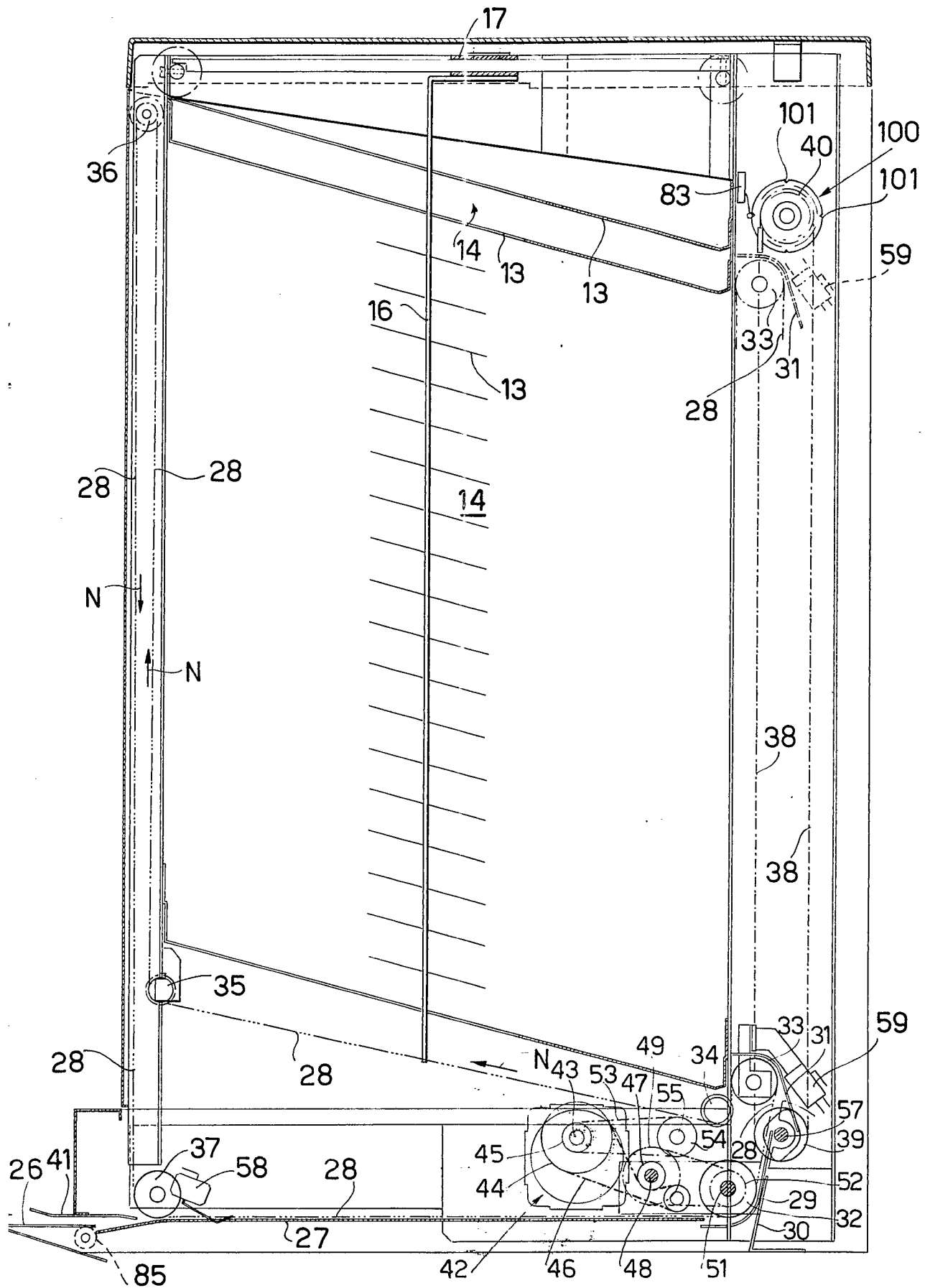
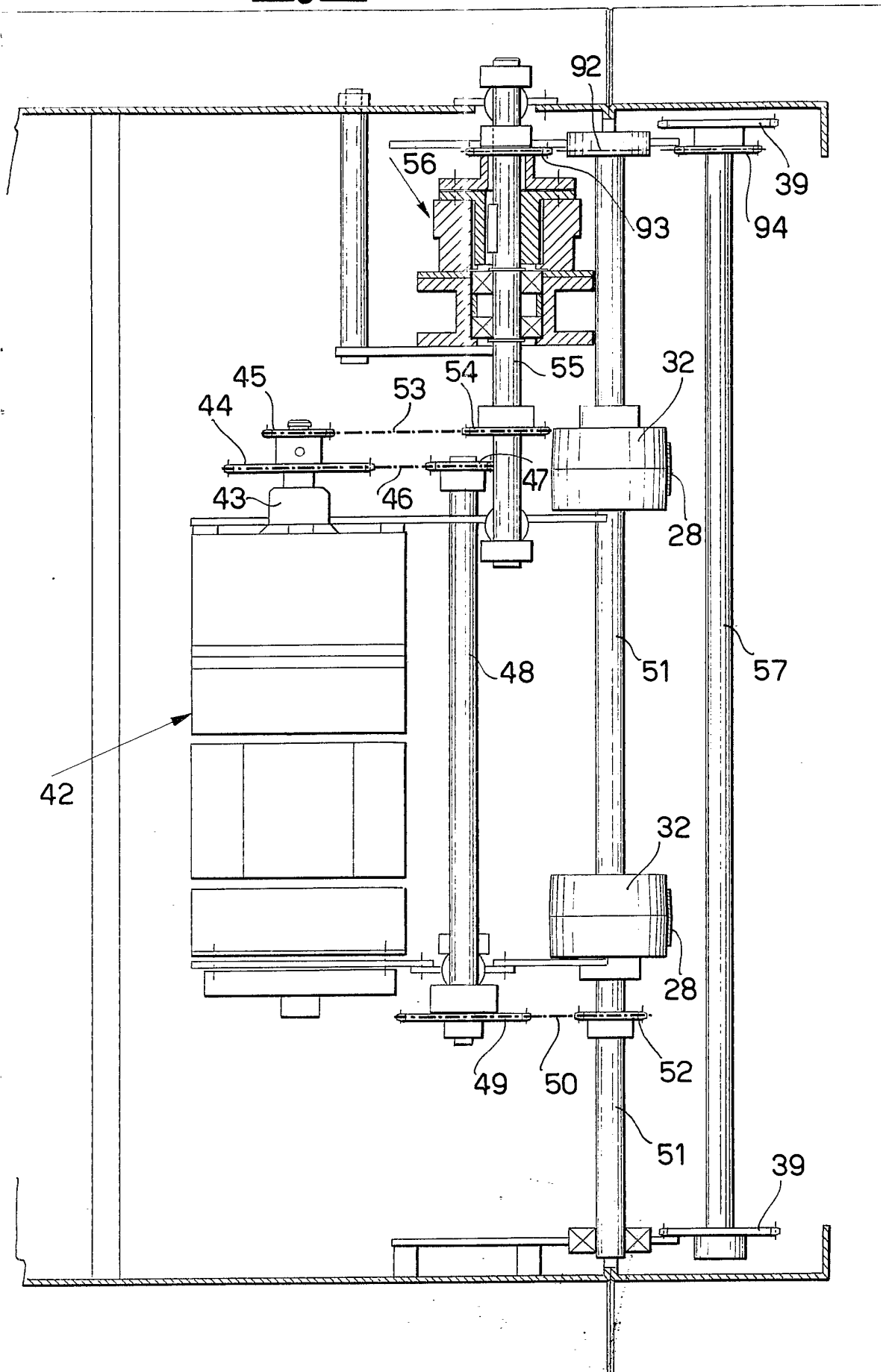


Fig. 5



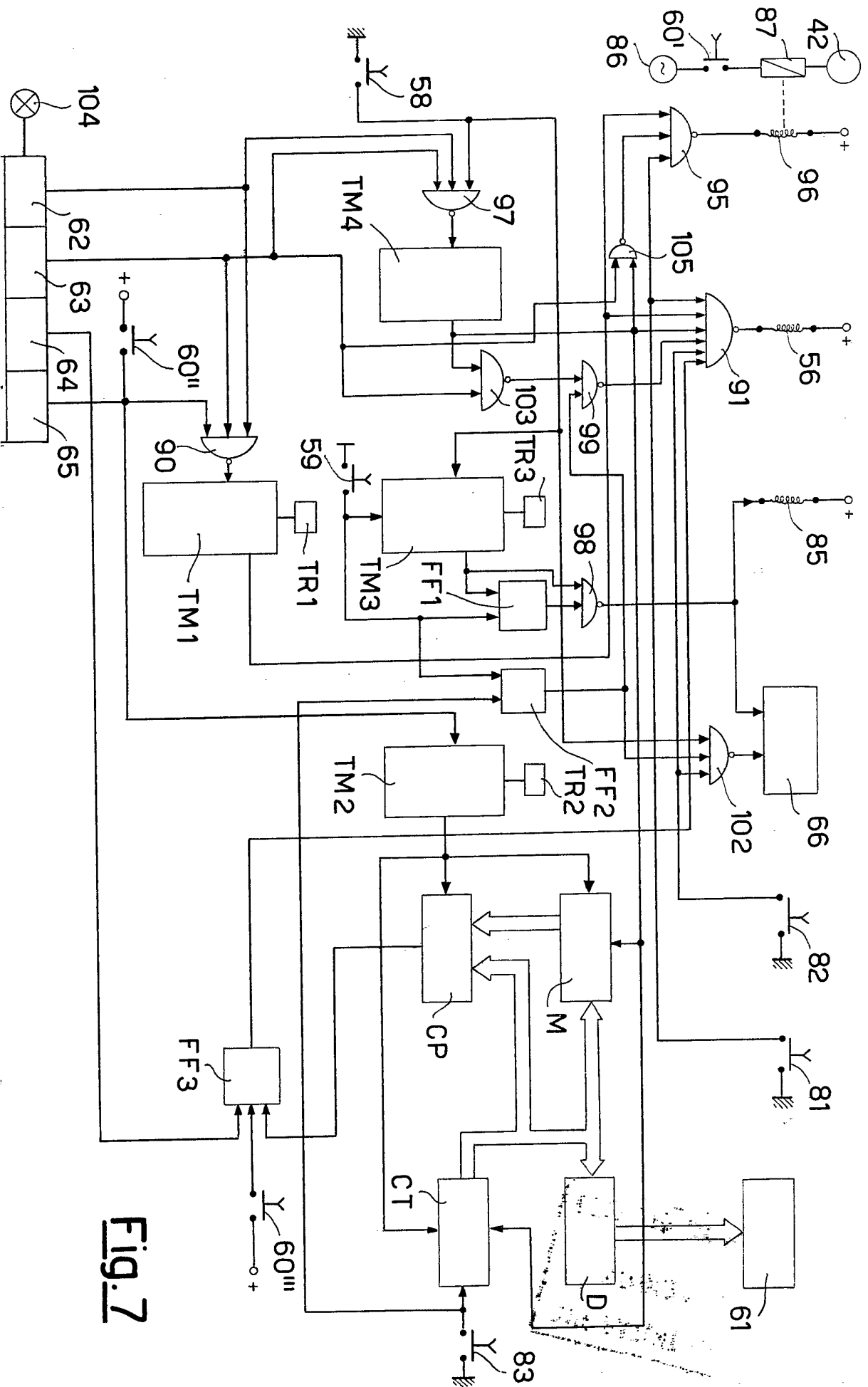
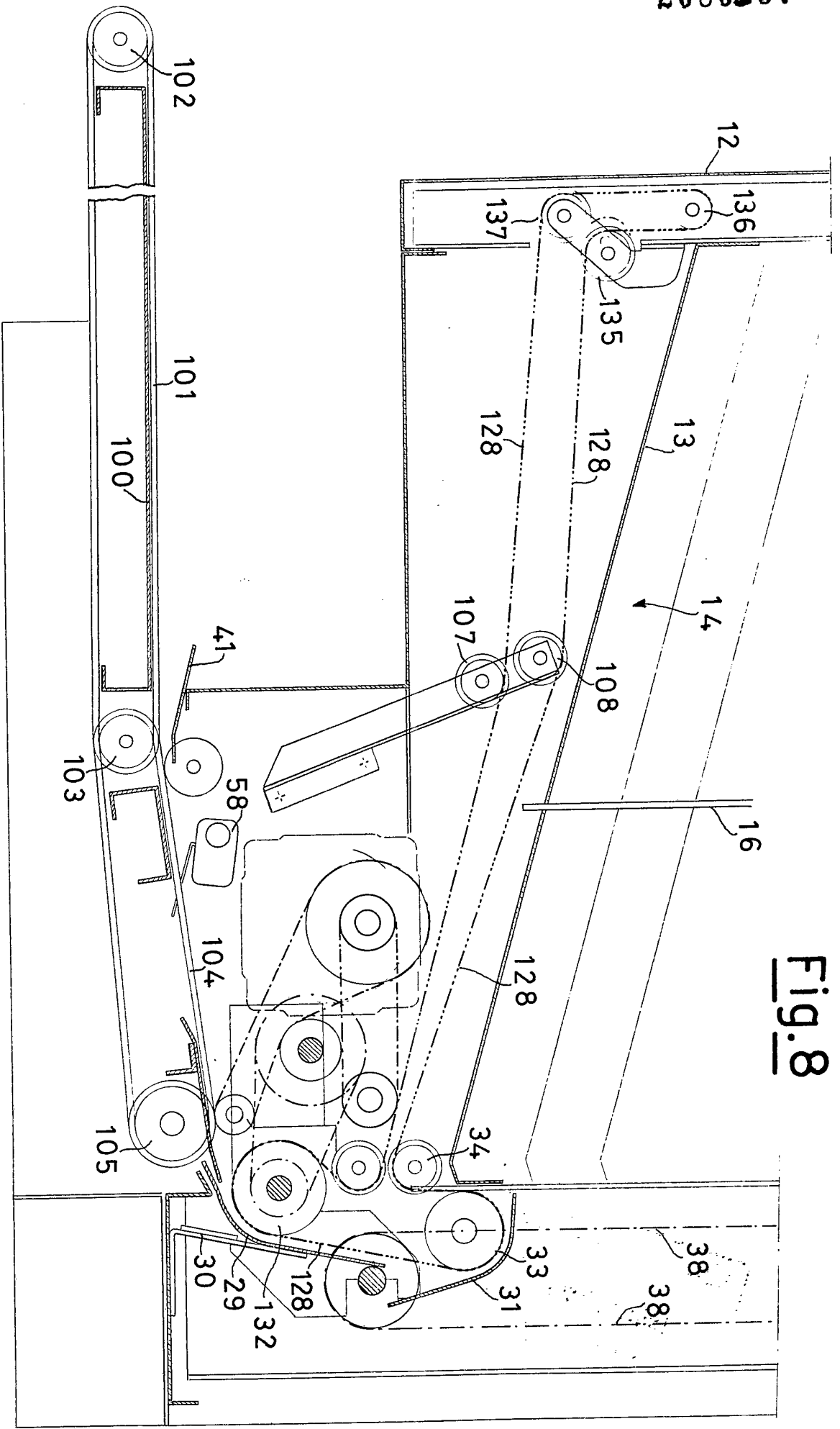


Fig. 7

Fig. 8



SPECIFICATION

Sheet sorting and distributing apparatus, particularly for copying machines

The present invention relates to an apparatus
 5 for sheet sorting and distribution, particularly for the combination with copying machines. The necessity is known, when more than one copy is serially made from the same original, of separating and sorting these copies, avoiding a subsequent,
 10 time consuming and annoying, operation of sorting and collecting the resulting copies, especially when a number of originals is copied.

It is also known that, apart from some very sophisticated types of copying machines (wherein
 15 the sorting and distribution apparatus is part of the copying machine), the currently available copying machines are not furnished with such an auxiliary apparatus.

In few cases only this apparatus is supplied, as
 20 an optional apparatus, from the manufacturer and is obviously adapted only for a particular model of copying machine.

On the other hand, the commercially available copying machines differ not only for the copying
 25 process (machines with fixed or mobile original carrying table; machines having the sensing surface in form of a drum or of a master; machines in which the toner is fixed either by heat or by pressure), but also for other characteristics, such
 30 as the copy making rate, the paper pattern and thus the inlet side of the blank sheets and the outlet side for the copies, etc.

The sorting and distributing apparatus as known and used up to date comprise a series of
 35 vertically superimposed drawers or spaces, to which the copies coming out of the copying machines are sequentially fed by means of remarkably complicated and cumbersome mechanisms, including carrying belts or ribbons,
 40 pneumatic or vacuum devices, mechanical deviating devices, etc. The complexity of the mechanism does obviously involve operating and maintenance problems as well as ready jamming.

The main purpose of the present invention is
 45 that of providing a sorting and distributing apparatus of universal type, namely adapted for the combination with whatever type of copying machine, the possibility of combination being meant not only as regards the size or body
 50 features (namely the correspondence between the copy exit of the copying machine and the entry of the apparatus), but also as regards the operating combination, namely the adjustability of the apparatus according to the operating
 55 characteristics of the copying machine (copying rate, etc.).

Another purpose of the present invention is that of providing an apparatus adapted for operation:

- a) as a sorting and distributing apparatus for a
 60 sequence of copies of the same original;
- b) as a distributing apparatus for the copies of a number of originals;
- c) as a copy collecting apparatus, without distribution.

65 A further purpose of the invention is that of providing a sorting and distributing apparatus wherein, upon a predetermined and adjustable time is elapsed, the carrying mechanism is, at will, either reset to the unoperative position or returned
 70 to a desired working position.

These and other purposes are achieved by means of a sheet sorting and distributing apparatus, of the type comprising a frame containing a number of superimposed spaces or
 75 drawers; a conveying mechanism for sequentially carrying single sheets to single drawers or spaces; a deviating member, positioned at the drawer or space to be fed and intermittently displaceable from a drawer or space to the next upper one; first
 80 means responsive to the entry of the sheet to be fed; second means responsive to the engagement of the sheet with the said deviating member, characterized by comprising first timing means by which, upon a predetermined time is elapsed after
 85 each actuation of said first responding means, the return of said deviating member to the initial position, corresponding to the first space or drawer to be fed, is caused to take place.

According to a preferred embodiment, further
 90 control means are associated to the said first timing means, said further control means being capable of returning said deviating member to the position occupied before said first timing means were operated.

95 There are furthermore preferably provided second timing means which can be set in order to cause the subsequent sheets to be deviated towards a separate collecting space and adapted to generate a warning signal, in the case in which
 100 the transfer time of a sheet from said first responsive means to the said second responsive means is greater than a maximum time limit, indicating a sheet jamming.

According to a further feature of the present
 105 invention said frame is mounted onto supporting means, the height of which is adjustable.

According to a further feature of the present invention, sheet guide means are associated to the
 110 inlet of the sorting and distributing apparatus, which are displaceable between a position in which the sheet is conveyed to the said conveying mechanism and a second position in which all the sheets are guided to a collecting container.

According to the latter feature of the invention,
 115 said collecting container comprises adjustable means for the positioning in form of ream of the sheets being collected within the container.

According to another feature of the invention, the driving means for the said conveying
 120 mechanism comprise a motor which is connected, through suitable transmissions, to rollers for the driving of the belts or ribbons for the sheet conveyance and to gears by which said deviating member is intermittently displaced, said motor
 125 being rotatable in both rotating directions and being connected to the said gears by means of an electromagnetic clutch, which is controlled by the said responsive means associated to the said deviating member, and to the said belt driving

rollers through an escapement coupling, such as to permit said motor to rotate.

According to a further feature of the present invention, in correspondence of the length of the

5 said sheet conveying belts in which they follow a vertical pattern up to the said deviating member, at least a fixed abutting ribbon or strap, having smoothed surface, is provided, whereby each sheet is conveyed between said conveying belt

10 and said fixed strap.

These and further features and advantages of the present invention shall more clearly appear from the following detailed description, referring to the accompanying drawings, in which:

15 Fig. 1 is a side elevation, partially cross-sectioned, view of the sorting and distributing apparatus of the present invention;

Fig. 2 is a rear, partial view of the apparatus of Fig. 1;

20 Fig. 3 is a view, like Fig. 2, of the upper part of the apparatus;

Fig. 4 is a cross-section view of the apparatus of Fig. 1, limitedly to the sheet carrying and conveying mechanism;

25 Fig. 5 is a schematic plan view, in cross-section, of the driving mechanisms for the conveying and sorting functions of the apparatus of Fig. 1;

Fig. 6 is a particular view of the control panel or

30 keyboard of the apparatus of Fig. 1;

Fig. 7 shows the general scheme by which the apparatus shown in the preceding figures is controlled;

Fig. 8 shows another embodiment of the sheet guiding and conveying means for the apparatus of

35 Fig. 1.

Referring to the drawings, it is first of all to be pointed out that the apparatus of the invention is designed so that no limitations exist as regards the combination with a copying machine: the subject

40 apparatus, as a matter of fact, has identical controls on both sides, apart from the control keyboard (Fig. 6) which is positioned on the desired side at the time of the apparatus

45 installation, both sides of the apparatus being arranged before hand for such a positioning.

The sorting and distributing apparatus of the present invention, as shown on the whole in Fig. 1,

50 comprises a frame 10, formed by two hollow standards 11, from which a T shaped casing 12 protrudes in a cantilevered fashion, shelves 13 being provided within the casing so as to delimitate drawers or spaces 14 for receiving the sheets to be sorted and distributed.

55 In the lower part of the casing 12 the operating mechanisms are housed, which shall be described hereinafter.

In the embodiment shown in the drawings twenty spaces 14 are provided, such a number

60 being not to be construed in a limiting sense.

Each shelf 13 is provided with a slit 15, which is vertically aligned with the slits 15 of the other shelves 13, and a vertical rod 16 passes through all the slits, it being displaceable along the slits so

65 as to form a ream forming pin for the sheets

which, in sequence, are fed to the single spaces 14. For the displacement of the rod 16 an upper control is provided, comprising a lever 17, rigidly fixed to the rod 17 and slidable along an upper slit

70 18 of the casing 10, the lever 17 protruding, as already mentioned, from both sides of the casing.

As shown in Fig. 3, in correspondence of the slit 18 indicia are provided, corresponding to the several sizes of the sheets used in the copying

75 machines.

As shown in Fig. 1, the two standards 11 have the lower end slidably and adjustably housed in a lower casing 19, containing the electrical and electronic assemblies of the apparatus.

80 Thanks to the adjustability of the standards 11, the cantilevered casing 12 may be vertically displaced, so as to perfectly align the inlet of the sheets to be distributed with the outlet of the copying machine.

85 To this end, a rigid member 20 is mounted inside each standard 11, this member being permanently secured, at its lower end, to the lower casing 19, whereas in the upper part the member 20 is connected by a fastening assembly

90 comprising a bolt 21 and a screw nut 22 to a bracket 23 which is rigidly fixed to the standard 11.

Consequently, by screwing and unscrewing the bolt 21, the standard 11 is caused to be displaced with respect to the upper end of the member 20,

95 thus giving place to the vertical controlled displacement of the upper casing 12.

As clearly shown in Fig. 1, besides the upper casing 12, the apparatus comprises a collecting

100 shelf 24, having the purpose of collecting the sheets coming out of the copying machine when:

a) The sorting and distributing apparatus is not in operation, whereby the standard copy collecting plane of the copying machine is substituted for or

105 completed by the shelf 24.

b) A jamming of the apparatus takes place whereby, during the resetting time, the operation of the copying machine must not be stopped.

c) The number of copies coming out of the

110 copying machine is greater than the number of spaces or drawers 14, which are available in the sorting and distributing apparatus.

The collecting shelf is pivotally connected, in the fore part, to the corner of the cantilevered casing 12, and is rearwardly secured to the

115 standards 11 by means of pins slidably housed in slotted members 84, whereby the shelf can be blocked either in the operating position (as shown in Fig. 1) and a rest position (not shown), in which it practically adheres to the bottom surface of the casing 12. Such a second position permits the access to the adjacent part of the copying machine. The collecting shelf 24 is furthermore provided with a ream forming bar 25, displaceable

120 along the edges of the shelf, with the same function of the vertical rod 16.

At the fore and lower corner of the cantilevered casing 12 a mouth member 26 is provided (which, upon the apparatus is installed, is positioned flush

130 with the exit plane of the copying machine); such

a member 26 is removably and pivotally mounted to the casing 12 and is shaped, in cross-section, as an acute angle having an outwardly facing corner.

5 The member 26 is movable, in a controlled manner (by means of an electromagnet 85), between two positions, namely the operating one shown in Fig. 4, in which the sheets coming out from the copying machine (indicated by the arrow
10 F), are guided to the internal conveying mechanism of the sorting and distributing apparatus, and a second position in which the sheets are guided towards the collecting shelf 24.

15 As shown in Fig. 4, downstream of the guide member 26 a sliding plane 27 is provided, wherein the sheet is conveyed by a conveying belt 28, forming an endless circuit, as hereinafter described.

20 At the rear end of the sliding plane 27 a first deviating member 29 is provided, having the purpose of guiding the sheet along a vertical pattern, it being always conveyed by the conveying belt 28.

25 To this end, the function of the plane 27 in the vertical length of sheet displacement, is fulfilled by at least one fixed belt or strap 30, preferably of smoothed metal, by which the sheet is supported during the upwardly conveying motion thereof caused by the conveying belt 29 until the sheet
30 comes to an upper deviating member 31, which is vertically displaceable so as to be positioned at the space or drawer 14 to which the sheet must be fed. In Fig. 4, such a deviating member is shown, in solid and in phantom lines, in two of the
35 positions that it can take, the number of these positions corresponding to that of the drawers or spaces 14.

Said two positions are characterized by the engagement of the deviating member 31 with
40 respective microswitches 81 and 82, not shown in Fig. 4 but illustrated in Fig. 7.

The endless conveying belt 28 is driven by a roller or cylinder 32 in the direction of the arrow N and passes, following the deviating member 29,
45 around the roller or cylinder 33, which is vertically displaceable together with the deviating member 31 and then around the idle roller 34; the belt then crosses the whole width of the cantilevered part of the upper casing 12, then passing around the
50 transmission rollers 35 and 36 and then coming back around the roller 37 to the driving roller 32.

The active run of the conveying belt 28 is thus that extending between the roller 37 and the roller 33, through the roller 32.

55 Starting from the lowest position, shown by solid lines in Fig. 4, the deviating member 31 must be intermittently displaced from a space 14 to the next one and to this end, together with the roller 33, it is fastened to an intermittent conveying
60 chain 38, passing around the driving gear 39 and the idle gear 40. At the same time the roller 36 is supported by a balance weight system, whereby the raising of the roller 33 corresponds to a lowering of the roller or pulley 36, since the belt
65 28 is an endless one.

It is to be noted that, above the guide member 26, a guide plate 41 is provided, cooperating to the guidance of the sheet to the nip between the roller 37 and the sliding plane 27.

70 The entry of the sheet is sensed by a microswitch 58 (or another likely responsive element, for instance a photocell), whereas a like microswitch 59, placed at the deviating member 31 and movable therewith, gives a signal of the
75 entry of the sheet into the drawer or space 14 to be fed and starts the operating sequence for the displacement of the deviating member 31, of the roller 33 and of the microswitch 59 itself, to the next upper space 14.

80 For the driving of the above mentioned components (as shown in Fig. 5) a motor 42 is provided, which is rotatable in both directions, and the power shaft 43 of which carries two pinion gears 44 and 45.

85 The pinion gear 44, through the chain 46, the transmission gear 47, the shaft 48, the gear 49, the chain 50 and the pinion gear 52, drives the shaft 51 having the roller 32 keyed thereto.

90 From Fig. 5 it is clearly seen that, as a matter of fact, two rollers 32 are provided, having respective belts 28 associated thereto, rollers and belts being symmetrically positioned with respect to the middle plane of the casing 12 and consequently of the sheet pattern.

95 In turn, the pinion gear 45, through the chain 53 and the gear 54, drives the shaft 55 of an electromagnetic clutch 56, controlling the intermittent raising of the deviating member 31 and of the roller 33.

100 The electromagnetic clutch 56, particularly through the chain 92 and gears 93 and 94, drives the shaft 57 having the gears 39 keyed thereto (the gears 39 being also two for balancing and symmetry necessity).

105 The control of the electromagnetic clutch 56 is given by the microswitch 59 which is operated by the passage of the sheet, it returning to the initial position after the sheet has been fed to the drawer of space at the height of which the deviating
110 member 31 is positioned.

In order to ensure that the deviating member 31 is displaced from a space 14 to another with the necessary and desired precision and timing, a control system is provided in combination with the
115 gear 40 and comprises a microswitch 83 having a movable contact urged to enter into radial notches 101 of a wheel 100, coaxially and rigidly mounted with respect to the said gear 40 (Fig. 4).

As already mentioned, the motor 42 is
120 rotatable in both directions.

When it rotates in counter clockwise direction, by looking at Fig. 4, it causes the driving and the motion both of the sheet conveying belts 28, and of the intermittent advancement chains for the deviating member 31 from a space 14 to the next
125 one.

When the deviating member has reached the last space 14 (upwardly) and it must be consequently returned to the initial position
130 (lowermost shelf 13), or it must take again such a

position due to different needs or operating conditions of the apparatus, the rotation direction of the motor is inverted (from counterclockwise to clockwise), whereby also the motion direction of the chains 38 is inverted, and consequently the deviating member 31 and the roller 33 are lowered again (whereas, due to the balance weight system, the roller 36 is consequently returned to the uppermost or starting position).

As regards the sheet conveying belts 28, they remain stationary, since the pinion gear is of the free wheel type (in the rotation direction corresponding to the clockwise rotation of the motor), whereby the pinion gear 52 is not driven and remains stationary for the whole return time of the deviating member 31 to the initial position.

Fig. 6 shows the control panel of the apparatus comprising, besides a main switch 60 and a progressive digital counter 61 for the sheets which are sorted and distributed, the following controls:

- 1) The push buttons 62 and 63, by which the operating mode of the apparatus is selected.
- 2) The return push button 64.
- 3) The reset push button 65.
- 4) The optical indicator 66 for the signalling of jamming within the apparatus.

The aforesaid push buttons and indicators are connected to the electrical and electronic assemblies of the apparatus, the main circuits of which are schematically shown in Fig. 7. These shall be now described with reference to the operating modes of the apparatus, which in the shown embodiment can operate according to two different modes:

— as sorter, namely with sequence feeding of a copy of each original in every space or drawer 14, and

— as basket or collecting device, namely by feeding all the copies of the same original in one and the same space or drawer 14, of all the copies of another original in a next space or drawer 24, and so on.

With reference to Fig. 7, by switching on the main switch 60 (Fig. 6) the related contacts 60', 60'' and 60''' are simultaneously closed.

As a consequence of the closure of the contact 60', the 220 volt a.c. supply from the mains, as indicated by 86, is fed through a relay 87, which is in the rest condition, to the motor 42, by which the conveying belt 28 is driven into motion in order to carry away possible residue sheets remaining in the apparatus; such residue sheets are fed to the space or drawer 14 before which the deviating member 14 was previously stopped.

The closure of the contact 60'' in turn permits a c.c. supply 89 to be fed to a logic gate 90, by which it is transmitted to the input of a timer TM1, having a regulator or trimmer TR1, and to the input of another timer TM2, having a regulator or trimmer TR2. Respective times T1 and T2 are thus started.

During the time T2 the digital indicator 61 (Fig. 6) shows the figure "88", suitable for indicating the proper operation of all the segments

thereof, until, at the end of the time T2, the output of the timer TM2 places at the counting digit "1" a counter CT which, through a decoder D, writes the figure "1" on the digital indicator 61 and loads "1" in a storage memory M.

During the time T1, which is greater than T2, two situations may occur:

(a) if the deviating member 31 is at the beginning in its lowermost position, shown by solid lines in Fig. 4, the microswitch 81 is engaged by the same deviating member 31 and, through a logic gate 91, keeps in the deenergized state the electromagnetic clutch 56, whereas through another logic gate 95 prevent a winding 96, controlling the relay 87 for the inversion of the feed to the motor 42, from being energized: the deviating member 31 thus remains in its position.

(b) If the deviating member 31 is at the beginning in a whatever position different from that previously considered, at the end of the time T1, the output of the timer TM1 causes the electromagnetic clutch 56 to be energized through the logic gate 91, and through the logic gate 95 causes the winding 96 to be energized for the control of the inversion relay 87, whereby the motor 42 can drive the chain 38 so as to cause the deviating member 31 to be lowered down to the position of maximum lowering shown by solid lines in Fig. 4; at this point the micro-switch 81, through logic gates 91 and 95, deenergizes the clutch 56 and the winding 96 of the inversion relay 87, whereby the chain 38 is stopped and the rotation of the motor 42 is inverted again.

In both cases, at the end of the time T2, the deviating member 31 is in the lowermost position and the conveying belts are driven in motion, and the apparatus is ready for operation, according to the sorter mode, unless a different selection is affected.

Such a situation is visually indicated by the lightening of a lamp 104.

According to the operation in the sorter mode, when the first copy of a first original comes out of the copying machine, the same copy actuates the inlet microswitch 58 which starts a timer TM3, and, through a logic gate 97, operates another timer TM4. Thus the respective times T3 and T4 are started.

The starting of the timer TM3 causes a flip-flop FF1 to be switched, although without effects due to the presence of a logic gate 98. If the copy does regularly pass through the apparatus, it engages the outlet microswitch 59 and consequently enters the lowermost space 14 before the end of the time T3, thus causing the timer TM3 to be reset and the inverse switching of the flip-flop FF1 to take place, which through the logic gate 98 prevents the output of the timer TM3 from causing the lightening of the optical indicator 66 (Fig. 6)

and the deenergization of the jamming electromagnet 85 for the rotation of the mouth member 26 (Fig. 4) to the position in which the subsequent copies are guided towards the collecting plane 24 (Fig. 1). In the contrary case, namely if the copy is stopped before reaching the

micro-switch 59, at the end of the time T3 the downward stepping front of the output of the timer TM3 is capable of inducing, through the logic gate 98, the aforesaid phenomena of lightening of the optical indicator 66 and of deenergization of the electromagnet 85.

Reverting to the case of correct operation of the apparatus, the closing of the outlet micro-switch 59 causes also a flip-flop FF2 to be switched, which through the logic gates 99 and 91 causes the clutch 56 to be energized for the raising of the deviating member 31. The latter then is displaced from the first drawer or space 14 to the second one, it being stopped at the exact time in which the movable contact of the position micro-switch 83 engages the closest notch 101 of the wheel 100 associated to the gear 40 (Fig. 4). At this point, as shown in Fig. 7, the micro-switch 83 causes the flip-flop FF2 to be inversely switched and thus the clutch 56 to be deenergized; moreover it changes to "2" the counting figure of the counter CT with the related change of the digital indicator 61, whereas the memory M remains to the figure "1".

The second copy coming from the copying machine is thus compelled to enter the second space 14, causing at the same time a novel cycle like that already described to take place and thus, except in the case of jamming, a further raising of the deviating member 31 up to the third space 14.

The same occurs for the other copies up to the twenty-first one which, by engaging the inlet micro-switch 58 while the micro-switch 82 is engaged by the deviating member 31 at the twentieth space 14 and the flip-flop FF2 is still in the state induced by the engagement of the twentieth copy with outlet micro-switch 59 (in fact the further closure of the micro-switch 83 has not occurred since the deviating member 31 is prevented from a further raising), causes through a logic gate 102 the indicator 66 to be lightened and possibly a warning sound signal to be emitted, whereas the deviating member 31 remains positioned at the twentieth space, in which all the incoming copies are fed.

Upon the feeding of copies from the copying machine ends, the timer TM4, which until that time was maintained in operation by the periodical closure of the inlet micro-switch 58, causes the energization of the clutch 56 and of the winding 96, for the switching of the relay 87 to the position of rotation inversion of the motor 42, to take place; the deviating member 31 is thus lowered down to the lowermost position, wherein the micro-switch 81 is engaged again, by which the clutch 56 is deenergized and the relay 87 and thus the control of the motor 42 are switched to the opposite condition.

The timer TM4 does furthermore control the counter CT to transfer its counting figure to the memory M.

The apparatus is now ready to receive and distribute to the several spaces 14 in the identical manner the copies of a second original, then of a third one, of a fourth one and so on, which are

made and fed by the copying machine.

The possibility exists that, before the arrival of the twentieth copy, for instance when the deviating member is at the tenth space 14, the paper feed is exhausted or a jamming occurs. At this point, apart from the lightening in the case of jamming of the optical indicator 66, the fall of the timer TM4 causes in the above explained manner the lowering of the deviating member 31 down to the lowermost position; to start again the operation, upon the defect is eliminated, the return push button 64 must be operated which, by switching a flip-flop FF3 initially set from the contact 60''' of the main switch 60 and then reset from a comparator CP due to the fall of the timer TM4, causes through the logic gate 91 the clutch 56 to be energized for the raising again of the deviating member 31. Such a raising ends when the deviating member is again in the due position.

To change to the basket mode of operation, the push button 63 must be depressed. It causes the timer TM1 to be actuated which, during a time T1, as already explained for the sorter mode of operation, ensures that the deviating member 31 takes the lowermost position (if it does not already be thereat). From that time each incoming copy, as sensed by the inlet micro-switch 58, operates the timers TM3 and TM4 and through the outlet micro-switch 58, operates the timers TM3 and TM4 and, through the outlet micro-switch 59, causes the timer TM3 to be immediately reset thereafter; on the contrary, no energization of the clutch 56 occurs, since it is prevented from taking place from the state in which the push button 63 places a logic gate 103 acting on the same gate receiving the output of the flip-flop FF2 controlled by the timer TM3.

Consequently, the deviating member 31 remains stationary at the lowermost space 14, all the copies coming thereto being fed to the said space. Upon the printing of the first group of copies terminates, the subsequent ending of the time T4 causes the timer TM4 to be deenergized, the output of which, through the logic gates 103, 99 and 91, is capable of inducing the energization of the clutch 56 while the inversion control of the motor 42 is blocked by the logic gate 105 for the raising of the deviating member 31 from the first space 14 to the second one.

There the deviating member is stopped at the exact time in which the position micro-switch 83, by sensing a notch of the wheel 100, causes the flip-flop FF2 to be switched to the state inducing, through the logic gates 99 and 91, the deenergization of the clutch 56. At this time the micro-switch does also cause, through the counter CT and the decoder D, the digital indication of the indicator 61 to be increased by one figure.

The same procedure is followed for all the subsequent groups of copies, which are thus fed in a like number of different spaces 14. In order to lower the deviating member 31 from the final position it takes, it is necessary to depress either the resetting push button 65 or the sorter push button 62. In both cases the output of the timer

TM1 causes in fact the clutch 56 and winding 96 of the inversion relay of the motor 42 to be energized.

The operation of the sorter push-button 62

5 obviously does also induce the rearrangement of the apparatus for the operation in the sorter mode.

It is important to point out that all the previously described functions of the apparatus shown in the drawings and, more generally of the
10 apparatus of the invention, are controlled by timing logic circuits (TM1—TM4) which, being adjusted at the time of the initial installation of the apparatus as a function of the operating characteristics of the copying machine to which
15 the apparatus is being associated, particularly as a function of the copy making rate thereof, permit the apparatus to be adapted to copying machines of several types.

More particularly, the timers TM1 and TM2
20 determine the times of initial setting of the apparatus, the timer TM3 determines the jamming time, namely the maximum time for the transfer of the copy from the inlet micro-switch 58 to the outlet micro-switch 59, beyond which the rotation
25 of the guide member 26 and the issuing of warning signals take place, and the timer TM4 determines the time of copying end, namely the time beyond which, due to the lack of further incoming copies, the apparatus takes the rest condition.
30

Furthermore automatic devices are provided, such as those controlled by the micro-switches 58 and 59, which are directly operated by the same incoming copy and are consequently
35 automatically set to the copying times, i.e. to the speed of the copying machine.

Considering now the Fig. 8, an embodiment is shown wherein, instead of the entry arrangement shown in Fig. 1, a plane 100, forming the standard
40 collecting plane of the copying machine, is also the inlet plane of the apparatus of the invention and, to this end, comprises at least an endless conveying belt 101, passing around the idle rollers 102 and 103. The latter is engaged by another
45 endless conveying belt 104, having the function of conveying the sheet to the fixed deviating member 29, at which the sheet is engaged by the conveying belt 128.

The latter thus differs from the belt 28 only for a different pattern and because it does not provide
50 the initial conveying of the sheet in the apparatus.

The belt by the roller 106 connected to the driving mechanism of the apparatus, which remains essentially unchanged.

55 The mouth member 26 is also omitted, whereby the function of the collecting plane 24 is fulfilled by the plane 101.

Guide and deviation rollers 107 and 108 are also interposed in the pattern of the belt 128,
60 whereas the functions of the rollers 136, 135, 137, 34, 33 and 1132 remain unchanged. It is further to be pointed out that, although in the specification reference has been made, explicitly and constantly, to the association to copying
65 machines, the apparatus of the present invention

can be combined with other machines (printing machines and the like) from which sheets to be sorted and distributed come out.

CLAIMS

- 70 1. Sheet sorting and distributing apparatus of the type comprising a frame containing a number of superimposed spaces or drawers; a conveying mechanism for the sequence conveyance of single sheets to the single drawers or spaces; a deviating
75 member positioned at the drawer or space to be fed and intermittently displaceable from a drawer or space to the next upper one; first means responsive to the entry of a sheet to be fed; second means responsive to the engagement of
80 the sheet with the said deviating member, characterized by comprising first timing means adapted to control, upon a predetermined time is elapsed from each actuation of the said first responsive means, the return of the said deviating
85 member to the initial position corresponding to the first space or drawer to be fed.
2. Apparatus according to claim 1, characterized in that control means, adapted to return said deviating member to the position it had
90 before the intervention of said first timing means, are associated to said first timing means.
3. Apparatus according to claim 1, characterized by comprising second timing means which are adjustable to determine the deviation of
95 the subsequent sheets towards a different collecting space and the issuing of warning signals in the case in which the transfer time of a sheet from said first responsive means to said second responsive means is greater than a predetermined
100 maximum limit, indicating a sheet jamming.
4. Apparatus according to claim 1, characterized by comprising third timing means which are adjustable in order to determine said
105 return of the deviating member to the initial position at the time of apparatus switching on.
5. Apparatus according to claim 1, characterized by providing at least a first and a second operating mode, which can be
110 alternatively selected, according to the first mode there being provided a displacement of the said deviating member from one to another of said spaces or drawers for each actuation of said
115 second responsive means, whereas according to the second mode a displacement of said deviating member from one to another of said spaces or drawers is provided each time said first timing means sense the elapsing of said predetermined
120 time, there being provided means responsive to the selection whereby the return control of the deviating member to the initial position is made non-operative.
6. Apparatus according to claim 1, characterized in that said frame is provided with
125 height adjustable supporting members.
7. Apparatus according to claim 6, characterized in that said frame is mounted in a cantilevered fashion to two hollow standards, which are adjustably slidable onto two vertical members.

8. Apparatus according to claim 1, characterized in that sheet guide means are provided at the inlet of said conveying mechanism, which are movable between an operating position
- 5 in which the sheet is guided for the engagement by said conveying mechanism and a second position in which each sheet is deviated towards a collecting plane.
9. Apparatus according to claim 8,
- 10 characterized in that said guide member is a profiled member having cross-section shaped as an acute angle, the corner of which faces the incoming direction of the sheets to be sorted and distributed.
- 15 10. Apparatus according to claim 8, characterized in that said collecting plane comprises a container mounted in an inclined position below said frame and provided with ream forming means for the sheets being collected in
- 20 the container itself.
11. Apparatus according to claim 1, characterized in that said first means responsive to the presence of the sheet comprise a micro-switch mounted downstream of said guide member and
- 25 said second responsive means consist of a micro-switch mounted to said deviating member, so as to be actuated by the passage of a sheet along said deviating member.
12. Apparatus according to claim 1,
- 30 characterized in that said sheet conveying mechanism comprises at least an endless belt or ribbon, having an operating length for the conveying of the sheet comprised between said inlet micro-switch and said deviating member,
- 35 said operating length comprising a horizontal portion in which said belt runs into contact with a fixed plane, the sheet to be conveyed being interposed between said inlet micro-switch and said deviating member, said operating length
- 40 comprising a horizontal portion in which said belt runs into contact with a fixed plane, the sheet to be conveyed being interposed between the belt and the plane, and a vertical portion, in which said sheet is interposed between said belt or ribbon
- 45 and at least a fixed ribbon or strap.
13. Apparatus according to claim 12, characterized in that said fixed ribbon or strap is of smoothed metal.
14. Apparatus according to claim 12,
- 50 characterized in that said conveying mechanism comprises an idle roller for said conveying belt or ribbon fastened, together with said deviating member, to a mechanism for the intermittent displacement of the deviating member from a
- 55 drawer or space to the next upper one.
15. Apparatus according to claim 14, characterized in that said displacement mechanism comprises a pair of gears connected by a chain to which said deviating member is
- 60 mounted.
16. Apparatus according to claims 12 and 15 characterized in that said conveying and displacement mechanisms are driven by only one motor, rotatable in both directions, said conveying
- 65 mechanism being disengaged from said motor during the return run of said deviating member to the initial position.
17. Apparatus according to claim 16, characterized in that said displacement
- 70 mechanism of the deviating member is connected to said motor through an electromagnetic clutch, which is energized when a micro-switch coupled to said deviating member is actuated by the passage of a sheet along the deviating member.
- 75 18. Apparatus according to claim 1, characterized in that each space or drawer is defined by a plane, each plane having a slit, a vertical ream forming rod passing through the slit and being displaceable therealong.
- 80 19. Sheet sorting and distributing apparatus substantially as hereinbefore described with reference to the accompanying drawings.