Feb. 17, 1942. A. B. CUMMINS 2,273,252

MEANS FOR SORTING SHEETS IN NUMERICAL ORDER

Filed Feb. 6, 1941

Fig. 1

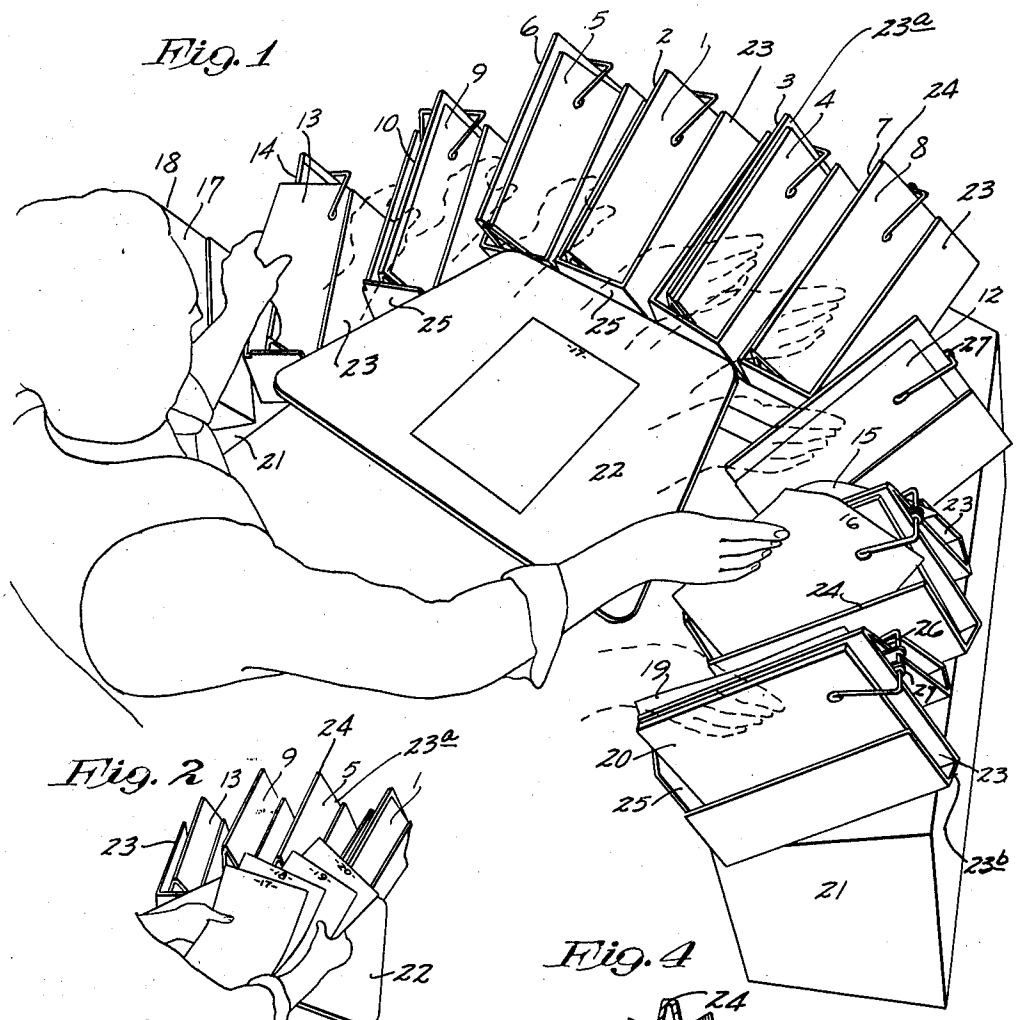


Fig. 2

Fig. 4

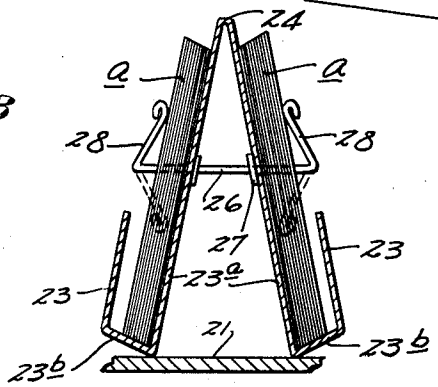
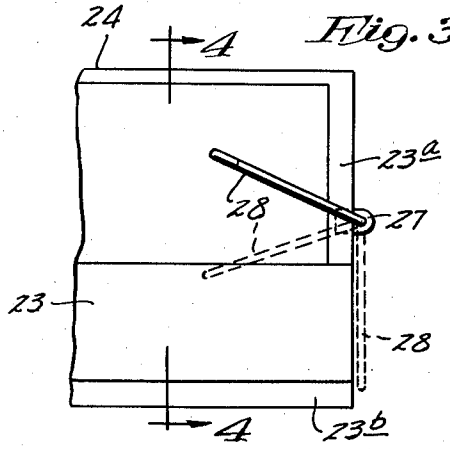


Fig. 3



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MEANS FOR SORTING SHEETS IN NUMERICAL ORDER

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14 Claims. (Cl. 270—58)

My invention provides an improved method and apparatus for facilitating the assembling of loose sheets in numerical order.

It is thought that the principles and generic features of both the method and apparatus will be more readily understood after having first described a preferred embodiment of the invention illustrated in the accompanying drawing wherein like characters indicate like parts throughout the several views.

Referring to the drawing:

Fig. 1 is a view in perspective showing the apparatus or equipment and diagrammatically illustrating in part the way in which the apparatus can be used;

Fig. 2 is a view in perspective illustrating a fragment or portion of the apparatus illustrated in Fig. 1, and particularly illustrating the manner and the order in which the hands of the operator are used in assembling the sheets on a table or deck after they are picked from the proper pockets or holders;

Fig. 3 is an elevation looking at the face of one of the duplex holders comprising two associated pockets; and

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 3.

On a suitable base or support a multiplicity of laterally spaced sheet holders are arranged adjacent to and preferably partly surrounding an assembling table or deck. The support here indicated at 21 is in the form of a curved flat-topped base, within the curve of which is a suitably supported assembling table 22. The sheet holders are placed upon the base 21 and preferably, and for an important reason presently to be noted, these holders are of duplex form, that is, each holder has two pockets 23, the rear walls 23a of which are reversely inclined and joined at their upper edges as indicated at 24. Preferably, the upper face of the base 21 is inclined toward the table 22 and the holders are placed thereon in correspondingly inclined positions. The lower or inner ends of the pockets are closed by end plates 25 while the upper ends of the pockets are preferably open. The outer walls of the pockets 23 are preferably much shorter than the inner walls or plates. The sheets that art to be sorted and properly assembled are placed in the pockets in groups, that is, all of the sheets placed in a given pocket will have the same assembling number or order of assembling.

It is important to note that the bottoms of the pockets 23 are inclined as indicated at 23b in a direction reverse to the inclination of the rear walls or back plates 23a. This arrangement causes the upper edges of the outside sheets progressively to project a little higher than the inner sheets so as to facilitate picking up the outside sheets. To effectually accomplish the result just stated, the bottom 23b should be at an acute angle to the back 23a. It is obvious that the term "pocket" is herein used in a liberal sense to include a holding element that will support and maintain in position a pack or group of sheets.

Here it may be stated that in the illustration given there are twenty groups of sheets to be picked up and assembled in numerical or serial order, and hence, for this illustration the sheets in the different groups are indicated as marked by the numerals 1 to 20, inclusive. All sheets in the same group are marked with the same numeral. This would provide for assembling, for example, books or the like, each made up of twenty sheets or leaves, the sheets or leaves of which are printed only on one side. Of course there may be any desired number of sheets in the same pocket bearing the same number.

For the best and most rapid two-hand assembling operation, the sheets 1 and 2 will be placed in the pockets of a central or intermediate holder and the groups of pages bearing increasing numbers will be placed progressively farther and farther from the central group or holder. In Fig. 1 the numbers of the pages, instead of being actually printed thereon, are indicated by numerals with leaders directed to the respective sheets.

In this preferred structure, as above indicated, the arrangement is such that the sheets may be properly selected in the proper serial order, by both hands, the hands being used alternately or substantially so. In arranging for this two-hand assembling action, the group of sheets of lowest number, for example, 1 and 2, will be placed in one of the intermediate holders and the groups of sheets of progressively increasing number will be placed in the pockets farther and farther away from the intermediate low number groups, alternated from right to left.

The preferred arrangement above indicated will be made still clearer by description of the manner in which the assembling operation is performed and which, briefly described, is as follows:

As a first but double operation, the operator

will pick off outside sheets 19 and 20 of the first two stacks at the right with his right hand while substantially simultaneously therewith picking off the outside sheets 17 and 18 from the two stacks at the extreme left of the holder, the hands now being drawn together over the table 22 with sheets 17 and 18 contained in the left hand placed over sheets 19 and 20 contained in the right hand as shown in Fig. 2; the sheets 17, 18, 19 and 20, now stacked in numerical order, being placed in a pile or stack upon the table to complete the first operation. By continuing similar operations progressing by picking off the sheets in the diminishing order in which they are numbered, a very rapid and complete assembling of the sheets may be performed. The last two operations will be for the operator to pick off sheets 1 and 2 with his left hand and sheets 3 and 4 with his right hand and stack these upon the top of the pile in numerical order and with sheet 1 on top of the pile. This being done, the sheets will read progressively from 1 to 20 from top to bottom of the accumulated stack or pile.

The structure of the duplex or two-compartment holder is important in the performing of rapid assembling operations and reduce it to substantially one-half the time that would be required to pick up the sheets from individual or independent compartments or holders.

The downwardly diverging walls or plates of the duplex holders make it an easy matter for the operator using fingers and thumb of one hand to pick up two sheets, one from each pocket, and assembling them in the proper order indicated. Of course, in performing the method involved in this invention, the arrangement of the stacks in the adjacent pockets, as well as the arrangement of the stacks in the several spaced holders, is important. For example, it is important that the stacks of sheets in the compartments of the same holder be indicated or known by numbers that differ but one digit, and it is also important that the stack in a particular group indicated by the lowest numeral be placed in that side of a particular holder that will bring the sheet of the lowest number to the top, under the natural hand movement required to pick up the sheets and deliver the same on the table.

For a one-hand assembling movement, the groups of sheets bearing the progressively increasing numerals would be located progressively in one direction from the groups of lowest number. Obviously, however, for the rapid two-hand, to wit: alternately right and left hand operations, the groups of increasing number must be placed alternately on first one side and then the other of the holders containing the groups of lowest number.

As an additional feature of novelty involved in the group holders, I provide an extremely simple device which will automatically maintain engagement and very light pressure with the outermost sheets of the groups not only when the packs are thick, but when they have been reduced in number. This device in its simplest form is in the form of a rock-shaft 26 shown as pivotally mounted in small ears or lugs 27 on the back plates 23*a* at the open ends of the compartments. This rock-shaft 26, at its outer ends, is provided with oblique arms 28, the free ends of which engage with the outermost sheets of the stacks. In Fig. 4, but not elsewhere, the stacks of sheets, which are progressively numbered, are indicated as above described and are here indicated as groups by the character *a*. Of course, there may be more or less of the sheet holders and, as above indicated, the number of duplicate sheets *a* placed in the pocket of any holder may be varied, at will. In the preferred way of using this improved apparatus to carry out the process involved, it is advisable to assemble the sheets on the table so that their numerals will progressively increase from top to bottom of the stack and will appear on the upper faces of the respective sheets. However, the order of selection might be reversed. For example, the sheets might be picked up and assembled according to the increasing numerical order, but in this case the sheets should be laid face down on the table and the accumulated stacks should be later turned right side up.

The back plates or walls of the duplex holders should have a downward divergence that is an acute angle and they should be closely connected or associated at their upper edges so that the hand will readily embrace both groups of sheets with the thumb contacting with one of the outer sheets and with the fingers of the same hand contacting with the outer sheet of the other stack. This arrangement permits the two sheets to be simultaneously picked from the holder by a single operation. In practice I have had the best results by setting the back plates 23*a* at a downwardly divergent angle varying from 25 to 30°.

It is highly desirable that the several sheet holders be assembled substantially on the arc of a circle and in such an arrangement that an operator sitting at the assembled table can reach the said holders with approximately the same stretch of the arms.

For the most efficient and most rapid selecting and assembling of the sheets, the various points noted are highly important, but it will, of course, be understood that various alterations or variations in the features disclosed may be made within the scope of the invention disclosed and claimed.

The term "sheets" is herein used in a liberal sense and would, of course, include various other devices such, for example, as cards.

The invention has been described as particularly adapted for assembling of sheets printed only on one side such, for example, as mimeographed sheets, cards, and the like, but can be used also in assembling sheets that are printed on both sides. It is not, of course, necessary that the sheets or pages be actually printed or marked with numerals but the proper numeral or serial order of assembling must be kept in mind. If the sheets were, for example, printed on both sides and if pages serially numbered were assembled, then the grouping in the pockets or holders might be arranged and according to the marking on the one side which would be 1, 3, 5, 7, etc., rather than 1, 2, 3, 4, and the like.

What I claim is:

1. An apparatus of the kind described comprising a multiplicity of sheet holders assembled in serial relation, each holder having two pockets with back-forming walls that diverge downwardly at an acute angle with their upper edges in such close relation that two sheets may be readily withdrawn by a single hand movement.

2. In an apparatus of the kind described, an assembling table and a multiplicity of sheet holders assembled about said table in such close

proximity thereto that sheets may be withdrawn from said holders by an operator sitting close to the table and by a substantially common arm stretch.

3. In an apparatus of the kind described, a sheet holder formed with pockets that diverge downwardly at an acute angle from substantially a common line at the upper edges of the back walls of said holder.

4. A duplex sheet holder formed with two pockets, the back-forming walls of which diverge downwardly at an acute angle approximately from a common line and the outer walls of which pockets terminate far below the upper edges of said back-forming walls so as to afford ready access to sheets contained in said pockets.

5. The structure defined in claim 4 in which the bottom-forming walls of said pockets are at an acute angle to the said back-forming walls.

6. The structure defined in claim 4 in which the bottom-forming walls of said pockets are at an acute angle to the said back-forming walls, said pockets, at one end, having end walls that afford stops for the edges of the sheets contained in said pockets.

7. The structure defined in claim 3 in further combination with a rock-shaft pivotally mounted and extended across said holder at one end of said pocket and provided with crank-like arms for engagement with the outer sheets of the two packs of sheets in the twin compartments of said holder.

8. The structure defined in claim 3 in further combination with a rock-shaft pivotally mounted and extended across said holder at one end of said pocket and provided with crank-like arms for engagement with the outer sheets of the two packs of sheets in the twin compartments of said holder, the said shaft being free for endwise movements and the arms thereof being at acute angles to the axis of said shaft.

9. The structure defined in claim 3 in further combination with a rock-shaft pivotally mounted and extended across said holder at one end of said pocket and provided with crank-like arms for engagement with the outer sheets of the two packs of sheets in the twin compartments of said holder, the said shaft being free for endwise movements and the arms thereof being at acute angles to the axis of said shaft, the bottoms of said pockets being at oblique angles to the back-forming walls thereof and the outer walls of said pockets being terminated far below the upper edges of said back-forming walls.

10. The method of assembling sheets in serial order, which consists in placing sheets of the same serial order in groups and the groups in spaced serial order with the groups of increasing order progressively farther and farther, first at one side and then at the other, from the group of lowest serial order, and then successively removing, in accordance with the serial progression, sheets first at one side and then at the other from the said groups and assembling the said sheets in a completed series.

11. The method defined in claim 10 in which the said groups of sheets are so placed that groups differing only one in serial order may be readily reached by the same hand of an operator and the outer sheets thereof removed by one operation, and in which arrangement the sheets in the closely assembled companion groups that are the lower order are nearest to the group of lowest order.

12. An apparatus of the kind described comprising an assembling table and a multiplicity of twin sheet holders, each holder involving upwardly converging pockets from both of which pockets two sheets may be readily withdrawn by a single hand movement, said holders being assembled in spaced relation about said table, the pockets of said holders having back-forming walls that converge upwardly at an acute angle and at their upper edges are joined.

13. An apparatus of the kind described comprising an assembling table and a multiplicity of twin sheet holders, each holder involving upwardly converging pockets from both of which pockets two sheets may be readily withdrawn by a single hand movement, said holders being assembled in spaced relation about said table, said series of holders being spaced, some thereof at the front and some thereof at each side of said assembling table, said holders being set with downward inclination toward said table.

14. An apparatus of the kind described comprising an assembling table and a multiplicity of twin sheet holders, each holder involving upwardly converging pockets from both of which pockets two sheets may be readily withdrawn by a single hand movement, said holders being assembled in spaced relation about said table, and which series of holders are spaced, some thereof in front of and some thereof on each side of said assembling table, said holders being set with a downward inclination toward said table, the pockets of said holders, at their ends, being closed by end walls.

ALFRED B. CUMMINS.