This invention relates to a paper towel, particularly to a paper towel which can be packed and dispensed in flat form, and to a dispenser therefor. This application is a continuation-in-part of application Serial No. 678,506 filed August 16, 1957, now abandoned, and of application Serial No. 783,401, filed December 29, 1958, now U.S. Patent No. 3,037,717.

Disposable paper towels are used widely in bathrooms, in the home, in automobiles, in picnics and in other places. It has heretofore been custom to prepare paper towels in the form of rolls or in the form of packs of interfolded individual towels for loading into a suitable dispenser from which individual towels can be dispensed as needed. Both of these forms are familiar in the trade.

It should be pointed out, however, that the provision of paper towels in the form of interfolded packs or in the form of rolls involves certain inherent disadvantages and uneconomical features. In the manufacture of packs of interfolded towels it is necessary that each towel be folded with respect to the next adjacent towel to be dispensed so that the withdrawal of one towel from a dispenser will effect the withdrawal of a part of the next towel into a position such that it can be grasped readily by the hand. This involves the use of costly and complicated folding machinery and requires the presence of a skilled operator to insure the successful operation of the apparatus and the production of properly folded towels. The preparation of paper towels in rolls is also a costly operation since it necessitates a rewinding operation to transfer the paper from a supply roll to the roll which is being formed. Individual towels of such rolls are generally separated from one another by a line of perforations and an additional operation is required to form the perforations. In addition, each roll requires the use of a core made of cardboard or other suitable material around which the perforated paper is wound and the core usually represents a substantial part of the material cost of each roll.

Both interfolded packs and rolls of paper towels are generally packaged in lots of several dozen or more for shipping, requiring the use of a carton made of heavy gauge corrugated paperboard or of other suitable material. Because of the nature of the interfolded packs and of the rolls, it is impossible to compress either of them prior to packaging into a shipping carton sufficiently to permit the economical use of the space within the carton. In the case of the rolls the towels cannot be wound too tightly on the core and there is also invariably a high proportion of waste space in the carton due to the unoccupied spaces between the round rolls. These factors lead not only to the use of undesirably large shipping cartons for the actual weight of paper contained in the cartons but are of importance in determining the freight rate on such large, bulky, relatively lightweight cartons of material. The net result is that both the packaging and shipping costs of both interfolded packs and of rolls of paper towels are excessively high considering the value and actual weight of the towels themselves.

The foregoing factors contribute in important ways to the high cost and inconvenience involved in the manufacture, packaging and shipping of paper towels in these forms. In addition, paper towels are often used, especially in the kitchen or laboratory, for purposes which necessitate their being spread out flat on a table or other surface. Towels which are sharply creased, as from being folded, or curled, as from being rolled, are not well suited to such uses and the consumption of paper towels for such purposes would be increased considerably if uncreased and uncurled towels which would lie flat on a flat surface were available.

According to the present invention the foregoing and other objections inherent in the manufacture, packaging, shipping and use of interfolded and rolled towels are overcome in great measure by providing a flat paper towel which can be assembled, in the way which will be described, in unfolded and unrolled form as a pack of flat sheets and, also, by providing a suitable dispenser in which a pack of the flat towels can be installed and from which the towels can be dispensed individually by mechanical means as desired, as will also be described. It is clear that any dispenser adapted to the dispensing of an individual paper towel from an interfolded pack or from a roll thereof would be of little or no value in dispensing flat, unfolded or unrolled paper towels.

The provision of such a towel makes it possible to arrange the towels in flat packs for ease of curves and, by suitably pressing the pack and banding it, to increase the density of the prepared pack to a value much greater than is possible with either interfolded or rolled towels. Because of the regular, usually rectangluar, configuration and relatively greater density of packs of the new flat towels, a given weight or number of the towels can be shipped in a much smaller carton than can an equal weight or number of towels in interfolded or rolled pack form with a consequent saving in carton costs and in shipping costs into the determination of which considerations of bulk may enter. The use of costly and complicated interfolding machinery is avoided as is the use of perforating machinery, rewinding machinery and the provision of cores normally required for the preparation of rolls of paper towels. A dispensed towel can be spread flat on a table top or other flat surface without any tendency for it to curl or lie unevenly when it is desired to use it in this way.

Although numerous attempts have been made heretofore to assemble flat paper towels in pack form from which individual towels could be dispensed as desired, these have not led to practical or economical arrangements. It will, of course, be apparent that in any such arrangement it is imperative from a practical point of view that the pack be disposed in a dispenser in a position such that each towel extends in approximately a vertical plane in order for the dispenser to present a neat and pleasing appearance and, more importantly, to avoid the projection of the dispenser in an ungainly fashion from a wall or other structure to which it is secured as would be the case if the individual towels were disposed horizontally within the dispenser. Heretofore it has been found possible to assemble paper towels in flat form for disposal vertically in a dispenser only in the form of integral pads in which the towels are secured to one another adjacent their top edges, generally by means of a mechanical fastening arrangement. In the case of mechanical fasteners for securing the towels together, it has generally been found necessary to actually perforate or otherwise form each towel so that it will tear around the fastener when dispensed in such a way that when all of the towels have been dispensed there will still remain a 'plug' of paper in the dispenser which must be discarded. The undesirably high cost of such an arrangement, due to the manufacturing operations involved and to the waste of paper incurred, as well as to the difficulty of developing a suitable dispenser for dispensing individual towels from such an
Although the invention will be described with particular reference to a paper towel in the form of a sheet of paper of suitable dimensions, weight and absorbent properties, it should be mentioned that paper sheets having a wide range of properties, particularly of flexibility and stiffness, can be formed into packs and dispensed in accordance with the invention, particularly when certain modifications which will be mentioned are incorporated in the dispenser. Such other sheets, for example, may, on the one hand, be made of waxed paper, parchment and certain grades of tissue and, on the other hand, of stock which is heavier and less absorbent than paper towelling stock, such as wrapping paper and the like. It will be clear as the description proceeds how the modifications mentioned can be incorporated to adapt the dispenser to the dispensing of paper sheets made of non-towelling stock.

The invention can be understood readily by reference to the accompanying drawing, wherein, in the interest of clarity, certain features are shown on a somewhat exaggerated scale and wherein:

FIGURE 1 is a plan view of a flat paper towel embodying features of the invention;

FIGURE 2 is an oblique elevation of a towel dispenser for dispensing individual towels similar to that of FIGURE 1;

FIGURE 3 is a side elevation, partially in section, of the dispenser of FIGURE 2 showing certain additional features thereof;

FIGURE 4 is a partial plan view of a cut metal blank illustrating one way in which certain features of the dispenser are provided for;

FIGURE 5 is a partial side sectional elevation showing the way in which the blank of FIGURE 4 is incorporated in the dispenser;

FIGURE 6 is a partial front sectional elevation corresponding to the side sectional elevation of FIGURE 5;

FIGURE 7 is a partial vertical sectional elevation showing an alternate arrangement of certain of the parts;

FIGURE 8 is a partial front elevation corresponding to the partial vertical sectional elevation of FIGURE 7;

FIGURE 9 is an elevation, partially in section, taken along the line IX—IX of FIGURE 3;

FIGURE 10 is a side elevation, partially in section and with certain parts cut away, taken along the line X—X of FIGURE 2;

FIGURE 11 is a side elevation, partially in section, corresponding to FIGURE 10 but showing a partial advancement of certain of the parts;

FIGURE 12 is a side elevation, partially in section, corresponding to FIGURE 11 but showing a further advancement of certain of the parts;

FIGURE 13 is a partial vertical sectional view taken along the line XIII—XIII of FIGURE 12; and

FIGURE 14 is an oblique elevation of a bound pack of paper towels of the invention.

Referring to FIGURE 1, there is illustrated a paper towel 15 which is adapted to be supported vertically in unfolded and unrolled flat condition in a suitable dispenser in a manner such that an individual towel may be dispensed from a pack thereof supported in the dispenser. It will be noted that the towel 15 is completely free of perforations or tear lines of any sort along which it must be torn during the dispensing operation and it will be apparent as the description proceeds that, when a plurality of the towels are assembled in face-to-face relationship in a pack and the pack loaded into a dispenser, the individual towels, although in face-to-face contact, are completely separate from one another. No stubs of the individual towels or "plugs" of the pack remain in the dispenser. Furthermore, because the towel stock used may comprise paper of a regular shape of the towel, an assembled pack, 55 of FIGURE 14, of a plurality of towels of satisfactorily high weight per unit volume for economical shipping can be formed, the pack being preferably bound with a paper band 16, as also illustrated in FIGURE 14. In addition, it will be clear that the packs, themselves, can be loaded into a suitably dimensioned shipping carton with essentially no waste space in the filled carton. Because of these considerations, the packaging and shipping costs of packs of the towels are reduced to a minimum.

A feature of the towel 15 is the provision which is made to support the individual towel both until the initiation of a dispensing operation and, of especial importance, until a sufficient section of an individual towel has been forwarded or ejected out of the dispenser into a position such that it can be grasped by the hand and the entire towel then withdrawn. Because of this feature there is no danger whatsoever of a partially ejected towel dropping out of the dispenser onto the floor before it is grasped by the hand. The supporting feature referred to consists of a pair of hanger slots 17 and 18 which extend from opposite lateral edges 19 and 21, respectively, of the towel 15 in the general direction of one another. The slots 17 and 18 are located in the upper half of the towel 15, i.e. they are located closer to the top edge 22 than to the bottom edge 23 of the towel. Although it will be apparent later on that considerable latitude can be exercised in the precise location of the slots 17 and 18, depending upon the characteristics of the particular paper towelling employed, it is generally convenient and preferable to locate the slots 17 and 18 so that they are removed from the top edge 22 of the towel by a distance equal to from about 10 to 40 percent of the length of the towel as measured between its top and bottom edges 22 and 23. For certain grades of paper towelling it is convenient to locate the slots at a distance from the top edge of the towel equal to from about 20 to about 30 percent of the length of the towel. The slots 17 and 18 are usually each removed from the top edge of the towel by the same distance.

The lengths of the hanger slots depend to a considerable extent upon the properties, including the weight and the stiffness, of the individual towel. To have the most desirable absorbent properties for water and to have a comfortable "feel" when used, most paper towels are cut from sheets of a moderately creped paper. Such towels possess a certain degree of stiffness and are not generally characterized as being "flimsy" but are still insufficiently stiff to have a harsh feel when used, e.g. when used to dry the hands. While it is not possible to give precise specifications, e.g. as to the degree of creping and the degree of stiffness, of paper suitable for use as towelling, such grades of paper are well known in the art and are herein sometimes, for want of a better term, referred to as simply "moderately creped" paper. Although the weight of paper used in making paper towels varies considerably, many towels are made from moderately creped paper having a weight of from about 25 to about 40 pounds per ream of 480 sheets each 24 by 36 inches. The paper towels of the present invention can be made satisfactorily from such paper stocks as have been described,
as well as from other stocks varying considerably from the ranges of properties just mentioned. Although the paper towel, and the dispenser therefor, of the present invention will be described with respect to the use of a paper stock having approximately the properties referred to for making the towel, it is pointed out that these properties are given merely by way of explanation, and are in no wise to be considered as limiting. Thus, as will be mentioned, by suitable modifications of the dispenser it can be used for dispensing sheets of moderately stiff tissue from a pack thereof or even for dispensing sheets of stock which is so stiff and harsh as to be wholly unsuitable for paper toweling. In some instances certain modifications of the sheet itself which is to be dispensed may be necessary or advisable, either with or without modification of the dispenser, and these matters will be referred to as the description proceeds.

Referring further to the hanger slots 17 and 18 of FIGURE 1, it is pointed out that the hanger slots not only extend from the lateral edges of the towel in a general direction toward one another but that they each also diverge downwardly from the top edge 22. The angle of divergence 24 of the slots will depend to a considerable extent on the properties of the particular stock from which the towel is made but with the general limit of about 5° to about 20°, the slots should be from about A6 to about 4 inch wide. However, as will be described further, sometimes a large number of hanger slots may be necessary in the case of less stiff sheets which can be curled on a shorter radius without damage.

The curling of the tab sections should be on a radius great enough to avoid creasing or breaking of the stock of the sections to an extent such that when they are released from the dispenser they will not curl and lie flat in essentially the flat plane of the balance of the towel. For this reason it is generally advisable in the case of especially stiff sheets to provide somewhat longer hanger slots than may be necessary in the case of less stiff sheets which can be curled on a shorter radius without damage.

From the foregoing it will be apparent that it is impossible to give any hard and fast specifications or limits for the exact location, width, length and angle of divergence of the hanger slots 17 and 18 since these properties of the slots depend upon so many properties not only of the towel itself but also of a dispenser in which a pack of the towels may be mounted for dispensing individual towels from it. However, with the foregoing considerations in mind, it is a simple matter, after the paper stock from which the towels are to be made and the particular dispenser which is to be used have been decided upon, to prepare a few individual towels in which slots of differing characteristics as guided by the foregoing discussion are cut and to then see which slot provides for the most satisfactory dispensing of the towels from the dispenser. Such a testing procedure can be carried out rapidly and easily without the use of special equipment of any sort.

Referring now to a dispenser suitable for containing a pack of towels similar to that of FIGURE 1 from which individual towels can be dispensed as desired, it will be noted from FIGURE 2 that one suitable dispenser comprises a flat cabinet of neat appearance, indicated generally at numeral 31, which can be hung on a wall or other support in any suitable fashion. The cabinet 31 as shown in FIGURES 2, 3 and 13 comprises a back member, including a back panel 32, forwardly projecting inner side panels 33 and 34 and a forwardly projecting inner top panel 35. The panels 33 and 34 are not necessarily connected at their upper ends with the panel 35. The cabinet 31 also comprises a front member, including a front panel panels 37 and 38 when the cabinet is closed is shown and a rearwardly projecting outer top panel 41. The back and front members are dimensioned with respect to one another so that the back member will telescope easily and snugly inside the front member when the cabinet is closed as in FIGURE 2. The back and front members are hinged together at the bottom as by hinge pins 42 of FITURE 1. The width of the cabinet is of course particularly critical but it is preferably appreciably wider than the rigid hanger plate which is to be employed, for reasons which will be mentioned later. Any undue width of the slots 17 and 18 is preferably avoided in the interest of conservation of paper stock since the towels are not curving away a correspondingly small portion of the sheet. In many instances, but again not by way of limitation, hanger slots which are from about 13/8 to about 1/4 inch wide can be employed with satisfaction.

It will be observed that if lines, represented by the dotted lines 25 and 26 of FIGURE 1, are drawn from the inner ends of the hanger slots 17 and 18, respectively, parallel with the lateral edges 19 and 21 of the towel 15 upward until they intersect the top edge 22 of the towel, there are defined between the slots, the upper ends of the lateral edges 19 and 21 of the sheet, the ends of the top edge 22 of the towel and the dotted lines 25 and 26 a pair of sections 27 and 28 of the towel. These sections 27 and 28 of the towel are, for want of a better term, sometimes herein referred to as "friction tab sections" or simply as "tab sections" of the towel. As will also be apparent from the following description, the tab sections 27 and 28 are each designed, as illustrated in FIGURE 13, to be curled inwardly of the sheet toward one another during the dispensing operation through an angle of at least about 30° into partial cylindrical form.

The arrangement to keep it closed, as by a hook 43 secured to the lower side of the inner top panel 35 and a suitable
catch 44 secured in suitable fashion inside the upper part of the front member in a position such that when the cabinet is closed the hook will engage the catch. Any convenient means can be employed for unlatching the fastening device when it is desired to open the cabinet. One convenient arrangement, indicated in FIGURE 2, comprises an open slot in the outer top panel 44 through which a key or other instrument can be inserted to depress the rearward end of the latch 44 and disengage it from the hook 43. The back and front members are open at the bottom. However, the lower end of the front panel 36 can, if desired, be sloped rearwardly in the form of a sloping throat panel 46 to decrease somewhat the size of the opening at the bottom of the cabinet and thus to restrict to some extent the entrance of dust and dirt into the cabinet as well as to prevent piffing of towels from the bottom of the dispenser.

The back member is provided with a pair of hanger plates 47 and 48, one of which is shown in FIGURE 3 and both of which are shown in FIGURE 13. The hanger plates serve to support a pack of paper towels of the kind illustrated in FIGURE 1 within the cabinet. One method of forming and attaching the hanger plate 47 is illustrated in FIGURES 7 and 8, it being understood that the opposite hanger plate 48 is formed and secured in a similar fashion. According to FIGURES 7 and 8, a suitably contoured strip of metal or other suitable material is formed in an approximately right-angular configuration so that one arm of the bent member can serve as a support plate 51 for the hanger plate 47. The support plate is secured to the inner surface of the back panel 32, as by rivet 52. In an alternate method for forming the hanger plates 47 and 48, a flat sheet of metal 53, which is to be used subsequently for forming the back member of the cabinet, is cut with a suitable die as illustrated in FIGURE 4 to provide a tongue which is to serve as the hanger plate 47 but which remains secured to the sheet along its rearward end. The tongue 47 is then bent upwardly until it extends at approximately right angles from the sheet 53 and the side of the sheet is also bent upwardly along the dotted line 54. In the finished cabinet the upturned edge of the flat metal sheet 53 thus becomes the inner side panel 33 and the adjacent portion of the sheet becomes the inner back panel 32. It is, of course, understood that the opposite hanger plate 48 is formed in similar manner at the same time.

The contours and locations of the hanger plates 47 and 48 within the cabinet 31 are of considerable importance. The outer edges of the hanger plates can be located as closely adjacent to the inner side panels 33 and 34 as conveniently possible in the interest of conserving space and material required to form the cabinet. It will thus be apparent as the description proceeds that the cabinet need only be a little wider than the width of a pack of towels which is to be suspended in it. The location of such a pack in the filled cabinet is shown clearly in FIGURES 3 and 10, as well as in various others of the figures, the outermost or front wall of the pack being referred to by the numeral 15 and the pack, in general, being referred to by the numeral 56. As seen from FIGURE 3, the pack 55 can extend almost to the top of the cabinet leaving room above it only for the hook 43 and catch 44 or for other elements of similar function. Similarly, as will be apparent from an examination of FIGURE 3, the pack 56 can extend essentially to the bottom of the cabinet so that the over-all area of the cabinet need be very little more than the over-all area of individual towels.

It will be noticed from FIGURE 8, as well as from FIGURE 6 and from various other of the figures, that the hanger plates 47 and 48 slope downwardly and laterally from their outer edges toward the center of the cabinet in much the same way as the hanger slots 17 and 18 in the towel 15 of FIGURE 1 diverge inwardly of the towel away from its top edge 22. As will be apparent from the drawings especially from FIGURE 1, the hanger plates 47 and 48 are inserted into the hanger slots 17 and 18, respectively, of the towels when a pack of towels is loaded into the cabinet. The loading operation is accomplished by opening the cabinet and swinging its front member downwardly out of the way and then inserting a pack of towels into the cabinet against the back panel 32 so that each hanger plate engages its respective hanger slot. In each of the towels in the pack, it being apparent from FIGURE 14 that the band 16 should not cover the hanger slots. This relationship is shown clearly in FIGURES 3, 6, 10 and 13. After the pack has been inserted and the band removed, the cabinet is again closed.

The degree of slope, i.e., the angle of divergence, of the hanger plates 47 and 48 is dependent to some extent upon the characteristics, such as the stiffness, of the paper towel which is to be dispensed using the dispenser. In general, the hanger plates should diverge centrally of the dispenser at an angle of from about 5° to about 30° away from the inner top panel 33 of the cabinet, usually at an angle of from about 8° to about 23°. It will, of course, be apparent that, in general, the angle of divergence, as indicated at 56 of FIGURE 6, of the hanger plates away from the inner top panel 35 of the cabinet will be approximately the same as that from the top edges 22 of the paper sheets in a pack loaded into the dispenser since the top edges 22 will generally be essentially parallel with the inner top panel 35. Although it will be noted that the range of angles of divergence given for the hanger plates 47 and 48, as indicated at 56 of FIGURE 6, is approximately the same as that for the hanger slots of the paper towels which are to be dispensed using the dispenser, it should be pointed out that in any particular instance it is generally advisable that the angle of divergence of the hanger plates be slightly greater than the angle of divergence of the hanger slots 17 and 18 of the towels. Although this difference will also depend to some extent upon the particular properties of the paper sheet to be dispensed, it is generally satisfactory for the hanger plates to diverge to an angle which is from about 2° to about 5° greater than the angle of divergence of the hanger slots. Thus, in the instance where paper towels having the characteristics previously referred to are to be dispensed from the dispenser, it is often convenient for the hanger plates 47 and 48 to diverge from the inner top panel 35, or from the top edge 23 of a towel suspended in the dispenser, at an angle which is approximately 3° greater than the angle of divergence of the respective hanger slots 17 and 18 diverge from the top edge 22 of the towel. This preferred relationship between the hanger plates and hanger slots is shown clearly in FIGURE 6. The reason for this preferred difference in the angles of divergence of the plates and slots will be mentioned later.

The proper contouring of the edge of each hanger plate facing the opposite hanger plate, i.e., its inner edge, is also important. As illustrated, especially in FIGURES 4, 7 and 13, it is convenient for the inner edge of each plate to extend forwardly in the dispenser essentially perpendicularly to the back panel 32, but so arranged that the respective hanger slots 17 and 18 are not larger than the over-all area of the cabinet 31. It is seen from FIGURE 3, 6, 10 and 13. After the pack has been inserted and the band removed, the cabinet is again closed.

The actual radius of curvature of the forward section of the inner edge of each hanger plate can lie within a
relatively wide range depending, to a considerable extent, upon the physical properties of the particular towels to be dispensed from the dispenser. Generally speaking, it is advisable in most instances for the radius for curvature of the sections 91 and 92 to be between about \( \frac{3}{4} \) inch and about \( \frac{7}{8} \) inch. In the dispensing of paper towels having properties heretofore mentioned, it is usually convenient to form the sections 91 and 92 on a radius of from about \( \frac{3}{4} \) inch to about \( \frac{7}{8} \) inch.

It is also desirable, although not essential in all cases, that the base of each hanger plate, i.e., the end or edge of the plate adjacent to the back panel 32, be formed on a short radius as indicated at 57 of FIGURES 5, 6, 7 and 8 so that the rearward end of the plate curves upward slightly before it adjoins or becomes integral with the back panel 32. This curvature of the rearward ends of the hanger plates can be quite small, usually on a radius between about \( \frac{3}{4} \) inch and \( \frac{7}{8} \) inch or more, often about \( \frac{5}{8} \) inch. The advantage of forming the hanger plate in this way is that, as illustrated in FIGURES 5 and 6, when a pack of paper towels is disposed in the cabinet on the hangers in the way which has been mentioned, and with the plates 47 and 48 diverging from the upper edges of the sheets somewhat more than the hanger slots 17 and 18, the outer lower corners of the friction tabs 27 and 28 will be in contact with a slight curve of the lower edge of the hangers. When the lower edge of the hanger plate 48, as illustrated in FIGURES 5 and 6, has been disposed in the cabinet the lower edge of the hanger plate 48 will engage the hanger slot 17 in a similar fashion. As soon as the frictional element 61, in its downward movement engages the front surface of the front face 15 and begins to forward the towel downwardly, forward curling of the friction tab sections 27 and 28 of the towel toward one another occurs, as shown in an intermediate stage in FIGURE 11, in response to the pressure of the sloping lower ends of the friction tab sections upon the upper surfaces of the hanger plates.

As the towel 15 is forwarded further downwardly, the lower edges of the friction tab sections 27 and 28 engage the inwardly curved forward end sections 91 and 92 of the inner edges of the hanger plates 47 and 48 and the curling of each tab section toward the opposite tab section is accentuated. As the frictional element 61 continues its downward travel, the curling of each entire friction tab section is caused to occur until the entire section is, as shown in FIGURE 12, in approximately partial cylindrical configuration, the curling usually occurring through a radius of at least approximately 90° until each friction tab section is in the approximate configuration of at least one-quarter of the surface of a cylinder, often being almost semi-cylindrical in configuration. This final configuration of the friction tab sections 27 and 28 and their relationships to the back panel 32 and the upper edge of the hanger slots 17 and 18 of the towel 15 below the hanger slots and to the rest of the pack 55 are shown clearly in FIGURE 13. Here it will be noted that the curled tab sections 27 and 28, because of their inherent stiffness and because they are not curled on a small enough radius to cause breakage or creating of the sections, press firmly and outwardly against the inner edges of the hanger plates 47 and 48 while the upper section of the towel between the tab sections 27 and 28, e.g., the section 63, because of the tension under which the tab sections 27 and 28 are held, presses firmly against the next adjacent towel in the pack.

By arresting the downward travel of the towel 15 when it has been forwarded downwardly sufficiently to assume the position shown in FIGURES 12 and 13, e.g., for roughly one-half the length of the sections, the frictional forward element 61 can then be returned to its original position as shown in FIGURE 10 out of contact with the towel 15, and the pressure of the tab sections 27 and 28 against the hanger plates 47 and 48, and of the upper central section 63 of the towel against the next adjacent towel, causes the forwarded towel to remain suspended in the dispenser with its lower end protruding beneath the frame of the dispenser in a position in which it can be contacted by the hand. With the towel suspended in this fashion there is no danger of its slipping downwardly out of the cabinet and falling on the floor to become soiled and wasted even though it be left suspended in this manner over a considerable time. It is apparent that once the towel 15 has been withdrawn completely from the dispenser the foregoing dispensing cycle can be repeated immediately and the next most forward towel dispensed in the same manner.

The frictional forward element 61 illustrated in FIGURES 9, 10, 11 and 12 can be of any conventional and suitable design and can be caused to travel in its path by any suitable type of mechanism. One suitable mechanism which can be employed is described and illustrated in the parent application Serial No. 678,506 and a further suitable mechanism is described and illustrated, and also claimed, in the parent application Serial No. 682,724. The nature of the forward mechanism described and illustrated in this application and the manner of its operation will be apparent from FIGURES 9, 10, 11 and 12. This mechanism is secured to the inner surface of the front panel of the cabinet and projects for only a little distance rearwardly into the cabinet, thus providing use of a cabinet having a minimum distance between its front and back panels. An actuating button or knob 65, secured to an element of the forward mechanism inside the cabinet, may be adapted to engage a forward element, or a like forward element, in the cabinet or in a cabinet for removing the towel.
the cabinet, projects forwardly through an actuator slot 66 in the front panel 36, as illustrated more particularly in FIGURE 2, the slot serving to guide the knob 65 in its vertical travel and to limit its travel upwardly and downwardly. The upper surface of the knob 65 is generally sloped upwardly away from the front panel of the cabinet to prevent the finger, from slipping off the knob when the knob is pressed downwardly. The dispensing operation is effected by the operator entirely by pressing the knob 65 downwardly as far as it will go in the slot 66 and then releasing it.

The dispensing mechanism also comprises a base plate 67 of suitably thin rigid material secured to the inside of the front panel 36 as by rivets 68. The base plate 67 is provided along its vertical edges with a pair of upstanding channels which face one another and which are formed conveniently by upstanding side members 71 and narrow longitudinal strips 72 removed from the surface of the base plate by a distance equal to the width of the slide members 71. The channels thus formed are on the side of the base plate 67 opposite the front panel 36. A suitable slider 73 of suitable width to be retained in the channels is located therein and adapted to slide upwardly and downwardly with respect to the base plate 67. A limit button 74 secured near the upper end of the base plate 67 limits the upward travel of the slider 73. The slider 73 is retained normally in its uppermost or retracted position by a suitable tensioned coil spring 75, one end of which is hooked over the upper end of the base plate and the other end of which is hooked over the lower panel of the slider. In one modification the slider is formed with a pair of raised inverted trough-like sections 76 and the spring 75 is conveniently located in one of these so that the major part of it is covered most of the time. The base plate 67 is provided with a slot 77 at least as long and as wide as the actuator slot 66 ends in register therewith. The slider 73 is also provided with a short slot 78 which, with the slider in its retracted position, is in register with the upper ends of the slots 66 and 77.

An elongated actuator tongue 81 is secured at its upper end, as by a rivet 82, to the upper section of the slider 73. The actuator tongue 81 projects downwardly of the dispenser from the rivet 82 for a suitable distance and has the frictional forward element 61 secured to its lower end, as will be described. The actuator tongue 81 is formed conveniently by being molded of a suitable plastic material so that it is relatively rigid from its lower end over most of its length upwardly. Stiffening ribs 83 can be formed along the edges of its rigid section if desirable or necessary. The actuator tongue 81 is also formed with a short section 84 which is sufficiently flexible to enable the forward element 61 to be swung into and out of frictional engagement with the forward towel 15 of the pack 55. This arrangement is conveniently provided for by making the section 84 thinner than the rest of the tongue and providing for termination of the stiffening ribs short of the flexible section. The entire tongue 81 can thus be molded of a suitable resinous material. The actuator button 65 can be formed integral with the actuator tongue 81, as illustrated in FIGURES 10, 11 or 12 or it can be formed separately and secured to the tongue as by a rivet 85 of FIGURE 9.

It will thus be observed that, when the mechanism is operated with the slider and attached parts in their retracted positions by pressing downwardly on the top of the actuator button 65 with the finger, the button slides freely in the slots 67 and 77. Because of the pressure of the finger on the button 65 is offset laterally with respect to the longitudinal axis of the actuator arm 81, the lower end of the arm is swung upwardly and the frictional element 61 is brought into engagement with the forward towel in the pack element 89 simultaneously with the downward travel of the slider 73. The knob 65 moves freely inwardly and outwardly through the slot 76 in the slider 73. The degree of pressure exerted by the frictional element 61 on the forward towel is related to some extent to the force exerted by the tension spring 75. As the knob 65 is pressed downwardly the slider 73 and the tongue 81, together with the frictional element 61, move downwardly as a unit and the front towel is forwarded downwardly in the way described previously. The limit of travel of the towel downwardly is, of course, defined by the length of the slot 66 and the distance through which the knob 65 can travel. For best results it is generally advisable to arrange for this distance to be approximately one-half, or somewhat less, of the length of the friction tab sections 27 and 28 of the towel.

The frictional forward element 61 can be secured to the lower end of the actuator arm 81 in convenient advantage. In one convenient arrangement the element 61 consists of an approximately half round section of relatively soft rubber with surface corrugations extending transversely with respect to the direction of travel of the slider. The actuator tongue 81 is formed with a broadened lower end 86 on which the element 61 is seated and to which it is secured by a suitable wire clip 87 lying in a suitable groove cut in the surface of the element 61. The parts are preferably arranged so that the frictional element 61 engages the towel approximately midway between its lateral edges and a center line of the towel. In this way any interference of the pressure exerted by the frictional element 61 upon the pack of towels with the proper curling of the friction tab sections of the towel is entirely avoided.

It will, of course, be observed that during the forwarding of the front towel by the frictional element 61 the forwarded towel is caused to slide along the surface of the second towel in the pack. This offers no difficulty whatsoever provided the frictional element 61 is chosen to engage the front towel with more friction than that with which the engaged section of the towel engages the next adjacent towel in the pack. It is sometimes advantageous to provide the back panel 32 with a thin friction plate, illustrated at 93 of FIGURE 12, over an area of its inner surface which receives a thrust from the frictional element 61 during its travel. Such a plate can comprise a sheet of soft rubber cemented to the back panel or can even be formed by painting a suitable area of the back panel with a composition which forms a film with a friction surface, or in any other suitable way. The provision of such a friction plate, although by no means essential, overcomes any tendency, which may sometimes be encountered with certain types of towels, for more than one towel to be forwarded down at a time of the frictional forward element 61 when more than one of the towels in the pack have been dispensed.

It will be noticed that there is illustrated in FIGURES 3 and 9 a tongue-like member 88 which is secured inside the front member near the upper end of the front panel 36 and which projects downwardly and rearwardly of the cabinet roughly the center of the pack of towels mounted therein. This element, which is a flat spring with a curved lower end, is sometimes of value when the sheets being dispensed are of relatively lightweight tissue. With such sheets there may be a tendency after the sheet has been forwarded downwardly in the cabinet for the curled friction tab sections 27 and 28, because of their very low degree of stiffness, to press against the hanger plates 47 and 48 with insufficient force to retain the sheet inside the dispenser and prevent it from falling out of the dispenser after the frictional forward element 61 has returned to its retracted position and no longer in contact with the sheet. By incorporating this modification the dispenser of the invention is particularly adapted to the dispensing of sheets made of lightweight tissue, oiled or waxed paper and other similar material. However, when paper towels and sheets of other materials having similar properties are used, the provision of the pressure spring 88 is unnecessary and is generally undesirable.
We claim:

1. In apparatus for dispensing single, flat, unfolded paper sheets of suitable flexibility and stiffness successively from a pack thereof comprising a plurality of sheets in face-to-face unjoined relationship, the combination including:
   a cabinet adapted to enclose a pack of flat paper sheets disposed vertically therein and comprising front, back, top and side panels, there being an opening at the bottom of the cabinet through which a single towel can be ejected from the pack,
   a pair of essentially flat, oppositely located, plate-like hangers, each secured with a lateral edge thereof adjacent to a side panel of the cabinet adapted to engage suitably formed opposite hanger slots in the sides of a pack of flat paper sheets to support the pack vertically within the cabinet,
   each hanger plate diverging from its edge adjacent to a side panel at a suitable angle away from the top panel of the cabinet, and the inner edge of each hanger plate extending forwardly in the cabinet for a suitable distance from the back panel with the end section of its inner edge farthest removed from the back panel being curved generally toward the opposite hanger plate on a suitable radius, and a vertically slidable forwarding means associated with the front panel of the cabinet adapted upon traveling downwardly to engage the sheet vertically downward for a predetermined distance until it projects from the opening at the bottom of the cabinet.

2. Apparatus as claimed in claim 1 wherein the forward section of the inner edge of each hanger plate is curved on a radius to cause a friction tab section of a flat paper towel supported on the hangers comprising the section of the towel extending between the hanger plate and the top edge of the towel to curl through an angle of at least about 90° toward the opposite friction tab section when the towel is forwardly downwardly while avoiding creasing or breaking of the friction tab section.

3. Apparatus as claimed in claim 1 wherein each hanger plate diverges from its respective side panel at an angle between about 5° and about 30° away from the top panel.

4. Apparatus as claimed in claim 1 wherein the end section of the inner edge of each hanger plate farthest removed from the back panel is curved on a radius of from about ¼ inch to about ¼ inch.

5. Apparatus as claimed in claim 1 wherein the rearward end of each hanger plate adjacent to the back panel of the cabinet is curved upwardly on a radius of from about ⅛ inch to about ¼ inch.

6. In a flat paper towel and apparatus for dispensing towels singly from a pack thereof retained in the apparatus, the combination of elements including:
   a cabinet having front, back, top and side panels and having an opening at the bottom thereof through which a single towel can be ejected from the cabinet, a pair of essentially flat hanger plates secured in the cabinet adjacent to opposite side panels thereof and removed a suitable distance from the top panel of the cabinet, each hanger plate being formed and disposed to extend forwardly in the cabinet with respect to the back panel thereof and having its outer edge located closely adjacent to one of the side panels, and each hanger plate diverging from the respective side panel at an angle of from about 5° to about 30° away from the top panel and having the forward section of its inner edge farthest removed from the back panel curved on a suitable radius generally toward the opposite hanger plate, a pack comprising a plurality of flat paper towels having top, bottom and lateral edges in face-to-face contacting but unsecured relationship suspended, with the top edge of each towel extending essentially parallel with the top panel of the cabinet, vertically in the cabinet on the hanger plates with each plate engaging a series of registering hanger slots formed in the separate sheets of the pack, each hanger slot communicating with a lateral edge of the respective sheet and extending therefrom toward the opposite lateral edge of the sheet and diverging therefrom away from the top edge of the sheet at an angle of from about 2° to about 5° less than the angle of divergence of the engaged hangers and being removed from the top edge of the sheet by a distance less than one-half the distance between the top and bottom edges of the sheet but at least as great as about 10 percent of the same distance, and forwarding means associated with the front panel of the cabinet adapted to engage the front sheet of the pack frictionally and to forward it downwardly in the cabinet until its lower end protrudes from the bottom of the cabinet.

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