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The references to figures 11 - 16 are deemed to be deleted (Rule 43 EPC).

(54) Large capacity multiple-format paper tray for an office machine

(57) A tray (21), for use in an office machine, such as in particular a photocopier (24), prearrangeable for selectively containing reams (22) comprised of a plurality of sheets (23), and having formats corresponding to the format of the sheets comprising them. The tray (21) is provided with a frame (31); a support plate (32), fulcrum-mounted on the frame (31) and upon which each ream (22) is supported, when it is laid in the tray (21); a ream-former (33) sliding along the frame (31) for laterally adapting, depending on the format of each ream (22), the plan dimensions of a seat (51) intended for

accommodating the ream (22); and a regulating device (36), connected to the ream-former (33), capable of automatically regulating, in relation to the position of the latter and thus to the format of the ream (22), an elastic force applied on the support plate to push the ream (22) against a sheet pick-up device (26), fitted on the photocopier (24). Accordingly, the pressure acting between the sheet pick-up device (26) and a front portion of the ream (22) is adapted to the format of the latter.

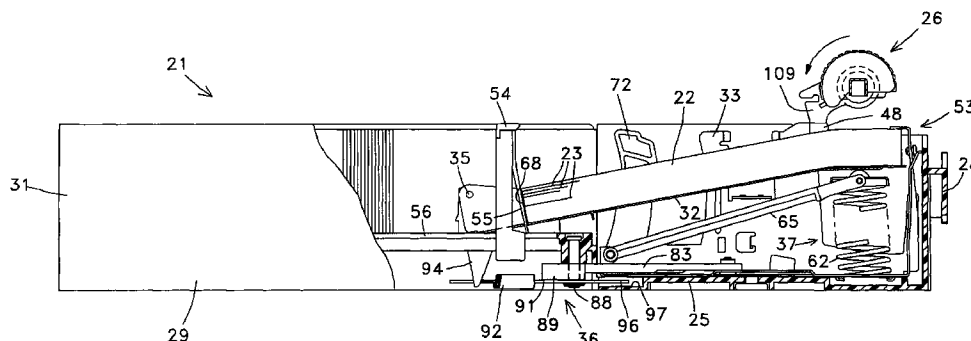


Fig. 3

DescriptionField of the invention

5 [0001] This invention relates to a tray suitable for containing a ream comprised of a plurality of sheets of paper identical in format, and accordingly having a format corresponding to that of the sheets comprising it, typically but not exclusively for use in an office machine, such as a photocopier.

Background of the invention

10 [0002] Trays having the characteristics indicated above are widely known, and are in current use in an office machine. Typically each of these trays is used by first loading therein a ream of sheets, and then inserting it in an appropriate seat in the office machine, so that the sheets of the ream can be picked up and fed one at a time to the office machine in question, where they will be suitably handled.

15 [0003] The structure and dimensions of these known trays are generally such as to permit accommodating, in each of them, only reams having a given specific format, that is to say sheets of paper of one format only, and not also reams characterized by each having a different format from the other.

[0004] For example, a typical known tray is removably insertable in a seat in an office machine, and comprises a raisable bottom suitable for supporting a ream of sheets, and elastic means, consisting of one or more springs, acting from below on this bottom to urge the ream, in opposition to its weight, against a pick-up device adapted for picking up and feeding, one at a time, the sheets from the ream in question.

20 [0005] In this known tray, the springs are of dimensions such that the thrust that they exert from below on the bottom has a value or a field of predetermined values strictly dependent on the weight of the ream that is supported by the bottom, so as to determine an optimal value, for the purposes of correct picking of the sheets, of the pressure generated between the ream and the device adapted for picking the sheets from the latter.

25 [0006] Clearly therefore from the above, the springs of the above-mentioned elastic means are histrionically inadequate for obtaining again an optimal pressure between the ream and the pick-up device, so as to permit a proper functioning of the latter for picking up and feeding the sheets, when the ream is of a different format, and accordingly a different weight, from that for which the springs were dimensioned.

30 [0007] The fact that each tray is adequate for the management of a single format of sheets and of corresponding reams gives rise to various drawbacks.

[0008] For example, in the event that the office machine is prearranged for accommodating a single tray at a time for the feeding of the sheets, the change of format of the sheets to be fed to the office machine also involves the removal from the latter of the tray containing the sheets of the format used first, and its substitution by another tray containing the sheets of the format that will be used. This substitution is inconvenient and results in a certain loss of time by the operator of the office machine. In addition, it is clear that, in this case, the various trays corresponding to the various formats of the sheets constitute an additional encumbrance with respect to that of the office machine, and moreover it is not always easy to locate them close to the latter when they are not being used.

35 [0009] There may be drawbacks even when the office machine is prearranged for simultaneously accommodating numerous trays corresponding to different formats of the sheets and therefore of the relative reams.

[0010] Such a prearrangement in fact increases the cost and the global dimensions of the office machine, making it more difficult to fit into the office. Furthermore, the formats potentially usable are so numerous, that the solution of prearranging the office machine so that it can simultaneously accommodate as many trays as there are usable formats, in order to satisfy all the requirements of format, is clearly out of the question, on account of the unduly high cost and encumbrance that such a solution would involve.

40 [0011] Also known are trays, also called multiple-format, suitable for alternatively containing numerous reams of different format, generally two, for example an A3 format ream in alternative to an A4 format one, or an A4 format ream in alternative to a B5 format ream.

[0012] For the purpose, the multiple-format trays are usually each provided with a manually adjustable side wall in order to adapt, depending on the format of the ream, a seat of the tray, in which the ream will be loaded.

50 [0013] Unfortunately these trays, besides having a limited possibility of adapting to the various formats of the reams, are not practical to use. In addition, the elastic means present in these trays, being dimensioned in relation to reams having quite different formats and therefore weights, are not always capable of determining pressure values, between the reams and the pick-up mechanism, close to the optimal values. Accordingly the performances too of these trays are somewhat remote from being optimal.

55 [0014] The need to optimize the handling of reams of sheets having different formats is particularly crucial in the case of a photocopier, since during use of the latter, format of the sheets is changed very frequently. In addition, photocopiers are already cumbersome machines, and can accordingly be placed in an office only with difficulty. Therefore, it is easy

to understand how this drawback is further accentuated by the presence of numerous trays, to switch from one sheet format to another, on account of the additional encumbrance produced by the trays.

[0015] The formats of the sheets of paper and of the relative reams that are normally used have dimensions and are indicated with symbols defined by given and universally accepted unification rules. Therefore for clarity's sake the different formats will be indicated in the following using these unified symbols, namely B5, A4, A3, etc.

Summary of the invention

[0016] In short, the main object of this invention is that of producing a tray suitable for accommodating a ream of sheets of paper, which is capable of eliminating the drawbacks outlined above concerning the handling of reams of sheets having different formats, and which in addition permits identical, or even better, performances than the known trays, for picking up and feeding the sheets of paper from the ream.

[0017] This object is achieved by the tray having the characteristics formulated in the main claim.

[0018] Another object of this invention is that of producing a tray, for the feeding of sheets of paper in an office machine, such as in particular a photocopier, manually insertable in an appropriate seat of the office machine and removable as necessary from said seat for the purposes of effecting loading of the sheets, which has a capacity for accommodating a quantity of sheets significantly greater than or at least equal to that of the currently known trays, and which at the same time has the ability to accommodate reams having different formats, so as to be able to be applied universally for practically all the formats of the sheets.

[0019] In greater detail, with this invention, it is intended to produce a tray that is capable of containing reams consisting of at least 500 sheets, and having formats conforming to those generally most widely used, for example in a range extending from the A5 format to the A3 format.

Brief description of the drawings

[0020] These and other characteristics, objects and advantages of this invention will be clear from the description that follows, provided purely by way of an illustrative, non-restrictive example, and with reference to the accompanying drawings, where:

Fig. 1 is a perspective view of an office machine, in particular a photocopier, in which a tray, according to this invention, is fitted for accommodating a ream of sheets of paper;

Fig. 2 is a first partial, plan view of the tray of Fig. 1 and of a device, belonging to the office machine, adapted for picking up the sheets of paper accommodated in the tray;

Fig. 3 is a lateral view of the tray and of the pick-up device of Fig. 2;

Fig. 4 is a second partial, plan view of the tray of Fig. 1, by itself;

Fig. 5 is a third partial, plan view representing the tray of Fig. 4, with a number of parts having been taken away;

Fig. 6 is a partial section according to a line VI-VI of Fig. 5;

Fig. 7 is a plan view of a cam type regulating mechanism of the tray of Fig. 1;

Fig. 8 is a section according to a line VIII-VIII of Fig. 7;

Fig. 9 is a plan view of a ream-former of the tray of Fig. 1;

Fig. 10 is a lateral view of the ream-former of Fig. 9;

Fig. 11 is a view of some details of the ream-former of Fig. 9;

Figs. 12 and 13 are respectively a lateral view and a front view of some details of the tray of Fig. 1;

Fig. 14 is a detailed plan view of the pick-up device of Fig. 2;

Fig. 15 is an enlarged scale section according to a line XV-XV of Fig. 14; and

Fig. 16 depicts an experimental arrangement used for conducting some tests on the tray of Fig. 1.

Description of a preferred embodiment of the invention

[0021] With reference to Fig. 1, a tray according to the invention, indicated generically with the numeral 21, is prearranged for accommodating, one only at a time, reams of sheets 22, each comprised of a plurality of sheets of paper 23 stacked one on top of another and having an identical format. Accordingly the formats of the sheets 23, comprising each ream 22, also define the format of the latter. In particular, the format of the sheets 23 and of the relative ream 22 correspond to the usual formats normally used on office machines, and defined by predetermined sheet height and width values, such as, for example, the formats indicated with the codes B5, A4, A3, etc.

[0022] The sheets 23, comprising the ream 22, may vary, not only in their format, that is in the dimensions of their sides and of their rectangular surface, but also in their thickness and in their weight per unit of surface area. For example, the sheets may indicatively weigh between 30 and 120 gr/m².

[0023] It will be understood therefore how, in relation to the type of sheet adopted and in particular to its format, each ream 22 suitable for accommodation in the tray 21 may have a different weight, plan dimensions, and thickness.

[0024] The tray 21 is fitted removably and slidably in an appropriate seat 50 of an office machine, such as in particular a photocopier 24, so as to permit an operator to slide the tray along the seat 50, and possibly also to remove it completely from the latter.

[0025] Sliding in the seat 50, the tray 21 has the possibility of assuming a first loading position, corresponding to the position depicted in Fig. 1, wherein the tray 21 protrudes from the casing of the photocopier 24 so as to permit the loading in the tray itself, by the operator, of a ream 22; and a second working position, wherein the tray 21 is arranged practically flush with the casing of the photocopier 24, and wherein it is arranged to co-operate with a pick-up device 26 (Fig. 2), located inside the photocopier 24 and described in detail later, having the function of picking up, one at a time, the sheets of the ream 22 loaded in the tray 21, and of feeding them towards other devices of the photocopier 24, by which the sheets 23 picked up will be suitably handled.

[0026] With reference to the Figs. 2-6, the tray 21 comprises a frame or structure 31 supporting the various components of the tray 21, having an inwardly hollow and roughly parallelepiped shape, and defining a bottom 25; two lateral sides 27 and 28, which bound the tray 21 to the sides; a front side 29 which bounds the tray 21 to the front and which is flush with the casing of the photocopier 24, when the tray 21 is in its working position; and a rear side 30 which bounds the tray 21 to the rear.

[0027] The front side 29 forms a front wall 19 towards the inside of the tray 21, and is also shaped like a handle towards the outside of the tray 21, so as to be able to be manipulated by the operator in order to slide the tray 21 between its loading position and working position.

[0028] Suitable supporting means, constituted in this case by two freely rotating wheels 38, are fitted on the rear side 30, with the purpose of facilitating insertion and sliding of the tray 21 in the appropriate seat 50 prearranged in the photocopier 24.

[0029] The tray 21 is also provided with a setting device 66, supported by the frame 31 and suitable for co-operating with a corresponding recognising device, belonging to the photocopier 24 and not depicted in the drawings, when the tray 21 is in its working position.

[0030] In particular, the setting device 66 has the purpose of permitting a control unit of the photocopier 24 to recognise the format of the ream currently accommodated in the tray 21, so as to manage coherently the sheets picked from this ream.

[0031] The setting device 66 is of known characteristics, and comprises a cursor 67 suitable for being placed manually by the operator in a plurality of predetermined positions, each corresponding to the specific format of the ream 22 accommodated in the tray 21, sliding in the directions indicated by the arrow 69 along a guide formed in the rear side 30. In this way, the cursor 67, depending on the position occupied, opens or closes contacts which will be sounded by the recognising device of the photocopier 24, when the tray 21 is in its working position, so as to establish unambiguously the format of the ream 22 accommodated in the tray 21.

[0032] The tray also comprises a support plate 32, which is fulcrum-mounted laterally on the frame 31 by way of two pins 35, and is suitable for supporting, at least partially, a generic ream 22, when it is loaded in the tray 21, and also for pushing it towards the pick-up device 26, when the tray 21 is in its working position; a lateral adapting device, or ream-former 33, sliding along the bottom 25 of the tray 21 and having a side wall 34; elastic means 37, arranged under the support plate 32, to exert on the latter a force or principal couple tending to rotate the support plate 32 about the respective pins 35, so as to raise it in relation to the bottom 25; and a regulating device or mechanism 36, associated with the elastic means 37, and connected at one end to the ream-former 33 and on the other to the support plate 32, so as to regulate, in relation to the format of the ream 22 accommodated in the tray 21, a global elastic force applied on the support plate 32, in opposition to the weight of the ream 22, in order to consequently adapt the pressure acting between the latter and the pick-up device 26.

[0033] As better described below, the ream-former 33 can be arranged to adapt with its side wall 34, as it slides along the bottom 25, to the dimensions of the ream 22 that will actually be loaded in the tray 21.

[0034] In particular, with reference to Figs. 9 and 10, the ream-former 33 comprises a support 41, made from a metal sheet bent into an L, having a horizontal leg 42 arranged adjacent to and along the bottom 25 of the tray 21, and a vertical leg 43, which defines the movable wall 34. In particular, the vertical leg 43 has a portion extending through an aperture 46 (Fig. 4) made in the support plate 32, in a direction roughly normal to the plane of the latter.

[0035] The movable wall 34 of the ream-former 33 constitutes an adjustable side of a seat of the tray 21, adapted for accommodating the ream 22. The horizontal leg 42 bears a slide 45 (Fig. 6), slidably accommodated in a slot 47, formed in the bottom 25. In this way the ream-former 33 can slide along the bottom wall 25, in the directions indicated by the arrow 40 (Fig. 5).

[0036] In addition, the ream-former 33 comprises a blocking/releasing mechanism 71 (Fig. 10), borne by the support 41 and having the purpose of selectively blocking or releasing the ream-former 33, with respect to the slot 47 and hence to the bottom 25, when the ream-former 33 is located in predetermined positions, corresponding to the various formats

of the reams 22 that can be loaded in the tray 21 .

[0037] In particular, the blocking mechanism 71 comprises a manual lever 72 fulcrum-mounted on the support 41 by way of a pin 74, which extends through a further aperture 49 (Fig. 4) made in the support plate 32, and is suitable for being rotated by an operator; and two levers 76 and 77, also fulcrum-mounted on the support 41 by way of a pin 75. The two levers 76 and 77 are constantly urged towards the bottom 25 by a pin spring 73 and are suitable for being commanded by the lever 72 so as to jointly move away from or draw closer to the bottom 25, depending on the direction of rotation of the manual lever 72. In this way, the levers 76 and 77 are suitable for selectively engaging with a plurality of slits 78 (Fig. 5), in order to consequently block the ream-former 33, or disengaging from the said slits 78, in order to release the ream-former 33.

[0038] The slits 78 are made in the bottom 25, are arranged side by side parallel to each other, and are in two rows, 81 and 82, extending along the sides of the slot 47, i.e. in the direction of sliding, indicated by the arrow 40, of the ream-former 33. Moreover, the slits 78 are each oriented in a direction perpendicular to the axis of the slot 47, and in particular those belonging to the row 81 are arranged to co-operate with the lever 76, whereas those belonging to the row 82 are arranged to cooperate with the lever 77.

[0039] Moreover, the slits 78 are suitably arranged along the slot 47, so that each predetermined position of the ream-former 33, relative to a certain format of the ream 22, corresponds to one only of the slits 78, whatever row it belongs to, that is to say in such a way that each slit 78 corresponds to a single predetermined position of the ream-former 33. It follows that when the ream-former is located in one of its predetermined positions, one only of the slits 78 is engaged by the lever 76 or 77. As anticipated above, the different slits 78 have the purpose of retaining the lever 76 or the lever 77, so as to block the ream-former 33 stably in its predetermined positions, corresponding to the permitted formats of the reams 22, once the ream-former 33, by sliding along the bottom 25, has reached these positions.

[0040] It is also clear that a rotation by the operator of the manual lever 72 in a direction suitable for causing the extraction of the lever 76 or the lever 77 from the corresponding slit 78 in which this lever was inserted, leads to releasing of the ream-former 33, thus enabling it to slide along the bottom 25 to reach another predetermined position, corresponding to a ream format different from that of the previous position.

[0041] Moreover, the fact that the levers 76 and 77 are constantly urged against the bottom 25 by the spring 73, as will be better described below, means that the insertion of the levers 76 and 77 in the various slits 78, in order to block the ream-former 33, is facilitated.

[0042] In order to make it easier to position the ream-former 33 and block it in the slits 78, the symbols relative to the different formats of the reams 22 are stamp-marked on a portion 60 of the support plate 32, between the apertures 46 and 49, as illustrated in Fig. 4, and are in addition arranged in line with different possible positions of the leg 43 corresponding to these formats.

[0043] The movable side wall 34 formed by the ream-former 33, the fixed front wall 19 of the tray 21, a regulating member 54, protruding from the bottom 25 and described in greater detail later, and finally a front edge 52 of the movable bottom 32 respectively define the four sides of a seat 51 suitable for accommodating the ream 22, and having a rectangular shape plan, as indicated with the dash and dot line in Fig. 4, corresponding to the specific format of the ream. In particular, the side of the seat 51, aligned with the edge 52, is disposed along a front portion of the ream 22, arranged to co-operate in contact with the pick-up device 26, so as to separate and feed one at a time the sheets 23 of the ream 22 accommodated in the seat 51.

[0044] The regulating member 54 is suitable for sliding along a slot 56, made in the bottom 25, in a direction perpendicular to the direction of sliding of the ream-former 33, and bears a hook suitable for cooperating with a series of notches, arranged laterally along the slot 56, in order to retain the regulating member 54 in a plurality of predetermined positions corresponding to the various possible formats of the ream 22.

[0045] The symbols for the different formats, similar to those indicating the different positions of the ream-former 33, are stamp-marked on the bottom 25, along the slot 56, to indicate the different positions in which the regulating member 54 may be located.

[0046] In addition, the regulating member 54 is provided with an elastic tab 55 (Fig. 6), capable of flexing elastically in contact with a rear edge 68 (Fig. 2) of the ream 22. In particular, the tab 55 has the purpose of effectively retaining the ream 22, when it is laid fully on the support plate 32 and the latter is disposed in an inclined position with respect to the bottom 25. In this way, the tab 55 prevents the ream 22 from sliding along the support plate 32, and also keeps the sheets 23 of the ream 22 perfectly one on top of the other.

[0047] The regulating member 54, and the movable wall 34 are adjustable with respect to the fixed wall 19 and the edge 52, so as to permit the length and width dimensions of the rectangular seat 51 to be adapted exactly to the length and width respectively of the specific format of the ream 22.

[0048] The ream 22, when set in the seat 51, may sit on the bottom with all of its surface on the support plate 32, as illustrated by way of example in Fig. 2, or the ream 22 may sit partly on the support plate 32 and partly on the bottom 25, but naturally always with one side of the ream 22 arranged in line along the edge 52.

[0049] In particular the ream 22 sits fully on the support plate 32, when its format is of reduced dimensions, or when

the ream 22 is arranged with its greater side along the edge 52, as for example in the case of a ream of A4 format having its greater edge of 297 mm aligned with the edge 52; whereas the ream 22 sits partly on the plate 32 and partly on the bottom 25, when its format is of greater dimensions, as for example in the case of the A3 format.

[0050] In general, the proportion between the portion in horizontal projection of the ream 22 sitting on the plate 32, and the portion in horizontal projection sitting on the bottom 25, is variable and obviously depends on the format of the ream 22 itself and on how it is oriented with respect to the edge 52, when it is accommodated in the tray 21.

[0051] In order to permit a correct picking of the sheets 23 from the ream accommodated in the tray 21, sheet retaining means, indicated generically with the numeral 53, are arranged at the ends of the side of the seat 51 aligned with the edge 52.

[0052] In particular the retaining means 53 are suitable for co-operating with the end corners of the front side, aligned along the edge 52, of each sheet 23 belonging to the ream 22, so as to suitably retain these corners. In this way, the retaining means 53 enable the pick-up device 26 to correctly separate and feed one at a time all the sheets 23 from the relative ream 22.

[0053] The retaining means 53 included in the tray 21 of this invention, though being of a type substantially known and widely used in the sector art, have been considerably improved with respect to those of the known art, precisely with a view to enabling the tray 21 to manage effectively and reliably reams 22 of different formats, and additionally comprised of a large number of sheets of paper.

[0054] In particular the tray 21 of this invention, by virtue of the improvements made to the sheet retaining means and other refinements that will be described, permits the accommodation and management of reams comprised of a large number of sheets, including 500 and more.

[0055] In this way, through the tray 21, entire reams 22 can be loaded, that is to say reams comprised of a number of sheets corresponding to that in which the reams are normally packed and supplied commercially and, as a result, it is no longer necessary to split the reams into smaller portions for loading purposes.

[0056] The retaining means 53 comprise two protrusions, of which a first protrusion, indicated with the numeral 57, is arranged at the end of the edge 52, adjacent to the wall 19, and is in addition connected to the latter, in such a way that the protrusion 57 is fixed with respect to the edge 52, and a second protrusion, indicated with the numeral 58, is borne by the ream-former 33, in such a way that the protrusion 58 moves along the edge 52, when the ream-former 33 is made slide along the slot 47, for regulating the seat 51.

[0057] The distance between the protrusions 57 and 58, indicated with the numeral L in Fig. 4, corresponds to the length of the front side of the seat 51, and therefore also to the length of the side, aligned with the edge 52, of the ream 22, when the latter is set on the support plate 32.

[0058] In other words, the distance L corresponds to one of the dimensions defining the format of the ream 22. The protrusions 57 and 58, are bent back roughly parallel to the plane of the support plate 32, so as to overlap the latter, partly at least, as illustrated in Fig. 4.

[0059] Further, the protrusions 57 and 58 are at an adaptable distance from the plane of the support plate 32, so as to form with the latter two respective seats suitable for accommodating and pinching, when the ream 22 is accommodated in the tray 21, the two corners of the ream 22 arranged at the ends of its front side aligned with the edge 52.

[0060] The amount of overlap of the protrusions 57 and 58 with respect to the plate 32, and the entity of the retaining force that the protrusions 57 and 58 exert, in pinching the corners of the ream 22, on the sheets 23 as they are picked up by the pick-up device 26, are of such dimensions as to permit good results for separating and feeding the sheets from the reams 22, for a wide range of formats and weights per unit area of the sheets comprising the reams 22.

[0061] In order to permit, as said earlier, the retaining of reams comprised of a large number of sheets, and thus being of considerable thickness, the protrusions 57 and 58 are mounted elastically on respective levers 121 and 122 (Figs. 10-13), in turn fulcrum-mounted respectively on the wall 19 and on the support 41 of the ream-former 33.

[0062] Accordingly the protrusions 57 and 58 are conferred the ability to yield elastically, with respect to the relative levers, so as to adapt and make room for the ream 22, when the latter is loaded into the tray 21 and is, accordingly, set on the support plate 32. In particular, the protrusion 57 is fulcrum-mounted on the lever 121 by means of a pin 123, and is subject to the action of a spring 124, urging it constantly against the bottom of a slot 126, so that the protrusion 57 is suitable for oscillating about the pin 123, in opposition to the action of the spring 124, in a field of oscillation defined by the two extremities of the slot 126.

[0063] Furthermore, the lever 121 possesses the ability to oscillate about a pin 131, affixed to the wall 19, within an predetermined angular field defined by two abutments, made from the wall 19 and not depicted in the drawings, which are suitable for co-operating with an arm 125 of the lever 121, in order to stop it in correspondence with the limits of its oscillation.

[0064] Similarly, the protrusion 58 is fulcrum-mounted on the lever 122 by way of a pin 127, and is suitable for oscillating about the latter in opposition to the action of a spring 128, within a field of oscillation defined by the two extremities of a slot 129.

[0065] The lever 122 bearing the protrusion 58 is fulcrum-mounted and oscillating about a pin 59 affixed to the vertical

leg 43 of the ream-former 33, and also has an oscillation of width limited by suitable stop elements.

[0066] The support plate 32, subjected by the elastic means 37 and the regulating device 36 to an elastic force tending to raise it in relation to the bottom 25, in turn constantly pushes the protrusions 57 and 58 upwards.

[0067] In this way, the protrusions 57 and 58 are normally arranged in a base position of predetermined height with respect to the bottom 25, and corresponding to the end position of the levers 121 and 122 against the relative abutments. In addition, the thrust on the protrusions 57 and 58 may also be exerted by the support plate 21, with or without interposition of the ream 22.

[0068] The elastic means 37 consist of a first compression spring 61, fixed and adjacent to the front wall 19, in a zone close to the protrusion 57, and a second compression spring 62, borne by the ream-former 33 and therefore capable of following its relative displacements along the bottom 25 of the tray 21.

[0069] Preferably, though by no means exclusively, the springs 61 and 62 have a helical configuration.

[0070] The springs 61 and 62 apply their elastic load on a lower face of the support plate 32, opposite that intended for receiving and making contact with the ream 22, through two caps 63, 64, fitted respectively on an upper end of the spring 61 and of the spring 62. Each cap 63, 64 has a central protrusion 90 (Fig. 10) designed to concentrate in a limited area, on the lower face of the support plate 32, the elastic load applied by the respective spring, 61 or 62.

[0071] In particular the cap 64, fitted on the spring 62, is fulcrum-mounted on a lever 65, which is in turn fulcrum-mounted on the support 41 of the ream-former 33 by way of a pin 79 and has the function of retaining the cap 64 to permit it to slide regularly along the lower face of the support plate 32, during the displacement of the ream-former 33 from one predetermined position to the other.

[0072] The regulating device 36, as already seen, has the function of regulating, in relation to the format of the ream 22 of sheets set on the plate 32, the total load applied by the latter on the ream 22, in order to push it against the pick-up device 26.

[0073] In particular, with reference to Figs. 5-7, the regulating device 36 comprises an arm 83, which connects the ream-former 33 to the regulating device 36, and has one end 86 guided by and sliding along a slot 84 made in the horizontal leg 42 of the support 41, and an opposite end 87 fulcrum-mounted on a pin 88 affixed to the bottom 25 of the tray 21; a cam 89 made as one piece on the end 87 of the arm 83, and therefore suitable for rotating, together with the latter, about the pin 88; a transversal bar 91 co-operating centrally with the cam 89, and furthermore mounted slidably on the face of the bottom 25 facing the outside of the tray 21; and a pair of traction springs 92, each connected at one end to the transversal bar 91 and at the opposite end to a corresponding, folded lateral leg 94 of the support plate 32. In addition, the end 86 of the arm 83 can slide along the slot 84 by means of a slide 85 (Fig. 7).

[0074] The transversal bar 91 is provided at its ends with two protrusions 96, of elongated shape, parallel to each other and disposed perpendicular to a central part of the bar 91, so that the latter assumes the shape of a double T.

[0075] In addition the transversal bar 91 is provided, in the centre, with a slot 93, through which the pin 88 extends, and a rod 95 suitable for being commanded by an inner profile 80 of the cam 89 to cause the sliding of the transversal bar 91 on the bottom 25, when the arm 83 and the cam 89 rotate jointly about the pin 88.

[0076] Each of the protrusions 96 has a first extremity, slidably fitted in a way 97 made in the bottom 25, and a second extremity, inserted in a slit 98 in the leg 94. Local to the second extremity, each protrusion 96 forms a shoulder 99, which is constantly urged by the traction spring 92, so that it tends to rest against the leg 94.

[0077] In this way, the protrusions 96 each form with the respective leg 94 a hinge coupling, which produces a stable connection between the protrusions 96 and the legs 94, and which at the same time is such as to permit a reciprocal rotation between them. Furthermore, as will be better described later, this coupling also gives the shoulders 99 the ability to detach themselves slightly from the respective legs 94, in opposition to the action of the springs 92, so that the force exerted by the regulating device 36 on the support plate 32, through the transversal bar 91, corresponds exactly to the elastic load produced by the deformation of the traction springs 92.

[0078] The pin 88 and the ways 97 have the purpose of co-operating respectively with the slot 93 and with the elongated protrusions 96 to guide, in linear fashion, the sliding of the transversal bar 91 along the outer surface of the bottom 25. More particularly, the linear sliding of the transversal bar 91 is commanded by the rotation of the cam 89, the said rotation being in turn produced by a sliding of the ream-former 33 along the slot 47.

[0079] For clarity's sake, Fig. 7 depicts schematically with a dot and dash line some possible operative positions of the ream-former 33 along the slot 47, and of the arm 83, which converts the sliding motion of the ream-former 33 into a rotation of the cam 89.

[0080] Accordingly, by sliding along the bottom 25, the transversal bar 91 is suitable for applying, through the traction springs 92, an elastic force on the legs 94 such as to produce, with respect to the pins 35 defining the axis of rotation of the support plate 32, an elastic regulating couple having a direction compliant with the primary couple exerted, again with respect to the pins 35, by the elastic means 37, namely by the springs 61 and 62. As a result, the regulating couple produced by the regulating mechanism 36 and the primary couple produced by the elastic means 37 are summed together, to produce an overall elastic force or couple acting on the support plate 32, with respect to the relative pins 35.

[0081] The regulating couple, as better described in the following, is activated only when the cam 89 with its inside

profile 80 comes into contact with the pin 95, not before, and assumes a variable value in relation to the positions of the ream-former 33.

[0082] In greater detail, the dimensions of the regulating mechanism 36 are such that the value of the regulating couple follows a predetermined load law, while the ream-former 33 is made slide by the operator along the slot 47 so as to position the wall 34 of the seat 51 in relation to the format of the ream 22 that will be loaded in the tray 21.

[0083] In particular, the regulating couple is scheduled to assume a practically null value, during a first stretch of rotation of the cam 89, in which there is no contact between the latter's inner profile 80 and the pin 95, and as a result the cam 89 does not exert any force on the pin 95. This first stretch corresponds roughly to a sliding field of the ream-former 33 between an internal extreme position, indicated with Po, and an intermediate position indicated with P1, both represented schematically with dot and dash lines in Fig. 4. The position Po corresponds to a minimum value of the distance L, whereas the position P1 corresponds to an intermediate position of the ream-former 33, in which contact is made between the cam 89 and the pin 95, and corresponding roughly to the A4^R format, i.e. to the case where the seat 51 is arranged for accommodating a ream of A4 format, with its short side aligned along the edge 52 of the support plate 32.

[0084] As already stated, the regulating couple is produced when the cam 89, with its inner profile 80, comes into contact with the pin 95. From that point on, the regulating couple gradually increases, while the ream-former 33 is made slide by the operator from the intermediate position P1, to an external extreme position P2, corresponding to the maximum value of both the distance L, and of the regulating couple.

[0085] The position P2 corresponds to the case where the seat 51 is prearranged for accommodating a ream of A3 format, or a ream of A4 format with its greater edge aligned with the edge 52.

[0086] During the sliding between the positions P1 and P2, the shoulders 99 of the protrusions 96 can detach themselves slightly from the legs 94, resulting in an elongation of the traction springs 92, which thus unambiguously determine, through the elastic load corresponding to their deformation, the value and the law of variation of the regulating couple.

[0087] The entity of the detachment of the shoulders 99 from the legs 94, and therefore the load applied on the latter by the springs 94, also depends on the angular position assumed by the support plate 32 with respect to the bottom 25, following loading thereon of the ream 22, the said angular position in turn depending on the thickness of the ream 22 loaded on the plate 32.

[0088] As a general rule, the thicker and accordingly also the heavier the ream 22 loaded on the plate 32, the greater the detachment of the shoulders 99 from the legs 94, and consequently the value of the regulating couple applied on the plate 32.

[0089] From the foregoing, it will be clear that the overall elastic couple acting on the support plate 32 with respect to the relative pins 35, and resulting from the sum of the regulating couple generated by the mechanism 36 and of the primary couple determined by the elastic means 37, assumes a variable value depending on the position of the ream-former 33, and correspondingly on the format of the ream 22 that it is intended to load in the tray 21 and therefore to set on the support plate 32.

[0090] As anticipated earlier, the tray 21, when it is fully inserted in the seat 50 and is thus located in its working position, is arranged to co-operate in contact with the pick-up device 26 of the photocopier 24, in order to determine feeding of the sheets 23 from the tray 21 to other organs of the photocopier 24.

[0091] More particularly, in practice, the ream 22 effectively accommodated in the tray 21 and therefore set on the plate 32, is pushed by the latter, under the action of the overall couple referred to earlier, against the pick-up device 26.

[0092] For a better understanding of the characteristics of the tray 21 and how it works, within the overall framework of the photocopier 24, the pick-up device 26 of the sheets 23 will now be described, with reference to Figs. 14 and 15.

[0093] In particular, the pick-up device 26 comprises: a shaft 101, having a U-shaped section and mounted rotatably at the sides on two walls of a fixed structure 102 of the photocopier 24; an inserting device 103 connected with one end of the shaft 101 for selectively commanding its rotation; a first fixed roller 104, having a semicircular shape and fixed integrally on the shaft 101; a second movable roller 106, also having a semicircular shape, integral with a bushing 107 sliding along the shaft 101; an intermediate roller 112, also semicircular shaped, arranged between the rollers 104 and 106 and borne by a bushing 113 sliding along the shaft 101; and, a first and a second traction spring, 111 and 114 respectively, extending longitudinally along the shaft 101 and accommodated inside the latter's U-shaped section.

[0094] In addition, a sleeve 108 coaxial with and rotational on the bushing 107, but prevented from sliding axially with respect to the latter, is provided with a protruding arm 109, which is suitable for cooperating in contact with the ream-former 33, and in particular with a protrusion 48 formed from its leg 43.

[0095] In particular, the traction spring 111 is connected by one end to the wall of the fixed structure 102, arranged adjacent to the entrance of the seat 50 prearranged in the photocopier 24 for slidably accommodating the tray 21, and by the other end to the bushing 113. In its turn, the spring 114 is connected by one end to the bushing 113 and by the opposite end to the bushing 107. In this way, the springs 111 and 114 exert an elastic force on the bushings 113 and 107 tending constantly to displace them, together obviously with the movable roller 106, towards an end zone of the shaft 101 disposed in the region of the entrance of the seat 50 for the tray 21.

[0096] The intermediate roller 112 has the function of producing a further zone of contact, in addition to that produced by the rollers 104 and 106, between the pick-up device 26 and the front edge of the ream 22, so as to improve effectiveness of the picking of the sheets from the latter. In particular, the intermediate roller 112 is especially useful and effective in keeping perfectly flat and without curving, along the front edge of the ream 22, the sheets 23 disposed uppermost in the latter, despite variability of the formats and thus of the dimensions of the sheets 23 handled by the tray 21 of the invention.

[0097] The tray 21 is used in the following way.

[0098] To begin with, the tray 21 may be disposed fully extracted from its seat 50 prearranged in the photocopier 24, or may be already partially inserted in the seat 50 and, in particular, protruding therefrom, in the loading position. In both cases, the tray 21 is ready to receive a new ream 22 of sheets 23.

[0099] In relation to the format of the latter, that is to say to the format of the new ream 22 that will be loaded in the tray 21, the operator prepares the plan dimensions of the seat 51, by regulating along the bottom 25 both the position of the ream-former 33, and the position of the regulating member 54.

[0100] In particular, if the new ream 22 to be loaded has a different format from that of the ream 22 used just before, the ream-former 33 is released from the position in which it was previously disposed, to be displaced to a new position corresponding to the format of the new ream 22. For this purpose, the operator appropriately turns the lever 72, in order to extract from one of the slits 78 the lever, 76 or 77, which previously blocked the ream-former 33, which is thus freed and becomes capable of sliding along the bottom 25.

[0101] Subsequently, the operator makes the ream-former 33 slide along the slot 47, keeping, by way of the lever 72, the levers 76 and 77 raised all the time off the bottom 25, until one of these levers is aligned with the slit 78 corresponding to the format of the ream 22 to be loaded.

[0102] At this point, the operator releases the lever 72, so that the lever 76 or 77 is inserted in the desired slit 78, thus stably blocking the ream-former 33 in the position corresponding to the format of the new ream 22 that the operator intends to load.

[0103] The operation of inserting the levers 76 and 77 in a new slit 78 different from the previous one, in order to adapt the seat 51 to a new format of the ream 22, may be considerably facilitated by sliding the ream-former 33 along the slot 47 while at the same time keeping the levers 76 and 77 set on the bottom 25.

[0104] To this end, the operator, after extracting the lever 76 or 77 that was blocking the ream-former 33, from the relative slit 78, moves the ream-former 33 slightly laterally, to prevent the extracted lever from being reinserted in the slit 78, and then releases the lever 72 so that both the levers 76 and 77 are set on the bottom 25.

[0105] Then, with the levers 76 and 77 set on the bottom 25 and pushed constantly against the latter by the spring 73, the operator slides the ream-former 33, until one of the levers 76 and 77 meets the slit 78 corresponding to the format of the new ream 22, and is automatically inserted in this slit under the action of the spring 73. Naturally, when sliding the ream-former 33, the operator must take care to avoid, in particular when working with the lever 72, inserting the levers 76 and 77 in a slit 78 corresponding to an unwanted format.

[0106] Similarly to regulation of the position of the ream-former 33, and therefore of the wall 34, the operator, depending on the new format of the ream 22, also performs regulation of the position of the member 54, by sliding it along the slot 56, and then blocking it with respect to the bottom 25, when the desired position is reached.

[0107] In this way, the plan dimensions of the seat 51 are adjusted to the format of the new ream 22, and in particular the length L along the edge 52 assumes a value corresponding to the length of the front edge of the ream 22, arranged to co-operate in contact with the pick-up device 26.

[0108] In the step described above of regulating the positions of the ream-former 33 and of the movable element 54, the operator can receive valuable help in reaching the desired positions quickly and accurately, by the indications of the different formats stamp-marked local to the positions of the ream-former 33 and of the regulating member 54 and corresponding to the different possible formats.

[0109] The ream-former 33, as it slides to reach the new selected position corresponding to the format of the new ream 22, determines the intervention of the regulating mechanism 36 in order to adjust, depending on the format of the new ream 22, the regulating couple applied by the regulating mechanism 36 on the support plate 32 and with respect to the relative pins 35.

[0110] As already stated, this regulating couple is summed with the elastic force exerted by the elastic means 37 on a lower face of the support plate 32, so that the latter is subjected to an overall couple adapted to the format, and therefore to the weight and dimensions, of the new ream that will be loaded in the seat 51.

[0111] It is underlined once again that this overall couple acts on the support plate 32 so as to oppose the weight of the ream 22, when it is set on the plate 32, and is also of such a value as to always prevail over the weight of the ream, even in the case where this reaches the maximum permissible values.

[0112] It follows that the support plate 32 is always capable of raising the ream 22, whatever its format, and together with it the protrusions 57 and 58 as well, so as to consequently push the levers 121 and 122 against the relative stops.

[0113] It also follows, as will be better specified below, that at the end of the step of loading the ream 22 in the tray 21

the top sheet of the latter, is always, whatever its format, at a predetermined position and height with respect to the bottom 25.

[0114] In particular, the sliding of the ream-former 33 along the bottom 25 commands, through the arm 83 which in turn slides in the slot 84, the rotation of the cam 89 about the pin 88.

[0115] The rotation of the cam 88 commands, through the rod 95, the linear sliding of the transversal bar 91 along the bottom 25, so as to adjust, depending on the format of the ream, the elastic load applied by the traction springs 92 on the legs 94 of the support plate 32, and consequently also the regulating couple acting on the support plate 32 with respect to the relative pins 35.

[0116] At this point, after regulating the plan dimensions of the seat 51, the operator performs loading of the new ream 22 in the tray 21. In this step, depending on the format of the ream 22 and its disposition with respect to the edge 52, the ream 22 can be set by the operator either fully on the support plate 32, or partly on the support plate 32, and partly on the bottom 25, but in any case always with the front edge of the ream 22 aligned with the edge 52.

[0117] To this end, the operator suitably lowers the support plate 32 in opposition to the action of the elastic means 37, and places the ream 22 on the support plate 32, in such a way that the front edge of the ream 22 is pinched, local to its two side corners, between the support plate 32 itself and the protrusions 57 and 58 of the retaining elements 53.

[0118] In this way the ream 22, when it is fully inserted in its seat 51, is stably retained on three sides, respectively by the fixed wall 19, by the adjustable wall 34, and by the regulating member 54, and is also retained along its front edge, i.e. local to its portion arranged to co-operate in contact with the pick-up device 26, by means of the protrusions 57 and 58. Further, whatever the thickness of the ream 22 loaded in the tray 21, the top sheet of the ream 22 is always at a constant predetermined height with respect to the bottom 25.

[0119] In fact, as already stated, the protrusions 57 and 58, which directly contact and retain the corners of the front edge of the sheet, are constantly subjected to an upwards thrust on account of the overall couple applied on the support plate 32 by the regulating device 36 and by the elastic means 37, so that the levers 121 and 122, bearing the protrusions 57 and 58, are also pushed upwards until they stop against the relative fixed abutments, which limit their oscillation.

[0120] It is clear that the inclination, i.e. the angular position, of the support plate 32 with respect to the bottom 25 may vary depending on the thickness of the ream 22 loaded in the tray 21, but it is equally clear that, in any case, the position of the protrusions 57 and 58, and therefore the height of the top sheet of the ream 22 with respect to the bottom 25 will always be the same at the end of the loading of the ream 22.

[0121] Following this, with the operation of loading of the ream 22 in the tray 21 concluded, the operator inserts the latter, if not yet inserted, in the seat 50 prearranged in the photocopier 24, and finally pushes the tray 21 so as to slide it along the seat 50, until the tray 21 reaches its working position.

[0122] The sliding of the tray 21, along the relative seat 50, automatically results in positioning of the movable roller 106 at a predetermined distance from the side 39 (Fig. 2) of the ream 22 placed against the wall 34 of the ream-former 33.

[0123] In particular, the ream-former 33, while the tray 21 slides along the seat 50, engages by way of the protrusion 48 with the protruding arm 109, which is initially displaced, under the thrust of the springs 111 and 114, to the area local to the end of the shaft 101 adjacent to the entrance of the seat 50, as indicated with the dash and dot line in Fig. 13.

[0124] Therefore, while the tray 21 completes its stroke along the seat 50 to reach the relative working position, the protrusion 48 trails the arm 109, causing thereby the axial sliding of the bushing 107 and accordingly of the movable roller 106 along the shaft 101, in opposition to the action of the springs 111 and 114.

[0125] In this way, as illustrated with the unbroken line in Fig. 14, at the end of the stroke of the tray 21 along the seat 50, the ream-former 33 places the movable roller 106 at a distance D1 from the edge 39 of the ream 22 against the wall 34 of the ream-former 33, having a value that is predetermined and suitable for permitting an optimal peeling of the sheets 23 from the ream 22 itself.

[0126] In addition, the axial movement of the arm 109 also causes, through the spring 114, the trailing along the shaft 101 of the intermediate roller 112 which, in this way, at the end of the insertion of the tray 21 in the seat 50, is located approximately equidistant from the rollers 104 and 106.

[0127] The roller 104 integral with the shaft 101 is also, when the tray 21 is fully inserted in the seat 50, at a predetermined distance D2 from the side of the ream 22 against the wall 19, whatever the format of this ream 22.

[0128] Further, in the working position of the tray 21, the sheet that is uppermost in the ream 22 is adjacent to and at a predetermined distance from the pick-up device 26.

[0129] Subsequently the latter, generally following a specific command from the operator, effects a programmed picking cycle, controlled by the inserting device 103, consisting of one or more rotations of predetermined entity of the shaft 101, so as to bring the circular portions of the picking rollers 104, 112 and 106 into contact with the top sheet 23 of the ream 22, and accordingly to cause its separation and picking from the other sheets of the ream 22.

[0130] In particular, the correct separation, one at a time, of the sheets 23 from the ream 22, following each picking cycle, is determined both by an adequate pressure acting between the semicircular portions of the rollers 104, 106 and

112, and the top sheet 23, when these come into reciprocal contact during the rotation of the shaft 101, and also by an adequate retaining action performed by the protrusions 56 and 57 on the sheet below the top sheet of the ream 22.

[0131] In particular, this retaining action prevents the sheet below from being trailed away by the top sheet, when the latter is contacted and picked by the rollers 104, 106 and 112.

[0132] The various details of function and construction, concerning in particular the retaining means 53, that enable this picking cycle to provide optimal results in separating and feeding the sheets from a ream, are widely known to those acquainted with the sector art, and have been frequently used in the art. These details will not therefore be described herein.

[0133] For the purposes of a clear understanding of this invention, it is again pointed out that an adequate value of the pressure acting between the pick-up rollers 104, 112 and 106 and the top sheet 23 of the ream 22, during their time in contact, is essential in order to guarantee a correct separating and feeding of the top sheet 23.

[0134] In the case of this invention, the value of this pressure corresponds to and is determined by the overall elastic couple or force acting on the support plate 32, in opposition to the weight of the ream 22 set thereon, being the sum of the predetermined elastic force applied by the elastic means 37 and the adjustable elastic force applied by the regulating mechanism 36. Therefore the regulating mechanism 36 and the elastic means 37 are dimensioned in such a way as to determine, when the rollers 104, 106 and 112 of the pick-up device 106 come into contact with the top sheet of the ream 22 loaded in the tray 21, a pressure, between the said top sheet and the pick-up device 26, having as optimal a value as possible for the purposes of a correct picking of the sheet, despite the variations of format and hence of weight of the ream 22.

[0135] Furthermore the regulating mechanism 36 and the elastic means 37 are of such dimensions as to maintain the pressure between the top sheet of the ream 22 and the pick-up device 26, within a field of still optimal values, also while the ream 22 is gradually consumed, due to the picking of the sheets, and its weight correspondingly reduced.

[0136] In particular, as already said, the regulating device 36 and more precisely the profile of the cam result in the application on the support plate 32, with respect to the pins 35, of a variable couple, following a predetermined law, depending on the position of the ream-former 33.

[0137] This variable couple is such as to determine, on being summed with that generated by the elastic means 37, the application on the support plate 32 of an overall couple or force having an optimal value, i.e. suitable for guaranteeing the best results in picking of the sheets 23 forming the ream 22 set on the support plate 32, upon variation of the position of the ream-former 33, and thus of the format of the ream 22 itself.

[0138] For completeness and to provide a clear indication of the performances provided by the tray of the invention, a table is provided below illustrating some operating parameters of the tray, detected experimentally using the test arrangement illustrated in Fig. 16.

[0139] In particular, the table indicates the various experimental values, measured in a tray 21 which has been removed from the seat 50, of a force F acting in the normal direction on a front edge of the ream 22 set on the plate 32, and apt to keep the top sheet of the ream 22 in question in a predetermined position corresponding to the working position assumed by the top sheet, when the tray 21 is accommodated in its working position in the seat 50, and the ream 22 is subjected to the pressure by the pick-up device 26.

[0140] Furthermore the value of the force F was detected, both by varying the format of the ream 22 contained in the tray 21, and for this purpose reams 22 were used having the dimensions of the main formats (A4, A4/R, A3, B5, B5/R e B4), and also by varying the number of sheets (500, 400, 300, 200, 100) comprising the ream 22, also including the case of an empty ream, i.e. comprised of 0 sheets.

[0141] It is added that the ream 22 used for the tests was comprised of sheets having a weight per unit area of approximately 80 gr/m².

[0142] It is clear therefore that the values of the force F thus detected are indicative of the values of the pressure operatively acting between the front edge of the ream 22 and the pick-up device 26, for variations, in the tray 21 of the invention, both of the format of the ream 22 contained therein, and of the number of sheets comprising this ream 22.

[0143] This table can also provide a most effective indication of how in reality the pressure exerted by the rollers 104, 106 and 112 on the sheets 23, for separating them from the remaining sheets of the ream 22, varies while thickness of the latter progressively diminishes due to the picking of the sheets 23.

No. sheets	500	400	300	200	100	0
A3	450	450	450	420	400	350
A4	450	450	380	355	355	350

(continued)

A4/R	470	430	380	375	375	350
B4	550	540	450	400	355	350
B5	480	450	425	425	400	350
B5/R	490	450	425	400	400	350
A5/R	457	454	430	425	425	350

[0144] As may be seen, on observation of the figures concerning the force F indicated in the table, the tray 21 enables the variation of the force F to be maintained within a fairly limited field, while the ream 22 is consumed, that is to say upon the variation of its number of sheets, in the case of practically all the main formats of the ream 22.

[0145] In particular, in the case of the A4 format, the variation of F, and therefore of the pressure between the ream 22 and the pick-up device 26, is of approximately 100 grams from when the ream 22 is full and has 500 sheets, to when the ream 22 is fully consumed.

[0146] The variation of F in the case of the other formats is more or less similar, and it is in any case sufficient to largely permit a correct separation and feeding of the sheets, during the entire period in which the ream 22 is consumed.

[0147] In particular the variation of F is permanently maintained inside the field defined by an upper limit of 550 grams, above which the pressure between the ream 22 and the pick-up device 26 would be excessive and could consequently result in the feeding of two sheets at a time, and a lower limit of 270 grams, below which the pressure could prove insufficient to constantly guarantee the picking of the top sheet of the ream.

[0148] This also means that the tray 21 is capable of handling with optimal peeling results not only reams having widely differing formats, but also reams initially comprising a large number of sheets, in particular at least up to 500 sheets, so that it may be concluded correctly that the tray 21 of the invention permits a genuinely universal application, due to its ability to contain and manage large quantities of sheets having the dimensions of the leading formats.

[0149] It remains understood that changes and/or improvements may be made to the tray for accommodating a ream of sheets of paper described up to this point, without departing from the scope of this invention.

[0150] For example, the types of springs used for the springs 61 and 62 and for the springs 92 could be inverted with respect to what has been described, that is to say the springs 61 and 62 could be traction springs, and accordingly the springs 92 could then be compression type.

Claims

1. Tray (21) for accommodating and feeding sheets of paper to an office machine (24), comprising:

a frame (31);

a seat (51) made in said frame and suitable for accommodating a ream (22) comprised of a plurality of sheets (23) and having a format corresponding to that of the sheets comprising it;

a support plate (32) movably fitted on said frame (31) and suitable for supporting at least partially said ream (22), when it is accommodated in said seat (51);

a movable wall (34) defining one side of said seat (51), and suitable for being displaced manually along said frame (31), in order to assume a plurality of predetermined positions, so as to adapt, depending on the format of said ream (22), the plan dimensions of said seat (51); and

elastic means (37) acting on said support plate for pushing said ream (22), in opposition to its weight, against a pick-up device (26) of said office machine (24) suitable for picking and feeding one sheet at a time from said ream (22),

characterized in that said tray further comprises regulating means (36), associated with said elastic means (37), for automatically regulating, depending on the position of said movable wall (34) and therefore on the format of said ream (22), an overall force exerted by said support plate (32) on said ream (22), for pushing it against said pick-up device (26), so as to correspondingly adapt the pressure generated between said ream (22) and said pick-up device (26).

2. Tray according to claim 1, **characterized in that** that said regulating means (36) comprise a cam (89) suitable for being commanded by the displacement of said movable wall (34) along said frame (31), intended to adapt the dimensions of said seat (51), and a transversal member (91) fitted movably on said frame (31) and suitable for being commanded by said cam (89) for exerting on said support plate (32) a variable force depending on the posi-

tion of said movable wall (32), in which said variable force is added to the elastic force applied by said elastic means (37) on said support plate (32) to determine said overall force.

- 5 3. Tray according to the claim 2, **characterized in that** said variable force is transmitted by said transversal member (91) to said support plate (32) through at least one spring (92) connected, by one end, to said transversal member (91) and, by the opposite end, to said support plate (32).
- 10 4. Tray according to claim 2, **characterized in that** said support plate (32) is fulcrum-mounted on said frame (31), and that said transversal member (91) and said support plate (32) are connected together, at two distinct zones, by two springs (92), so as to be free to rotate reciprocally, when said support plate (32) rotates with respect to said frame.
- 15 5. Tray according to claim 1, **characterized in that** said regulating means (36) are dimensioned in such a way that the force exerted by them on said support plate (32) assumes a substantially null value, when said movable wall (32) is moved along a first stretch between a first extreme position (Po) corresponding to a minimum value of a front side (L) of said seat (51) and an intermediate position (P1), so that while the displacement of said movable wall (34) remains inside said first stretch, said overall force is determined solely by said elastic means (37), and in that the force exerted by said regulating means (36) on said support plate (32) has an increasing pattern, when said movable wall (32) is moved along a second stretch from said intermediate position (P1) to a second extreme position (P2) corresponding to a maximum value of said front side (L).
- 20 6. Tray according to claim 1, **characterized by** a ream-former (33) sliding manually along said frame (31), in a direction parallel to a front edge (52) of said support plate (32), said ream-former (33) comprising a support (41) extending from said support plate (32) and forming said movable wall (34), and manually actuatable blocking means (71, 72, 76, 77), for blocking said ream-former (33), with respect to said frame (31), in a plurality of predetermined positions (Po, P1, P2) defining the different positions of said movable wall (34) arranged for adapting the plan dimensions of said seat (51).
- 25 7. Tray according to claim 6, **characterized in that** said elastic means (37) comprise two springs, of which a first spring (61) is affixed to said frame (31) and a second spring (62) is borne by said ream-former (33), and in that said ream-former (33) further bears a retaining protrusion (58) for retaining at one end a front portion of said ream (22) aligned, during application, with the front edge (52) of said support plate (32), so that said second spring (62) and said protrusion (58) of said retaining means move in conjunction with said ream-former (33) along said support plate (32) and in a direction parallel to the front edge (52) of the latter-named, when said ream-former (33) slides along said frame (31) to reach said predetermined positions (Po, P1, P2).
- 30 8. Tray according to claim (7) **characterized in that** said blocking means (71) comprise at least one lever (76, 77) suitable for engaging, in order to block said ream-former (33) in the relative predetermined positions (Po, P1, P2), with a plurality of slits (78) made in a bottom (25) of said frame (31).
- 35 9. Tray according to claim 1, wherein said pick-up device (26) comprises at least one feeding roller (106) suitable for sliding axially on a shaft (101), and further suitable for rotating in contact with a top sheet of said ream (22) to separate it from the other sheets of the latter, and said office machine (24) is provided with a seat (50) in which said tray (21) may be inserted in order to reach a working position, **characterized in that** said tray (21) further comprises positioning means associated with said movable wall (34) and suitable for positioning, along said shaft (101), said feeding roller (106), so that it is located, when said tray (21) is in said working position, at a predetermined distance (D1) from a side edge (39) of the ream (22) accommodated in said tray (21), whatever the format of this ream.
- 40 10. Tray according to claim 9, **characterized by the fact that** said movable wall (34) is arranged for cooperating in contact with a protruding arm (109) to push said movable roller (106) along said shaft (101), in opposition to the action of a spring (111, 114), while said tray (21) is being inserted in said seat (50), said protruding arm being borne by a bushing (108) rotatively coupled with said movable roller (106).
- 45 11. Tray (21) according to claim 1, comprising retaining means (53), associated with said pick-up device (26), to permit the sheets (23) to be picked up and fed correctly, one at a time, from the ream (22) set on said support plate (32), said retaining means being provided with at least one tab (57, 58) suitable for retaining a lateral corner of a front edge of said ream (22), **characterized in that** said at least one tab (57, 58) is fitted elastically with respect to said plate (32), so as to yield elastically and make room for said corner, when said ream (22) is arranged and laid manually on said support plate (32).
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- 55

12. Tray (21) for an office machine, especially though by no means exclusively a photocopier (24), suitable for accommodating a ream (22) comprised of a plurality of sheets (23), and comprising a support plate (32) whereupon said ream (22) is arranged to be set, and retaining means (53) operatively associated with a pick-up device (26) of said office machine (24), for determining the picking up and feeding, one at a time, of the sheets (23) from said ream (22), when the latter is accommodated in said tray (21) and set on said support plate (32), said retaining means (53) being provided with at least one protrusion (57,58) capable of retaining a corner of a front edge of said ream (22), **characterized in** that said protrusion (57, 58) is borne in said tray (21) in an elastically yielding way with respect to said support plate (32), so as to be able to yield and let said corner pass, and subsequently return to its original position after said corner has passed, when said ream (22) is arranged and set manually on said support plate (32).

13. Tray according to claim 12, **characterized in** that said retaining means are further provided with a lever (121, 122) suitable for oscillating with respect to said support plate (32), wherein said at least one protrusion (57, 58) is fulcrum-mounted on said lever (121, 122) and is suitable for oscillating with respect to the latter, in opposition to the action of a spring, to let said corner pass, and wherein said elastic means (37) constantly push said lever (121, 122), by way of said protrusion and said support plate, towards an extreme position corresponding to a predetermined position of a top sheet of said ream (22).

14. Tray for accommodating a ream comprised of a plurality of sheets and having a format corresponding to that of said sheets, in combination with a pick-up device arranged in a seat of an office machine, suitable for receiving said tray (21), said pick-up device (26) having at least one feeding roller (106) provided for rotating in contact with a front edge of said ream (22) accommodated in said tray, so as to separate and feed, one at a time, the sheets from said ream, said tray comprising a frame, a seat suitable for accommodating said ream, and a ream-former sliding along said frame, said ream-former being arranged to be put in a plurality of predetermined positions corresponding to the possible formats of said ream, so as to adapt, depending on said possible formats, the plan dimensions of the seat prearranged in said tray, **characterized in** that said ream-former, in whatever predetermined position it is placed, is suitable for co-operating with said feeding roller so as to position it at a predetermined distance from an end of the front edge of said ream, when said tray is inserted in the prearranged seat of said office machine.

15. Office machine **characterized in** that it incorporates a tray according to claim 1.

16. Office machine (24) according to claim 15, having a seat (50) wherein said tray (21) may be inserted in order to reach a predetermined working position, and wherein said pick-up device (26) comprises at least one feeding roller (106) suitable for rotating in contact with a front portion of said ream (22), when said tray (21) is in said working position, **characterized in** that said feeding roller (106) is axially movable along a shaft (101), and in that said pick-up device (26) further comprises a support (108) connected to said feeding roller (106) for trailing it along said shaft (101) in opposition to the action of a spring (111, 114), said support (108) being arranged for operating in contact with said movable wall (34), during the insertion of said tray (21) in said seat (50), in such a way as to dispose said feeding roller (106) along said shaft (101) at a predetermined distance (D1) from a side edge (39) of said ream (22), upon said tray (21) reaching said working position, whatever the format of the ream (22) accommodated in said tray (21).

17. Office machine **characterized in** that it is a photocopier for the reproduction of images on the sheets of the ream accommodated in said tray (21).

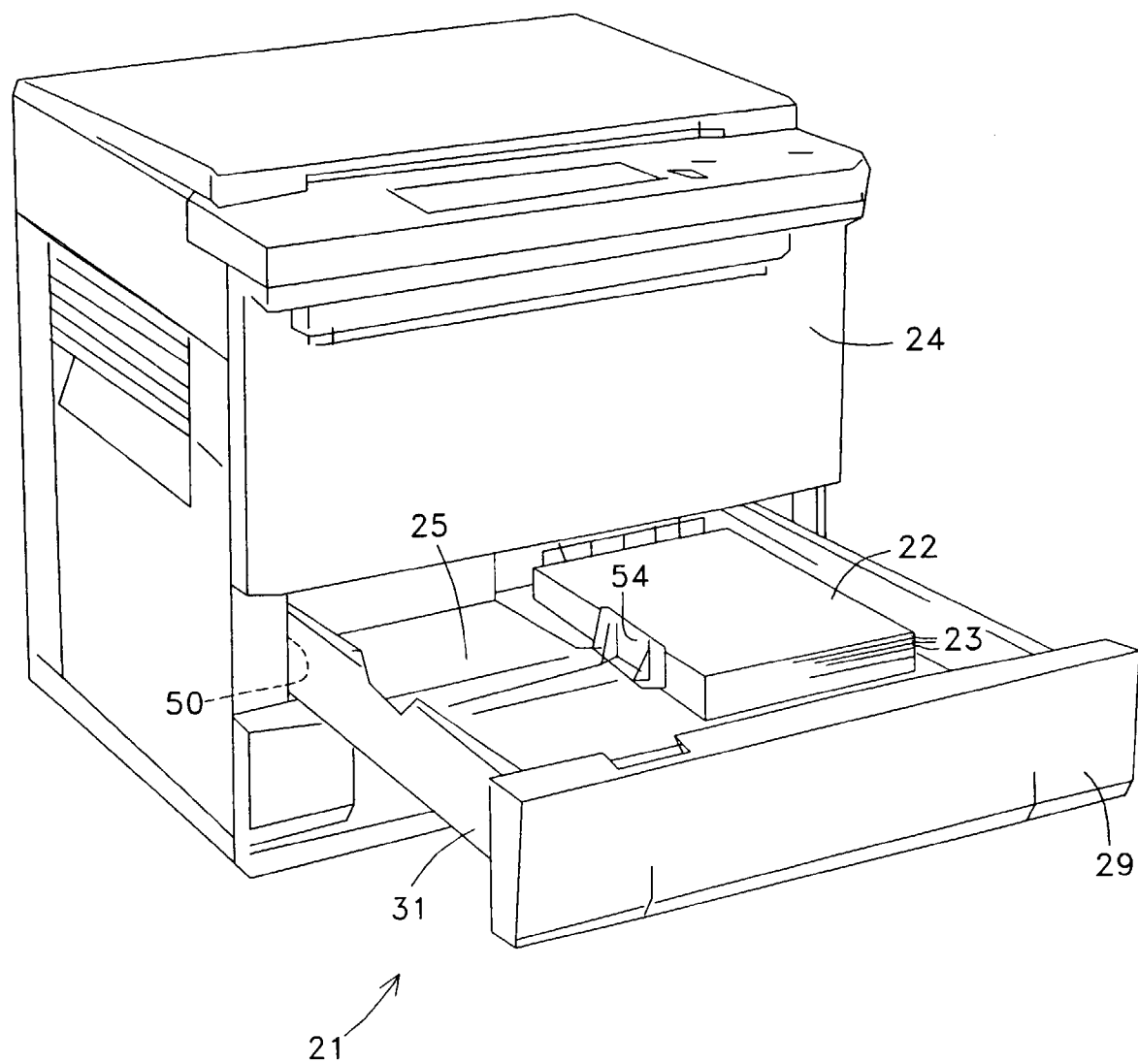


Fig. 1

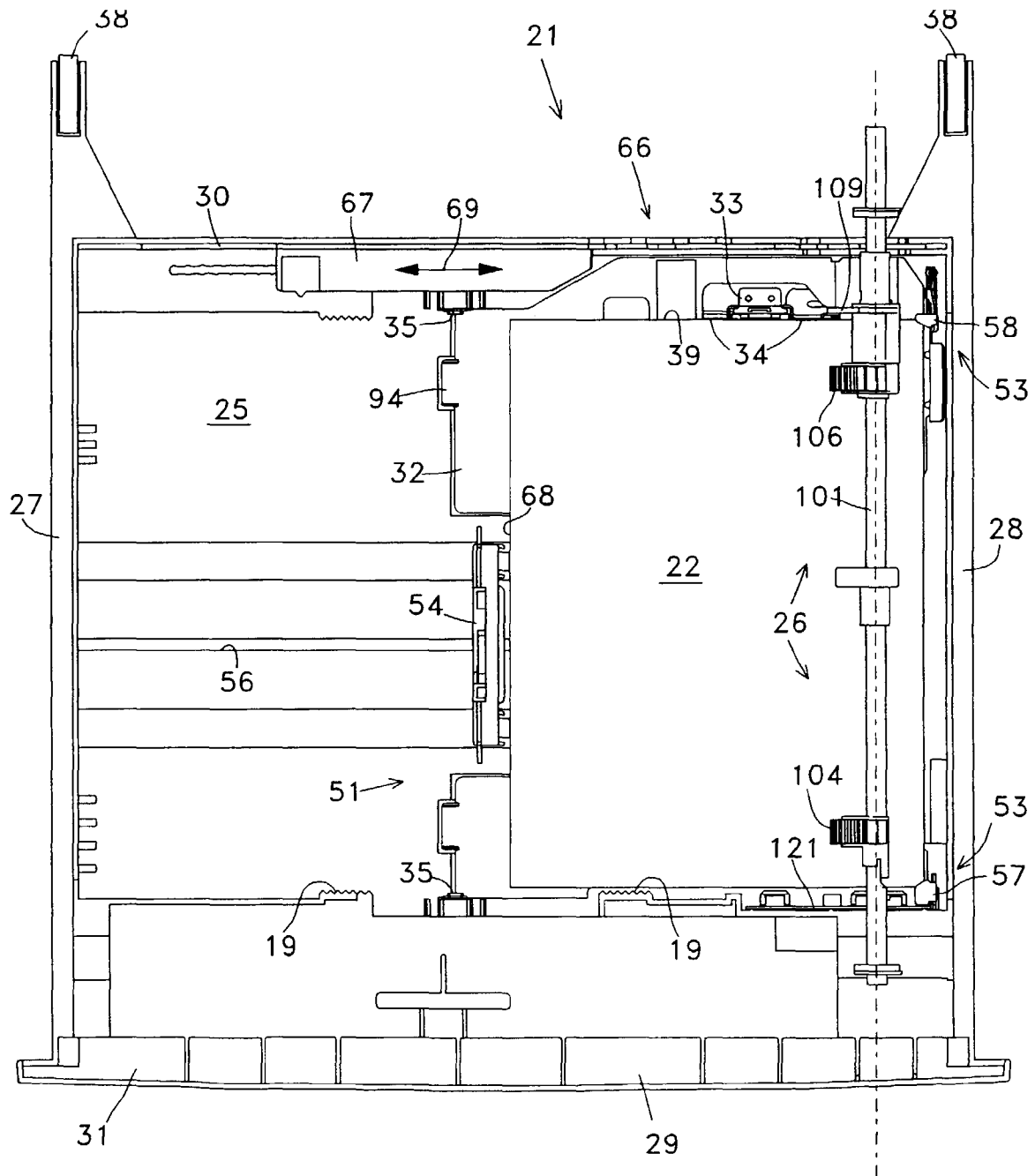


Fig. 2

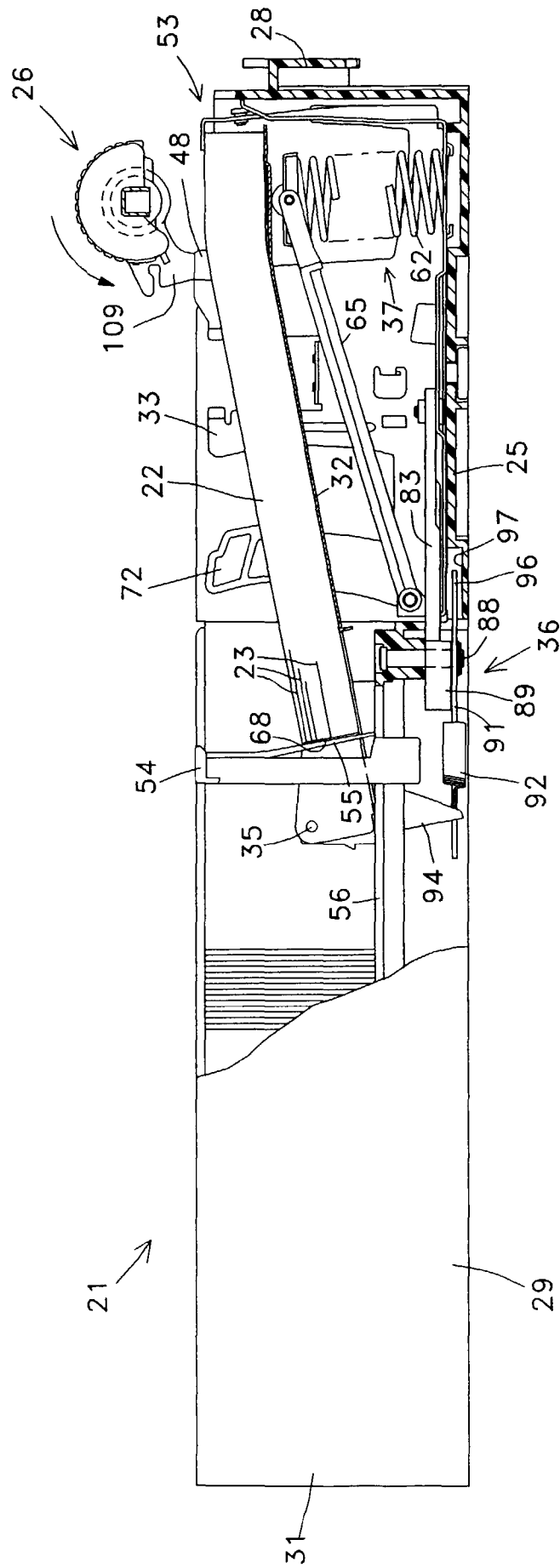


Fig. 3

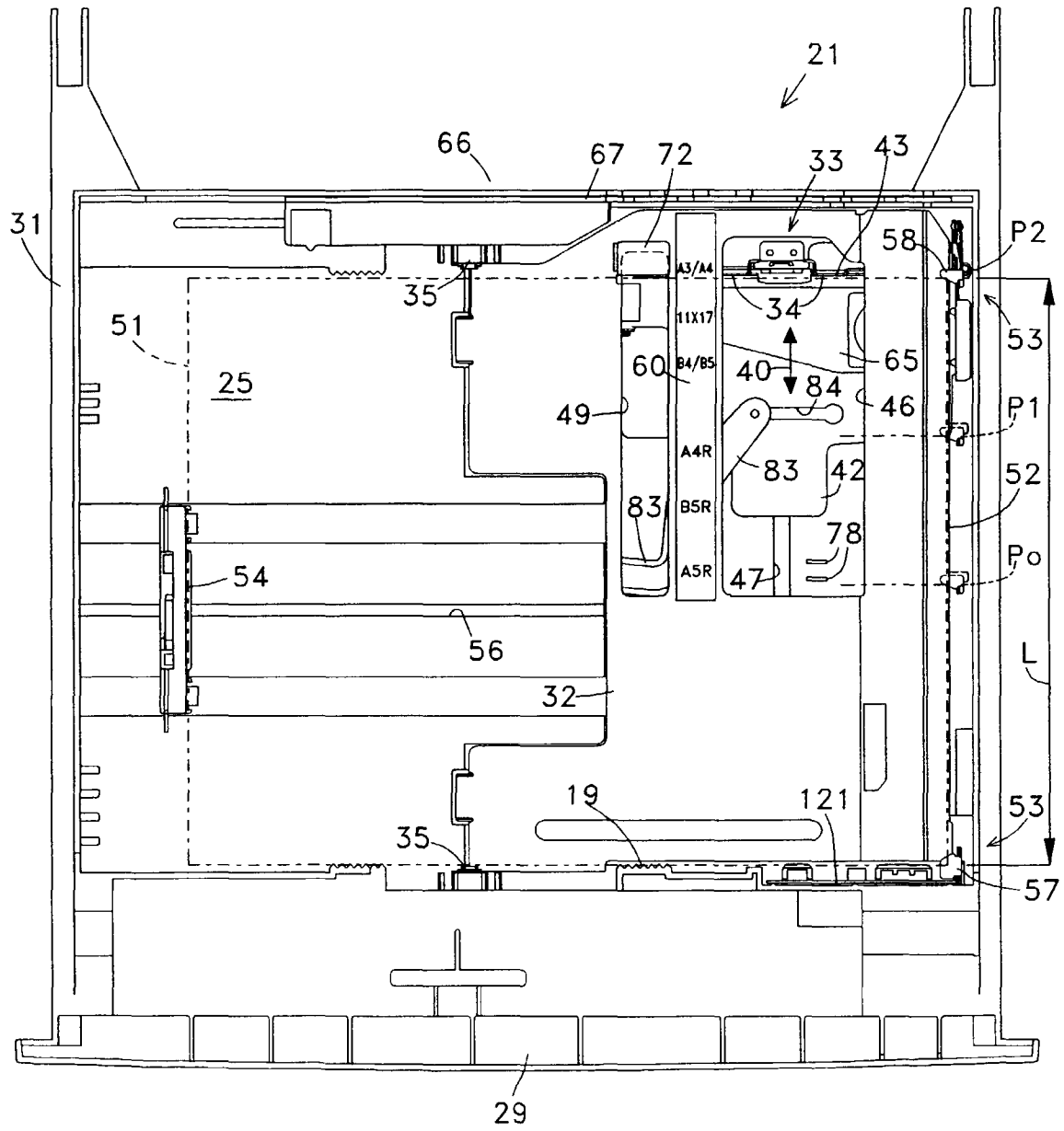


Fig. 4

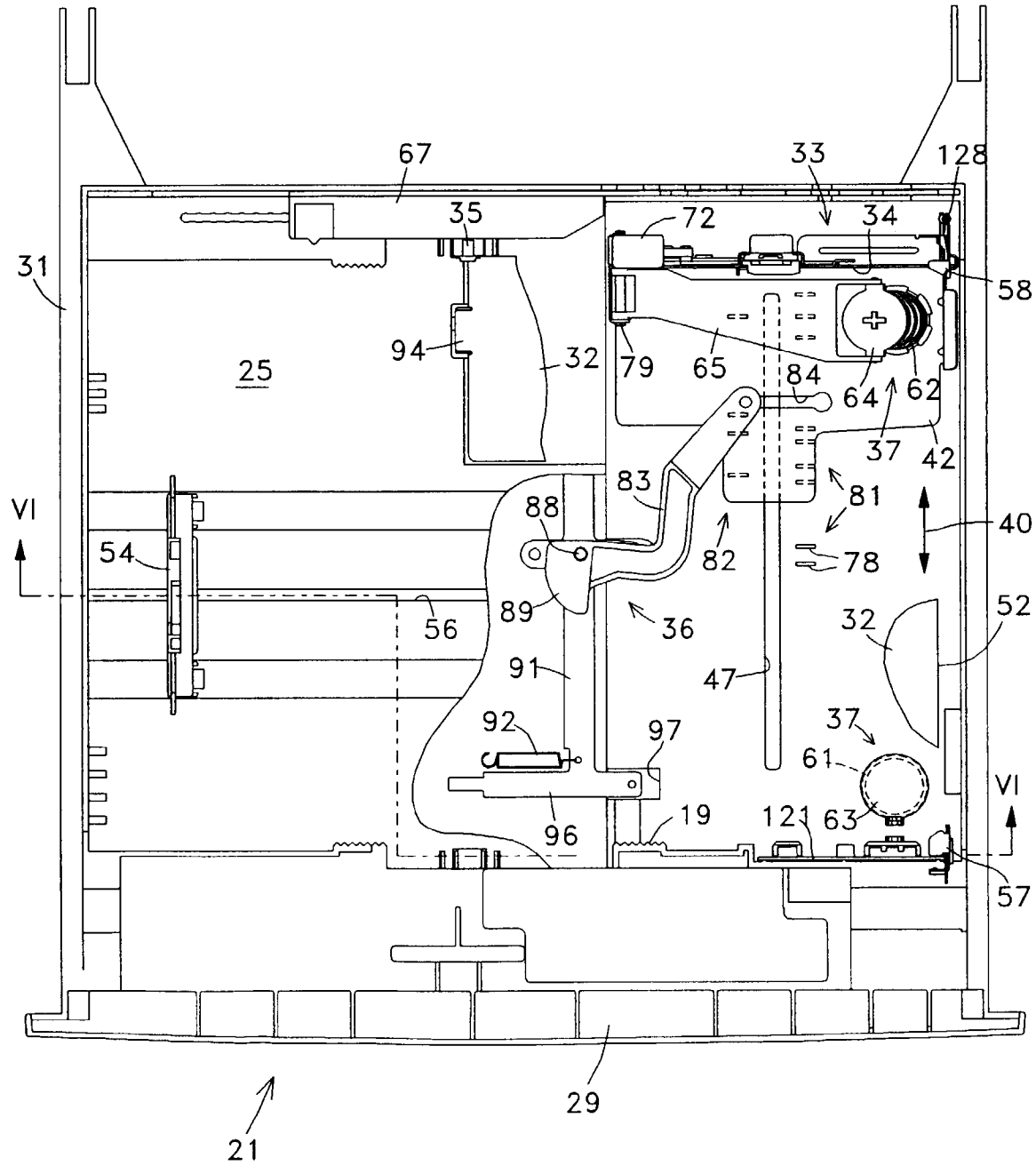


Fig. 5

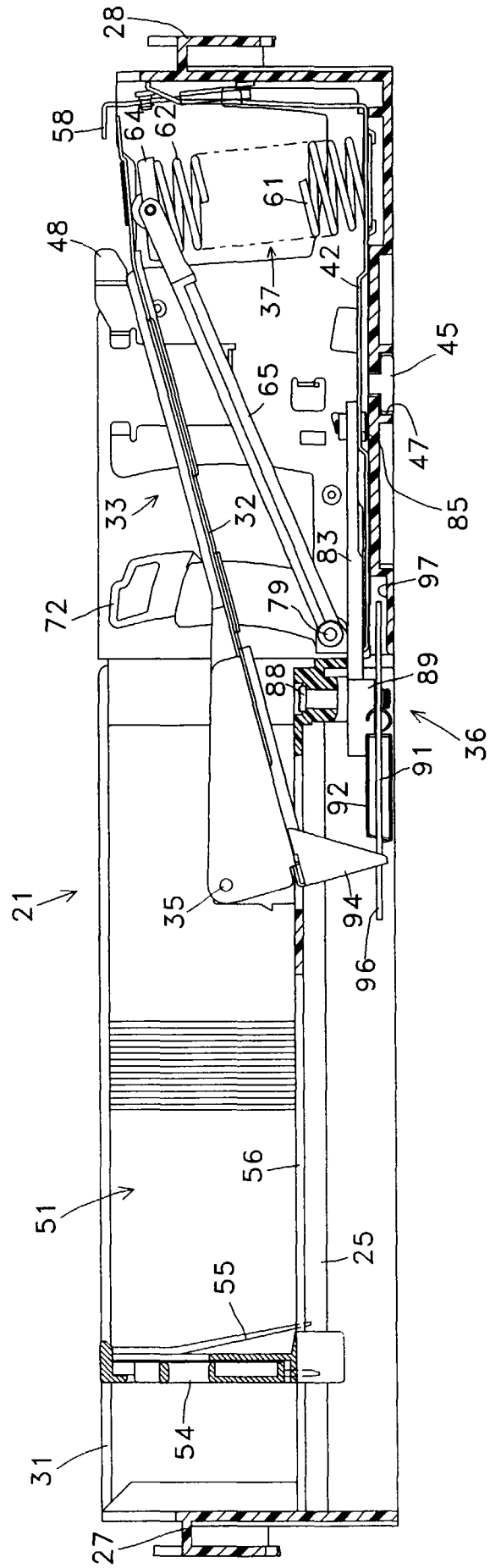


Fig. 6

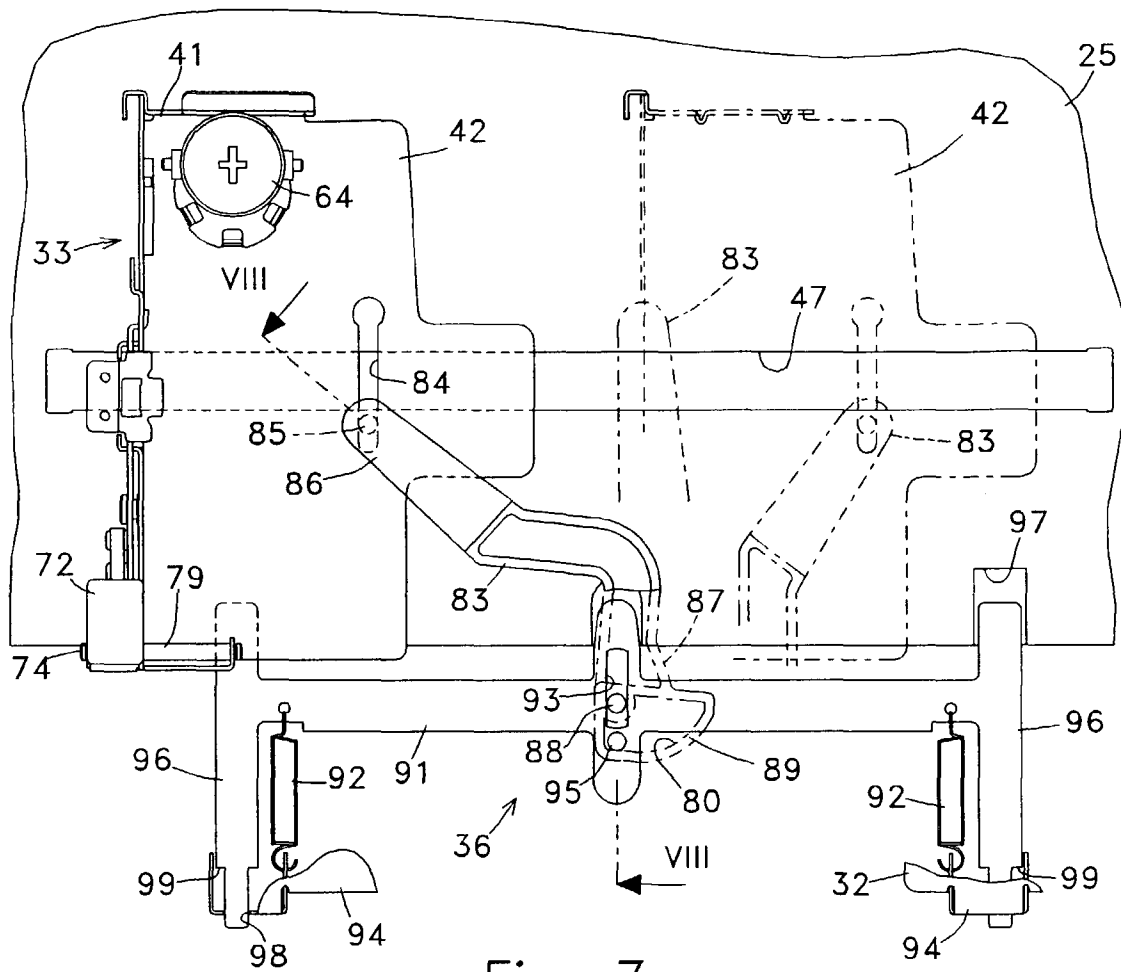
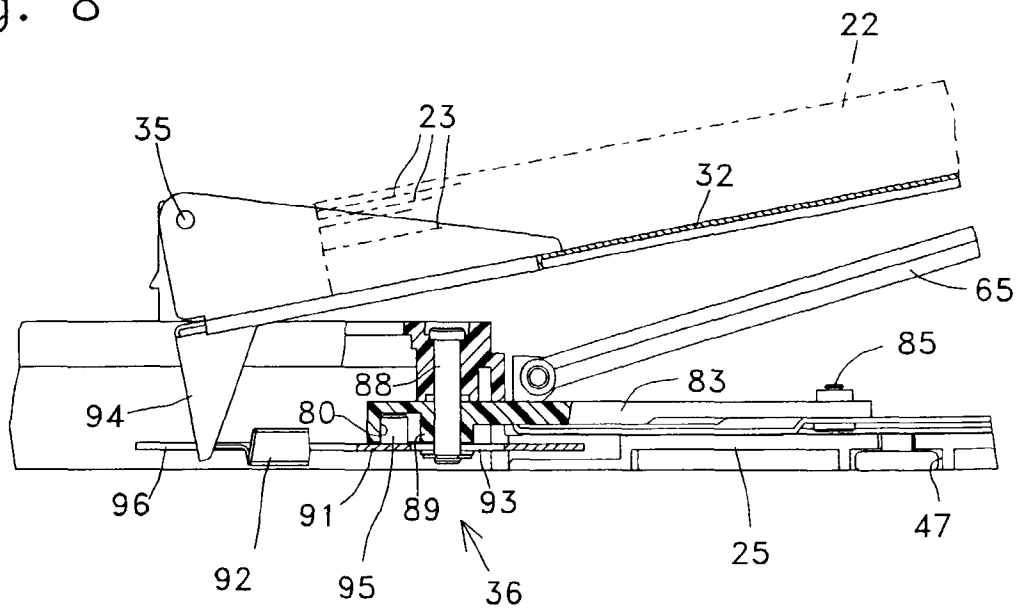


Fig. 7

Fig. 8



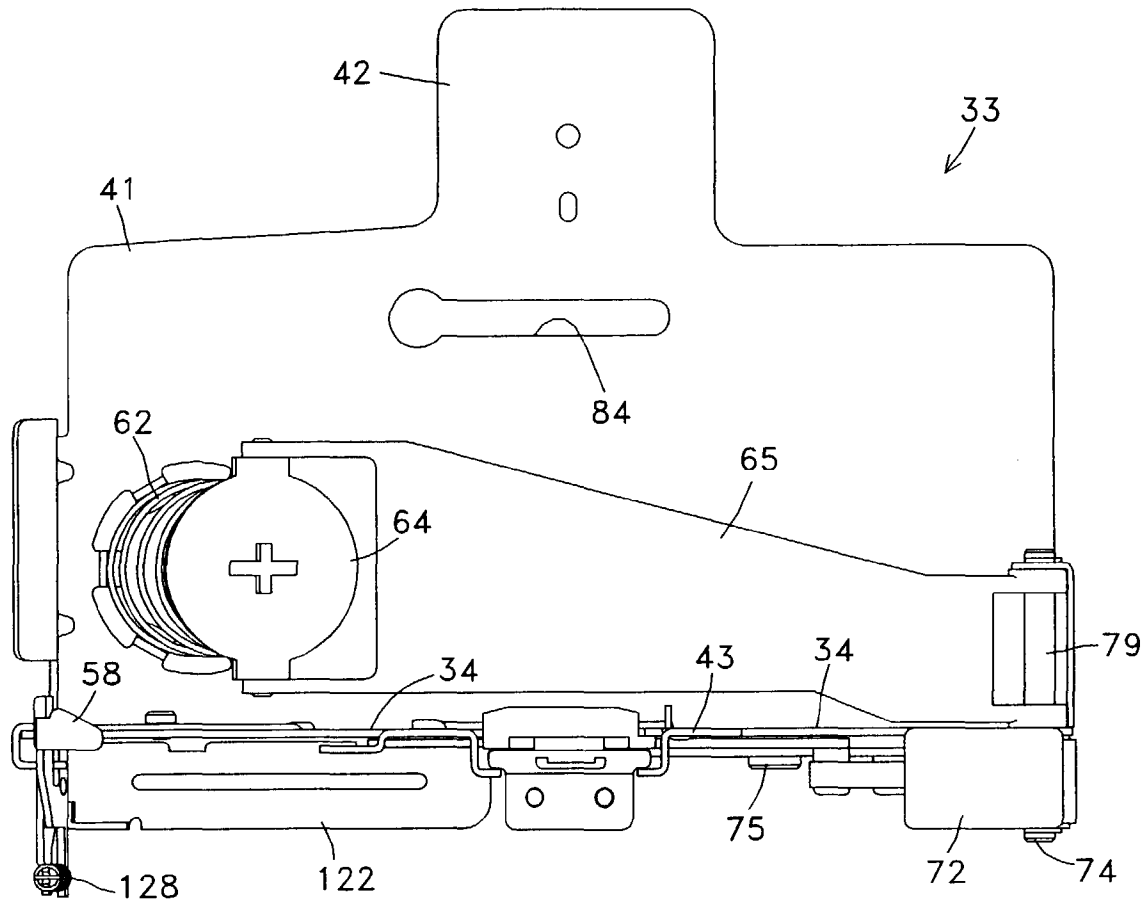


Fig. 9

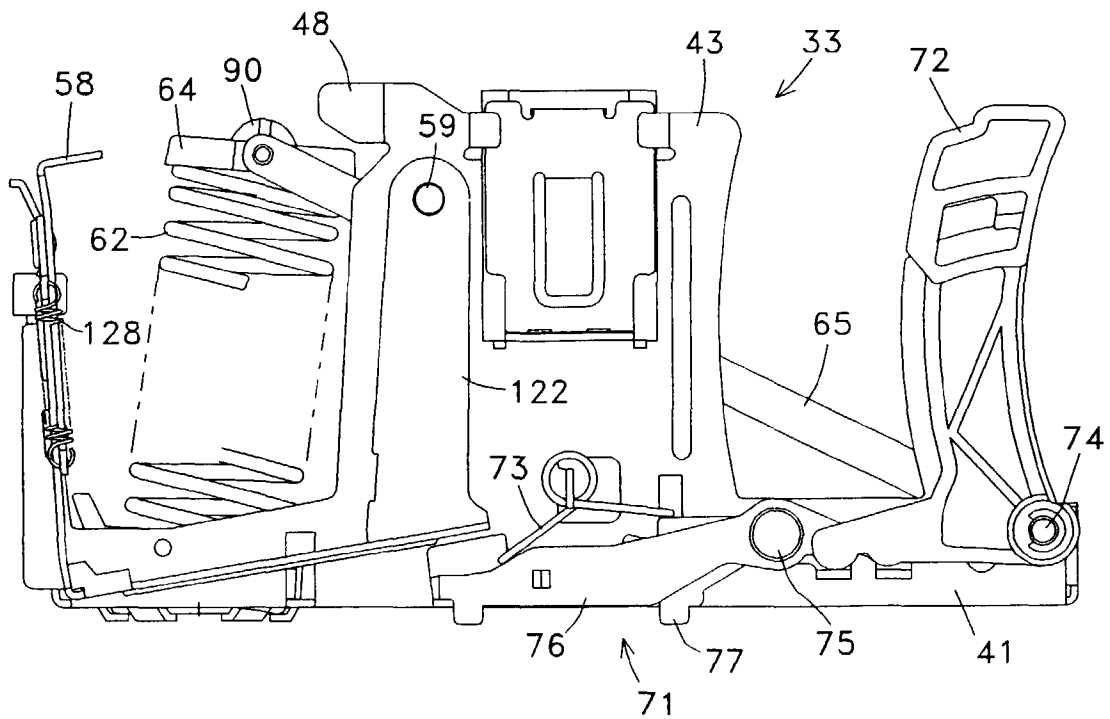


Fig. 10