Aug. 30, 1966 W. W. HARTER 3,269,591

PAPER DISPENSER WITH FLYWHEEL

Filed Dec. 3, 1964

FIG. 1.

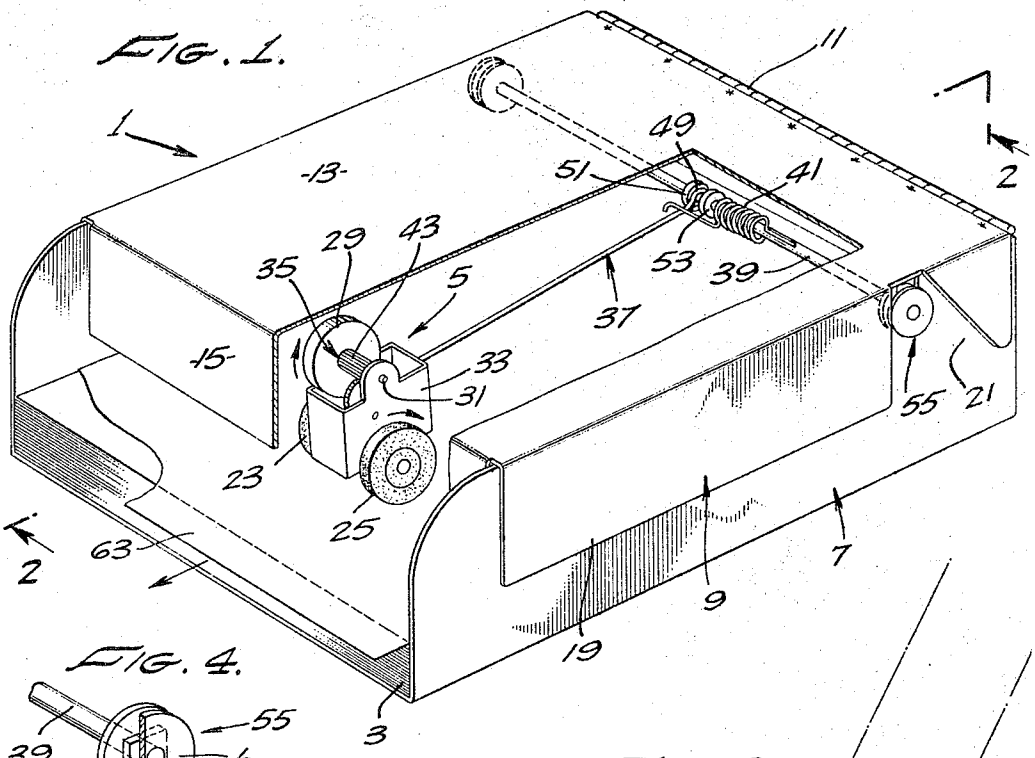


FIG. 4.

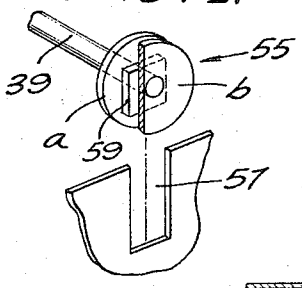
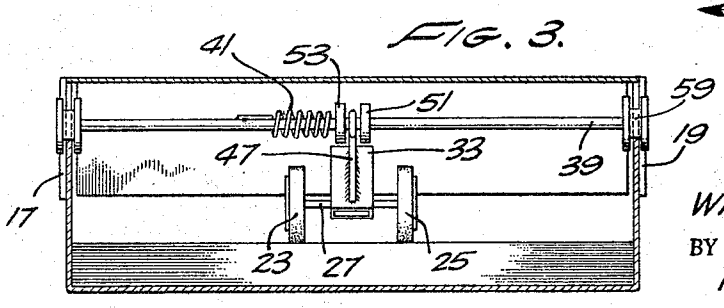


FIG. 2.

FIG. 3.



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PAPER DISPENSER WITH FLYWHEEL

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This invention relates to a device for automatically dispensing flat objects, one at a time, from a stack of same. More particularly, the invention relates to such a device primarily adaptable for the dispensing of individual sheets from stacks of stationery or similar paper materials.

It is common office practice to keep immediately available supplies of stationery, second sheets, various business forms, and other items constantly used in the conduct of business affairs, in open boxes, stationery racks, or the like in desk or filing cabinet drawers or in other locations, such as on desk tops, of a more exposed nature. The purpose of so maintaining current supplies of these materials is to have them instantly available for use and thereby avoid the necessity of continuously opening and closing stationery boxes, or the like, as the need for individual sheets arises. A primary disadvantage of leaving stationery, or other paper materials, wholly or partially exposed in this fashion is, of course, the resulting accumulation of dust, dirt and other soiling agents on the paper surfaces.

The present invention provides dispensing means for stationery and like materials, the use of which makes it possible for the daily consumer of such items to keep current supplies thereof protected from dust and other airborne soiling agents while they are being dispensed and, at the same time, making it unnecessary to open a box or other container each time a new sheet of paper or the like is needed. Moreover, the invention makes stationery supplies more readily available, as will be seen, than they would be if stored in open boxes or stationery racks in desk drawers or similar places. Another advantage of my invention resides in the fact that by its use individual sheets of paper are dispensed far more easily than they can be retrieved from stacks lying in open boxes or the like.

It is thus a principal object of this invention to provide a means of rapidly and effectively dispensing stationery and like materials a sheet at a time from a fresh supply protected against dust and other airborne soiling agents.

It is another object of the invention to provide such means in sufficiently compact and attractive form to permit its display and use in open locations, such as desk tops, heretofore felt to be unsuitable for such purposes because of space limitations. It is another object of the invention to provide such means which performs its successive dispensing actions through the utilization of energy expended in the removal of individual sheets of material therefrom.

Other objects, advantages and features of the invention will become apparent as the description thereof proceeds.

The structural character and manner of functioning of the dispensing means of this invention will be better understood from the accompanying drawing, of which:

FIGURE 1 is a cutaway perspective of a preferred form of a device in accordance with this invention, the device being shown in the process of operation and with arrows to indicate the directional movement of various of its component parts.

FIGURE 2 is a longitudinal sectional view of the device taken along cutting plane 2—2 of FIGURE 1, also showing, in phantom outline, a transposed position of the inner workings of said device illustrative of the later described manner in which they can be moved out of the

way for purposes of loading the device with stationery, maintenance work thereon, etc.

FIGURE 3 is a transverse view, mostly in section, of the device taken along line 3—3 of FIGURE 2.

FIGURE 4 is an exploded enlarged perspective view, partly in section, illustrating the means by which the internal workings of the device are supported and maintained in their proper operating position.

Considering now the drawing in greater detail, there is shown, in operating posture, a preferred embodiment of a stationery dispensing device **1**, having a housing with room for the disposition of a stack of stationery, or equivalent material, **3** with a dispensing mechanism **5**, described in detail below, supported thereon, said housing consisting of a bin **7** with side walls and a back wall **67**, a top enclosure **9** and hinges **11** between back wall **67** and the rear edge of the top enclosure permitting the latter to be raised and lowered for opening and closing purposes. Top enclosure **9** has a flat top **13**, a downwardly depending front skirt **15** and downwardly depending side flap **17** and **19**, the side flaps each being notched, as shown at **21**, for reasons explained hereinafter.

The dimensions and geometrical shapes of the top, side flaps and front skirt of top enclosure **9** are such as to permit snug fitting enclosure of bin **7** with said side flaps hugging the outer surfaces of its side walls, and front skirt **15** partially enclosing its front end, all as depicted in the drawing, and particularly FIGURE 1. The reason for only partial, rather than complete, enclosure of the front end of bin **7** by skirt **15** is, as will later be more evident, to leave room under its bottom edge for the removal of sheets from the stack of stationary **3** disposed in the bottom of bin **7**.

As previously indicated, dispensing mechanism **5** is supported atop the stack of stationery **3**. While, as previously noted, the stationery in stack **3** can be an equivalent material, it will hereinafter in this discussion, for purposes of simplicity, be referred to simply as stationery. The parts making up mechanism **5** are two friction rollers **23** and **25**, having rolling contact surfaces of rubber or like material, fixedly secured to the ends of an axle **27** which thereby turns with the rollers; a gear housing having front and rear walls and two side walls (the housed gears and means of support for said housing being described hereinafter); a flywheel **29** rotatably supported by means of an axle **31** and bearing brackets, as depicted on FIGURE 1, on the upper edges of the side walls of gear housing **33**; a train of gears **35**, supported within gear housing **33** in a manner presently described, linking flywheel **29** with friction rollers **23** and **25** in such a way that the flywheel revolves in the same direction as the rollers when they rotate; an anchor rod **37** fixedly secured to the rear wall of gear housing **33** at one end and eye-looped around a shaft **39**, supported transversely of bin **7** and rearwardly of the gear housing, at its other end; and a spring **41** bearing downwardly on anchor rod **37** near its eye-loop encirclement of shaft **39**, as shown on FIGURE 1.

Gear housing **33** is positioned about midway between friction rollers **23** and **25**, as shown particularly well in FIGURE 3, and the rollers are, in turn, positioned about midway between the side walls of bin **7**. The weight of the gear housing, as well as of the enclosed gears and flywheel **29**, is borne by friction roller axle **27**, by means of matching bearing holes in and near the bottom of the respective side walls of the gear housing through which the axle passes in journal-bearing relationship. This is well illustrated in the drawing, particularly FIGURES 2 and 3. To help prevent sidewise slippage between gear housing **33** and roller axle **27** the axle is splined interiorly of the housing adjacent the inner surface of each of its side walls. The resulting splines create an effective axle diameter too large to pass through the adjacent roller axle

bearing holes in the gear housing walls and thus prevent relative slippage between the gear housing and axle in either direction.

Gear train **35** can be any combination of intermeshed gears capable of transmitting kinetic energy from rollers **23** and **25** to flywheel **29**. The selection of a proper combination of gears for this purpose is not difficult. Suffice it to say that a first gear wheel will necessarily be keyed to axle **27** (possibly at one of its splined sections) and a second gear wheel **43** is in surroundingly coactive relationship with flywheel axle **31** so that the transmission of power through the gear train imparts the same rotation to flywheel **29** as it does to that gear. Since, as previously noted, the direction of functional rotation of flywheel **29** is the same as that of friction rollers **23** and **25** there must of necessity be an intermediate gear wheel, or its functional equivalent, separating and interengaging said first and second gear wheels. If the first and second gear wheels directly intermeshed, the latter, and hence flyheel **29**, would revolve in the opposite direction from the direction of rotation of the friction rollers. As in the case of the selection of suitable gears for the gear train, the improvisation of rotatable support means for said intermediate gear wheel, or its equivalent, in gear housing **33** is well within the skill of the routineer and hence will not be presently discussed.

Anchor rod **37** has a downwardly directed turn in one end, the downwardly depending segment thereof, shown at **47**, being fastened, by welding or equivalent means, to the rear wall of gear housing **33** to provide a firm hold on the housing. From the point of its downward turn, which occurs at **45** near the top of the rear wall of gear housing **33**, rod **37** extends straight rearwardly, at a slight angle of inclination, to its rear terminal eye loop **49**, encircling transverse shaft **39**. The eye-looped end of the rod is prevented from sliding any appreciable distance from the center of shaft **39** in either direction by two vertically parallel washers **51** and **53** force-fitted onto said shaft to positions closely flanking eye-loop **49**, as shown particularly well in FIGURES 1 and 3.

Shaft **39** is sized to fit transversely across bin **7**. For reasons later made evident, the shaft is held against axial rotation by a locking configuration at each end, one being shown in enlarged scale at **55** on FIGURE 4, which fits into a matching slot therefor in an appropriate one of the bin **7** sidewalls, one such slot being shown at **57** on FIGURE 4. The locking configuration comprises a pair of discs *a* and *b* and a flat block **59** of square periphery, all having center holes of a size just sufficient to receive shaft **39** in force-fit relationship. These three elements are force-fitted onto each end of shaft **39** with the shaft passing through the aligned center holes, the two discs being arranged either side of, and flush with, the flat block to form a sandwich-like combination. The hole directions in the discs and flat block are perpendicular to their faces and the flat block is of smaller cross-face dimension than either of the discs, thereby assuring a recessed area around its periphery and between the discs.

Slot **57** and its counterpart in the opposite bin sidewall are each designed to snugly receive one of the flat blocks **59** in coplanar relationship as illustrated by the drawing. When the flat blocks and their mating slots are thus fitted together, shaft **39** is held in horizontal position perpendicularly transverse, and near the top, of bin **7**. Each flat block **59** is slightly thicker than the bin sidewall slotted for its reception and, as above indicated, each edge of the block is recessed between parallel outwardly projecting peripheral segments of adjacent discs *a* and *b*. These peripheral segments prevent the axial migration of shaft **39** from its proper operating position and thus serve to lock dispensing mechanism **5** in place.

Downwardly depending side flaps **17** and **19** of top enclosure **9** have been partially cut away in the vicinity of the above-described slots in the sidewalls of bin **7**. The cut away parts of said side flaps, as the drawing shows, are of sufficient size and shape to permit the closing of top enclosure **9** without contact of the side flaps with either locking configuration on shaft **39**. The relative size and shape of the resulting opening in each side flap is apparent from the drawing.

Wound around shaft **39**, and having one straightened end extension attached by welding or other means thereto, is a helical spring **41**, previously mentioned. The unattached end of spring **41**, in straightened and extended form is so oriented as to cross anchor rod **37**, in downwardly pressing relationship, near its rearward eye-looped end. Spring **41** thus exerts a certain amount of force on dispensing mechanism **5**, the force being transmitted to gear housing **33** through anchor rod **37**, the purpose of this being to help maintain sufficient friction between rollers **23** and **25** and the top of stationary stack **3** to best enable the rollers to fulfill their function, as disclosed below.

Equivalent means of maintaining the necessary downward force on rollers **23** and **25** as, for example, the judicious attachment of a weight, or weights, to mechanism **5**, can be employed in lieu of, or in addition to, spring **41**, if desired. Here again, as in the case of certain other functional aspects of my invention, the determination of the proper amount of downward force, and its manner of achievement, is a simple matter to one skilled in the art and one which requires no exercise of invention in the light of present teachings.

As the drawing makes abundantly clear, the pictured dispensing device can be readily opened for replenishing its supply of stationery, repairing its inner working parts, etc., by merely raising top enclosure **9** on its hinges in the manner illustrated by the appropriate phantom lines on FIGURE 2. Also, as will be evident from the foregoing description and the transposed phantom outline position of dispensing mechanism **5** on FIGURE 2, that mechanism can be swivelled upwardly out of bin **7**, for any of various purposes, as desired. In view of this, it will of course be understood that the fit of eye loop **49** around shaft **39** is sufficiently loose to permit such swivelling action. It will also be understood, as a matter of common sense, that the two flat blocks in the end-disposed locking configurations on shaft **39** must be in aligned symmetry around shaft **39** for proper assembly of the pictured embodiment of my dispensing device. Finally, dispensing mechanism **5** is completely removable from bin **7** by the simple expedient of pulling it straight up and out of engagement with the receptive slots for the shaft **39** locking configurations in the bin sidewalls, being careful not to twist shaft **39** and jam said configurations in the process.

The manner in which the pictured embodiment of my dispensing device functions is well illustrated by the drawing, including, of course, the directional arrows thereon. To explain briefly its operation, however, after the top sheet of stationery is removed from stack **3** in the below-described manner, the sheet immediately below it is left, by virtue of the dispensing action of the device, with its front edge slightly projecting from the front of the stack, as shown at **63** on FIGURE 1 and **65** on FIGURE 3. This is the way in which my dispensing device works, that is, by always leaving the sheet to be next removed with a front edge projecting for easy grasp as a result of each separate sheet extraction from stack **3**. The sheet with the projecting edge is, as will be seen, always the top sheet of the remaining portion of stack **3** in bin **7**.

To extract a sheet of stationery from dispensing device **1** and trigger its dispensing mechanism to move a second sheet into proper position for subsequent ease of removal, edge **63** of the top sheet of stationary stack **3** is grasped by hand and pulled outwardly as indicated by the applicable directional arrow. The forward movement of the sheet, by virtue of its frictional contact with rollers **23** and **25**, causes the rollers to revolve in place in a clockwise direction from the vantage point for FIGURES 1 and 3, the consequent rotation continuing as

long as the rollers remain in contact with the moving sheet. The direction of rotation of rollers **23** and **25** is, of course, consistent with forward movement of the sheet of stationery with which it is in frictional contact, since such forward sheet movement is the prime mover for the roller movement. The rotational movement of rollers **23** and **25** transmits energy to flywheel **29** through gear train **35**, causing the flywheel to rotate in the same direction as the rollers.

As the sheet being pulled from the top of stack **3** moves ahead, its rear edge eventually clears rollers **23** and **25**. FIGURE 2 illustrates a point in the operation shortly after this clearance has taken place. The functional essence of this invention resides in the ability of my dispensing device to utilize kinetic energy stored in flywheel **29**, as a result of the above-described transmission of energy from rotating rollers **23** an **25** thereto, to perform its dispensing function. This is accomplished as follows: after the sheet being pulled from my device (hereinafter referred to as the motive sheet) clears rollers **23** and **25**, kinetic energy stored in flywheel **29** causes it to continue its rotation for a short period of time. The continued rotation of the fly wheel back-transmits power to rollers **23** and **25** through gear train **35**, thus causing them to rotate in frictional contact with the top sheet of remaining stationary stack **3** for a short while. The latter period of roller rotation is short because the kinetic energy imparted to flywheel **29** as a result of the limited energy input to the system by the pulling of the motive sheet from stack **3** is quickly dissipated by the drain of gear train **35** and rollers **23** and **25** operating in their dispensing capacity.

While, as explained, the time of rotational movement of friction rollers **23** and **25** after the motive sheet has been pulled from under them is small, it is adequate to cause forward movement of the next sheet down in stack **3**, upon which the rollers now rest, an amount consistent with the purpose of this invention. The amount of sheet edge projection shown at **65** on FIGURE 3 typifies this quantum of forward movement. It is, of course, the same frictional contact between stationery and rollers **23** and **25** which originally caused the rollers to move by contact with the moving paper that now causes the paper to move by contact with the moving rollers.

It will be appreciated that the particular embodiment of my dispensing device illustrated in the accompanying drawing is merely exemplary of one of its preferred forms, and that there are many variations thereof within the scope of my invention. Some of these variations have been disclosed above and others will readily suggest themselves to those skilled in the art from the present teachings. Within the latter category are such substitutionary changes as equivalent power transmission systems for gear train **35** (including gear trains causing oppositely directed flywheel rotation), equivalent pressure creating means for helical spring **41**, equivalent anchoring systems for gear housing **33**, and others too numerous to mention.

It is not essential to my invention that my dispensing mechanism be housed and so long as it can be adequately supported and maintained in position for operational capability (a feat normally requiring only the ordinary skill of the routineer), the mechanism can be employed in the open for dispensing sheets from a stack. Such utility carries with it operative ranges of unit size and classes of dispensible materials and the compass of the invention thus extends to units of any size and dispensible materials of any sort, in warehouses, lumber yards, or elsewhere, which lend themselves to the dispensing treatment of this invention.

This invention has been described in considerable detail in order to comply with the patent laws by providing a full public disclosure of at least one of its forms. However, as already indicated, such detailed description is not intended in any way to limit the broad features or principles of the invention, or the scope of patent monopoly to be granted.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

What is claimed is:

1. Means for dispensing flat objects from the top of a stack thereof comprising, in combination:

(a) roller means adapted to make dynamic frictional contact with a flat surface;

(b) means maintaining said roller means in frictional contact with the top of the stack of said flat objects whereby as the top one of said objects is pulled out from under it the movement of the object causes roller actuation of said roller means;

(c) flywheel means;

(d) means rotatably supporting said flywheel means; and

(e) means drivingly connecting said roller means with said flywheel means whereby roller actuation of the former in position atop the stack of said flat objects by pulling the top one of the objects out from under it causes the roller means to drive the flywheel means thus imparting kinetic energy thereto which, in turn, causes continued actuation of said roller means in frictional contact with the second one of the flat objects in the stack whereby that object is pushed forward to a position from whence its forward edge can be easily grasped for subsequent removal from said stack.

2. Means for dispensing sheets of paper, one at a time, from the top of a stack thereof comprising, in combination:

(a) a housing for a stack of paper sheets and the below-described dispensing mechanism, said housing having a front opening to permit withdrawal of said paper sheets therefrom;

(b) roller means adapted to make dynamic frictional contact with a flat paper surface;

(c) means maintaining said roller means in frictional contact with the top of a stack of said paper sheets whereby as the top one of the sheets is pulled out from under it the movement of the sheet causes roller actuation of said roller means;

(d) flywheel means;

(e) means rotatably supporting said flywheel means; and

(f) means drivingly connecting said roller means with said flywheel means whereby roller actuation of the former in position atop the stack of said paper sheets by pulling the top one of the sheets out from under it causes the roller means to drive the flywheel means with consequent absorption of kinetic energy by the latter which, in turn, causes continued flywheel movement after withdrawal of said top sheet past the zone of dynamic frictional contact with said roller means;

whereby said continued flywheel movement drives said roller means in dynamic frictional contact with the second one of the sheets in the stack to a sufficient extent to push that sheet to a position from whence its forward edge can be easily grasped for subsequent removal from said housing.

3. The means for dispensing sheets of paper of claim **2** in which the means drivingly connecting said roller means with said flywheel means is gear train means.

4. The means for dispensing sheets of paper of claim 2 in which the means maintaining said roller means in frictional contact with the top of a stack of said paper sheets comprises an elongated anchor member fixedly secured to said roller means to hold the latter substantially in place, and a spring so positioned as to exert downward pressure on said anchor member.

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