Jan. 10, 1967 R. S. BARR 3,297,342

METHOD AND APPARATUS FOR SEPARATING CONTINUOUS MULTI-PART STOCK FORMS

Filed March 16, 1965 2 Sheets-Sheet 1

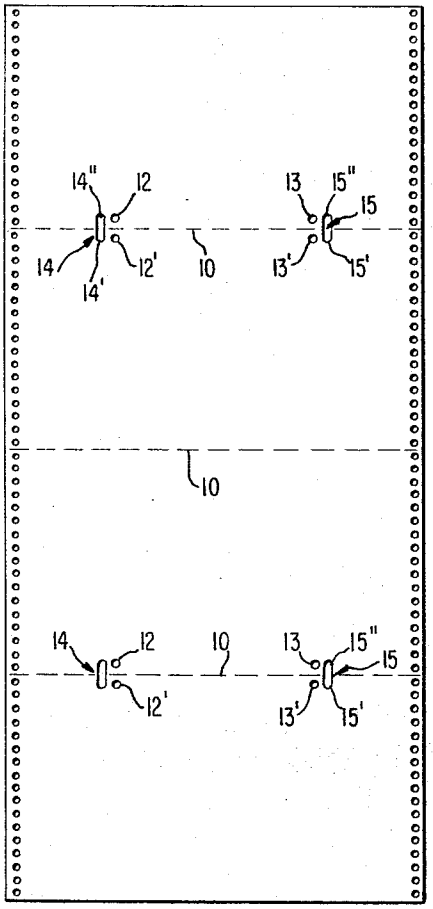


FIG. 1a

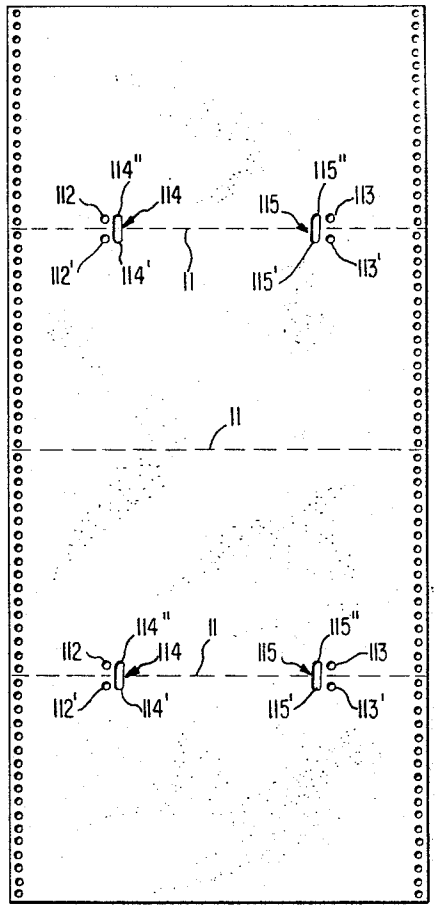


FIG. 1b

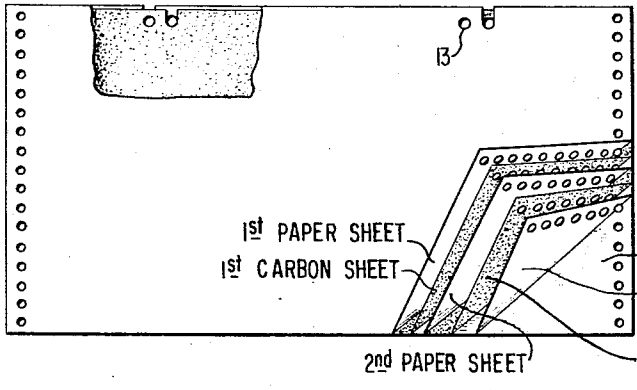


FIG. 2

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METHOD AND APPARATUS FOR SEPARATING CONTINUOUS MULTI-PART STOCK FORMS

Filed March 16, 1965 2 Sheets-Sheet 2

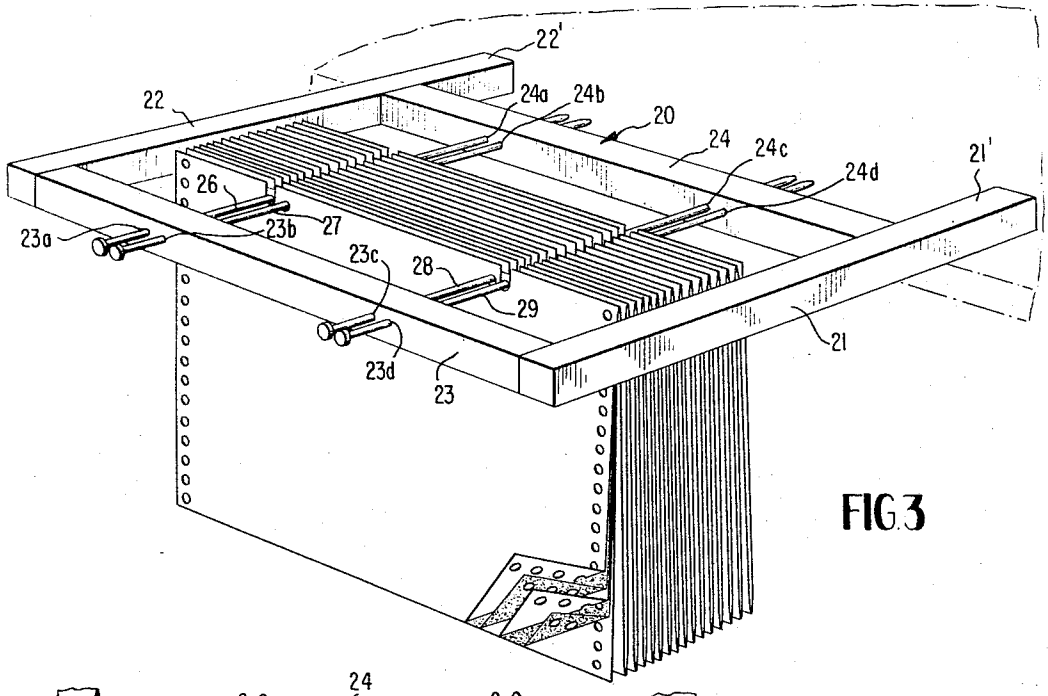


FIG.3

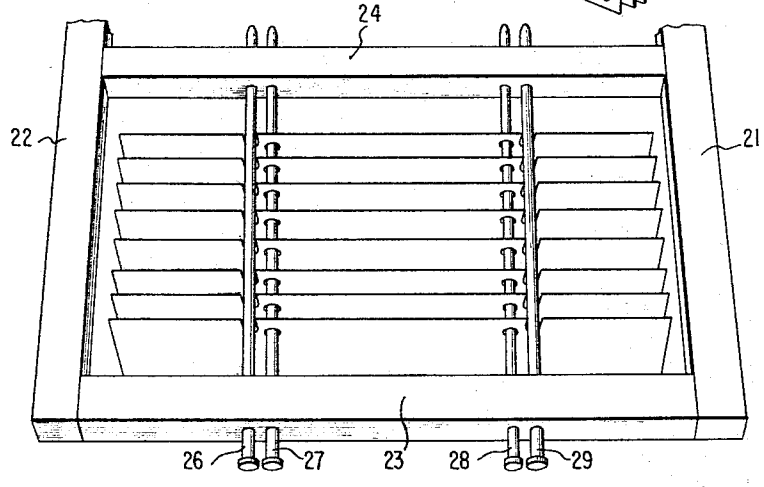


FIG.4

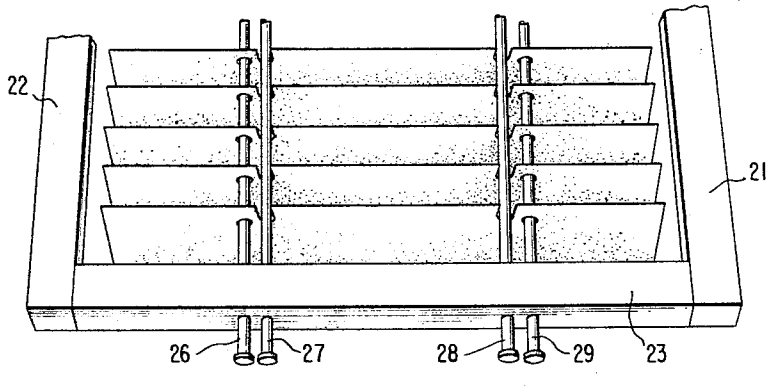


FIG.5

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METHOD AND APPARATUS FOR SEPARATING CONTINUOUS MULTI-PART STOCK FORMS

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6 Claims. (Cl. 282—11.5)

The present invention relates to a method and apparatus for separating continuous forms of the type used in computers and analogous data processing machines.

Electric accounting machines and computers are utilized to an ever-increasing extent in the automatic data processing field. With the use of such machines, it is not uncommon to prepare simultantously four or five copies of a continuous report numbering in the hundreds of pages. The data processing equipments generally used all utilize essentially the same type of paper for the printing of the reports. This paper is purchased in continuous lengths in a fanfold condition and is commercially available in any number of copies or parts up to maximum of eight copies or parts at present. A length of commercially available continuous 8-part paper, to give an example, consists of alternating layers of eight sheets of paper and seven sheets of carbon paper. The continuous multi-part paper, acquired and stored in fan-fold condition, is fed during operation of the data processing equipment continuously into the machine in which the report is printed thereon. Upon leaving the data processing equipment, the continuous multi-part printed paper is again automatically refolded after passing through the plattens of the printing machine. Usually, the reports are stored and also read in this fan-fold condition. The reason for storing and reading the report in fan-fold condition is that once a report has been machine printed, it would extend to a considerable length if opened out from its fan-folded condition.

A problem, however, arises with the separation of the fan-folded multi-copy reports into separate or individual copies, discarding at the same time the carbon paper in the separating operation. The difficulty underlying the separating problem resides in the fact that, as pointed out hereinabove, one desires to maintain the continuous nature of the report, and to store each report in fan-fold condition to facilitate subsequent reading thereof.

To date, two avenues of approach offer themselves, namely (a) a manual report separation and (b) an automatic separation by means of commercially available machines.

The manual report separation, however, though used most frequently, is unsatisfactory as it is an extremely slow and dirty process by reason of the presence of the carbon ink. As a matter of fact, the manual report separation is also economically unsatisfactory because of the large number of man-hours necessary to perform the job. In large-size installations, the cost of manual separation may become a significant item.

To achieve automatic separation, a number of machines are presently commercially available. These machines are all relatively similar as to the principal operation thereof and entail numerous disadvantages. Foremost, these machines are all relatively expensive, involving an initial invesment of several hundred dollars. Furthermore, and more important, all of these commercially available machines require a considerable set-up time and adjustment which must be precise to avoid tearing the reports during the separation. While the set-up time may become less significant for reports to be processed as the length thereof increases, the set-up time required in connection with the presently available machines, however, is a sufficiently serious problem for reports of average or

shorter length so that medium and small data processing installations seldom use these machines and instead resort to the manual separation of the reports.

The commercially available separators of the type mentioned hereinabove are usually motor driven in which the multi-part fan-fold report is fed into the machine to separate out the individual copies into individual sets while the carbons are usually automatically disposed, for example, wound on spindles for subsequent disposal.

Accordingly, it is a principal object of the present invention to provide a method and apparatus for separating multi-copy fan-folded reports which obviate the shortcomings and inadequacies mentioned hereinabove with the prior art.

It is another object of the present invention to provide a method and apparatus for separating fan-folded multi-copy reports into separate or individual reports while simultaneously therewith discarding the carbon in the separating operation, which is simple and inexpensive, and also fills the presently felt genuine need in data processing installations of average or smaller size.

It is still another object of the present invention to provide a method and apparatus for separating fan-folded multi-copy reports of the type mentioned hereinabove which assures superior performance to that obtainable with present-day separating machines irrespective of the size of the installation or length of reports produced.

A further object of the present invention resides in the provision of an apparatus suitable for use with the method for separating multi-copy fan-folded reports which is extremely inexpensive in manufacture, offers great flexibility in its use and does not require special skills on the part of the operator.

Another object of the present invention resides in the provision of an apparatus suitable for separating fan-folded multi-copy reports which is relatively light in weight, may be readily stored and is simple to be installed for use, while at the same time requiring relatively little floor space.

Still another object of the present invention resides in the provision of an apparatus for use with the method acording to the present invention for separating fan-folded multi-copy reports, which does not require any electric power, has a minimum of moving parts, requires no maintenance nor any adjustment and is completely service-free and of practically infinite length of life in operation.

A further object of the present invention resides in the provision of an apparatus for separating fan-folded multi-copy reports which is safe to the operator and the reports, precludes any injury to the operator, and makes impossible any tearing of the reports in the separating operation.

Still another object of the present invention resides in the provision of an apparatus for separating fan-folded multi-copy reports which permits a simple separating operation that is clean, does not require rolling or wrinkling of the carbon paper thereby making possible re-use of the latter, and can be used without adjustment, for any size report and any number of copies in the report.

These and other objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein:

FIGURE 1*a* is a top plan view of a portion of an individual sheet of paper of continuous multi-part stock in accordance with the present invention,

FIGURE 1*b* is a plan view of a portion of a continuous carbon paper for use with the continuous multi-part stock forms in accordance with the present invention,

FIGURE 2 is a plan view, with parts broken away in the top sheet and one corner of several sheets bent over, of a fan-folded multi-part stock of individual continuous sheets and interleaved continuous sheets of carbon paper, ready for use,

FIGURE 3 is a perspective view of the apparatus in accordance with the present invention which may be utilized for realizing the method of separating the fan-folded multi-copy reports according to the present invention,

FIGURE 4 is a perspective view, on an enlarged scale, of the apparatus shown in FIGURE 3 illustrating the operation of the present invention, and

FIGURE 5 is a partial perspective view, similar to FIGURE 4, and illustrating a different phase in the method of separating the report according to the present invention.

Known in the prior art is a key-sort system by means of which certain cards can be selected from a larger group. In such prior art system, this is made possible by the fact that some cards contain closed holes while the remaining cards have open holes in the same position on the cards. An elongated member is utilized in this prior art system, extending through the holes in a file of cards to lift out only those cards with closed holes while the cards with open holes are left in place within the file. However, such prior art system is used exclusively for selectively sorting the cards which are positively lifted out of the file in the selecting process.

In contradistinction to this prior art key-sorting system, the present invention utilizes a simple prepunching in the continuous paper and in the continuous carbon copy so that at least two needles or the like can be passed through aligned apertures in the continuous sheets and interleaved carbon paper when in the fan-folded condition, whereby the aligned apertures are so arranged and located in the continuous sheets of paper and continuous sheets of carbon that the one set of aligned apertures are open in the direction toward the edge only in the sheets of paper while the other set of aligned apertures are open toward the edge of the fan-fold report only in the continuous sheets of carbon paper.

Referring now to the drawing, wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGURE 1*a*, this figure illustrates four pages of a continuous stock of sheet-like paper normally used in automatic data processing equipments. As is conventional, the continuous sheet is provided with spaced apertures along both sides thereof, operable to engage with sprocket-type wheels in the processing data equipment to feed the paper. Additionally, though the stock is in continuous form, the individual papers are prepunched or perforated, as is also conventional, to facilitate tearing each page from the remainder of the stock.

The portion of the carbon paper illustrated in FIGURE 1*b* is made in an analogous manner as the paper of FIGURE 1*a* insofar as the feed apertures along both sides is concerned. Additionally, the individual pages are also prepunched or perforated to facilitate tearing off of individual pages of a multi-part report.

In FIGURE 1*a*, reference numeral **10** designates the separating lines produced in any conventional manner, e.g. by perforations, between individual pages. In FIGURE 1*b*, the separating line, as in FIGURE 1*a* prepunched or perforated, and marking the plane of separation between individual pages of carbon paper is designated by reference numeral **11**.

In addition to the conventional features of commercially available continuous sheet stock of paper and carbon as described above, the sheets of printing paper and of carbon paper differ from the prior art by the provision of additional apertures punched out therein during manufacture thereof.

In FIGURE 1*a*, two relatively small apertures **12**, **12'** and **13**, **13'** are provided on each side and spaced a predetermined distance from the eventual separating line **10**.

Additionally, each page is also provided with two elongated apertures **14** and **15**, disposed outwardly of respective apertures **12**, **12'** and **13**, **13'** and of such contour that it extends up to the separating line **10**.

As may be readily seen in FIGURE 1*a*, oppositely disposed apertures **12** and **12'** and oppositely disposed apertures **13** and **13'** are of similar size and equidistant from the line **10** disposed therebetween. Similarly, apertures **14** and **15** which are constituted by adjoining aperture portions **14'** and **14''** and aperture portions **15'** and **15''** are so dimensioned and arranged that they form, together, the continuous elongated apertures **14** and **15**. The apertures **12**, **12'**, **13**, **13'**, **14**, and **15** are provided only at every other separating line **10** for reasons that will appear more fully hereinafter when considering the report in fan-fold condition.

Apertures **112**, **112'**, **113**, **113'**, **114**, and **115** in FIGURE 1*b* correspond to apertures **12**, **12'**, **13**, **13'**, **14**, and **15** of FIGURE 1*a*, it being noted, however, that the continuous elongated apertures **114** and **115** are disposed inwardly of the apertures **112**, **112'** and **113**, **113'**.

More particularly, the various apertures are so located and arranged, as may be readily seen from FIGURE 2, that with the multi-copy report in the fan-folded condition, as illustrated in this figure, apertures **12** and **12'** align with apertures **114** and apertures **13** and **13'** align with apertures **115** while apertures **14** and **15** align with apertures **112**, **112'** and apertures **113**, **113'**, respectively. Of course, the various sheets of papers as well as the various sheets of carbon must be punched over the entire length thereof of the continuous multi-part fan-fold paper in the manner illustrated in FIGURES 1*a* and 1*b*.

Referring now to FIGURE 3, the apparatus according to the present invention in its simplest form comprises a frame generally designated by reference numeral **20** including two elongated members **21** and **22** and two transverse members **23** and **24**, all securely interconnected with one another to provide a substantially rectangular frame. The members **21** and **22** are provided with extensions **21'** and **22'**, respectively by means of which they may be secured to a table in any suitable manner, for example, by clamps or the like.

In the illustrated embodiment, each of the transverse members **23** and **24** is provided with four apertures **23***a*, **23***b*, **23***c* and **23***d* and apertures **24***a*, **24***b*, **24***c* and **24***d*, respectively. The apertures are so located that apertures **23***a* and **24***a* are aligned, apertures **23***b* and **24***b* are aligned, apertures **23***c* and **24***c* are aligned and apertures **23***d* and **24***d* are also aligned to receive therein a substantially straight elongated member such as needles **26**, **27**, **28**, and **29**. As shown in FIGURE 3, the needles or rods are inserted into the four holes **23***a* through *d* and **24***a* through *d* in which they are able to move freely. These rods **26** through **29** may also be individually withdrawn or inserted, which is important as will appear more fully hereinafter from the description of the operation according to the present invention.

FIGURE 4 illustrates the location of the rods **26** through **29** in relation to the four apertures provided in each page of a multi-part fan-fold report when inserted into the respective apertures **23***a* and **24***a* through **23***d* and **24***d*.

In FIGURE 4, only the top sheet of a multi-part report has been fan-folded and inserted into the apparatus. As may be readily seen, the two innermost rods **27** and **28** support the sheet of paper by extending through apertures **12**, **12'**, **13**, and **13'** whereas the outermost rods **26** and **29** engage in apertures **14** and **15** which are open toward the top edges of the fan-folded report, and therefore do not contribute to the support of the paper.

In FIGURE 5, only one sheet of carbon paper, in the fan-folded condition, is inserted in the apparatus. Again, it should be noted that in this case the two outermost rods **26** and **29** support the carbon paper by extending through apertures **112**, **112'**, **113**, and **113'** while the innermost

rods **27** and **28**, engaging in elongated apertures **114** and **115**, open toward the top edges of the fan-folded carbon paper, fail to contribute to the support.

FIGURES 4 and 5 are included herein for illustrative purposes only to help illustrate the principle of operation of the present invention, it being understood that the various parts can be modified and refined in numerous ways.

It is obvious that withdrawal of the two outermost rods **26** and **29** in FIGURE 4 would not affect the paper. On the other hand, withdrawal of the two innermost rods **27** and **28** in FIGURE 4 would eliminate the support for the fan-folded paper which, by gravity, would then fall to the floor when the two innermost rods **27** and **28** are withdrawn irrespective of the position of the two outermost rods **26** and **29**.

It is also obvious from FIGURE 5 that the presence or absence of the two innermost needles **27** and **28** does not affect the support of the single continuous sheet of carbon paper supported by the two outermost needle rods **26** and **29**. On the other hand, upon withdrawal of the two outermost rods **26** and **29**, the single continuous sheet of carbon paper would drop by gravity to the floor.

Referring now again to FIGURE 3, six sheets of paper and five sheets of carbon paper interleaved between the six sheets of paper and all fan-folded have been inserted into the illustrated apparatus.

In operation, the two innermost needles **27** and **28** are initially withdrawn whereupon the bottom or sixth sheet of paper (not visible) would become unsupported and would fall, by gravity, to the floor. The sheet of carbon paper immediately above and in contact with the last sheet of paper, however, cannot fall because the two outermost rods **26** and **29** continue to support the same. Since the fifth sheet of carbon paper is below all remaining sheets, it prevents the rest of the report from falling by gravity. It should also be noted that the lowest carbon sheet, however, only requires to be of such strength as to hold the sheet of paper directly thereabove since each sheet of paper is supported by the carbon paper located directly therebelow which are individually held in place by the presence of the two outermost rods **26** and **29**.

The two innermost rods **27** and **28** are now reinserted and the two outermost rods **26** and **29** are withdrawn whereby the fifth carbon sheet that has become the bottom sheet is now unsupported and will fall out from the rest of the report. The remainder of the report, however, is supported by the innermost rods **27** and **28** including the fifth sheet of paper. The two outermost rods **26** and **29** are now replaced and the two innermost rods **27** and **28** are again withdrawn. As a result thereof, the fifth sheet of paper is permitted to drop. By alternately replacing one set of rods and withdrawing the other set, one sheet of the report at a time consisting alternately of a sheet of printing paper and carbon paper is released while the remaining sheets of the report continue to be supported by the rods. In this manner, the report is separated, one sheet or one carbon at a time.

In actual practice, the released bottom sheet does not fall by gravity but must be teased from the remainder of the reports by simple manual manipulation.

From the foregoing, it becomes at once obvious that the present invention entails numerous advantages. The apparatus shown and described in FIGURE 3 is simple and relatively inexpensive. Its initial cost represents only a small fraction of the cost of automatic machines commercially available today on the market for automatically separating the various copies of a fan-fold multi-part report.

Additionally, the present invention assures a relatively speedy separation of the report that compares favorably even with the fuly automatic machines when considering the time necessary for preliminary set-up and adjusting operations. For example, a complete separation of a four-part fan-fold report, four inches in height—that is

of average size—can be realized in about five minutes or less with all carbons disposed of . This also includes all set-up time that may be required. To do the same job with existing form separating machines takes about eight minutes while the same job takes about 35 minutes when performed manually.

The present invention also offers a great flexibility and versatility in its use since reports of any length can be completely separated without any adjustment in the apparatus according to the present invention. No skilled operators are necessary to handle the apparatus of the present invention as in practice any person can learn to use the apparatus efficiently in a matter of a few minutes. Furthermore, there is no possibility of injury or harm to the operator nor is there any danger of tearing of the reports by the use of the apparatus according to the present invention. Aside from lacking any need for readjustments for different paper sizes, as required by the power-driven machines of the prior art, no electric power is required for the apparatus and operation in accordance with the present invention, thereby eliminating any danger to unskilled operators or tearing of the reports.

Obviously, the weight of the apparatus according to the present invention may be kept to a minimum and its size is such that it can be readily stored with small space requirements. Additionally, it can be readily mounted onto the wall over other equipment or secured to existing tables or the like whereas present machines of the aforementioned prior art each occupy about sixteen square feet of floor space and must be located near a power outlet.

Since the apparatus according to the present invention is not power driven and only has two moving parts, it requires no lubrication, no adjustment whatsoever, and is substantially foolproof against any breakdown. Obviously, maintenance such as lubrication, cleaning, adjustments, etc., are totally eliminated with the apparatus according to the present invention.

Since the cost of manufacture involved in the apparatus according to the present invention is extremely low, even relatively smaller data processing installations and departments can afford to own several of the apparatuses in accordance with the present invention, thereby being able to perform simultaneous separations of several different reports.

Aside from safety to the oeprator, the apparatus according to the present invention also offers the advantage to the operator that the operator's hands never come in contact with the surface of the carbon paper. This feature is not only of importance to the operator but also important to the re-usability of the carbon paper which with the apparatus of the present invention is neither touched by the operator's hands nor rolled or wrinkled in the removal thereof. Consequently, the thus-separated carbon paper could be economically trimmed down to size and re-used in typewriters.

While I have shown and described one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications. For example, the pair of innermost rods and outermost rods may be rigidly interconnected with one another so that the operator only has to manipulate a single member which may be in the form of a handle secured or forming part of the interconnection. Furthermore, suitable interlock means may be provided which assure that one set of rods cannot be withdrawn until the other set of rods is again properly in place. For example, such interlock may be of mechanical nature whereby a suitably mounted clamping member for each rod is so constructed and arranged that it securely clamps, for example, by friction the needles of one set as long as the needles of the other set are withdrawn and releases the same only upon re-insertion in proper place of the previously withdrawn set of needles. The engagement of the clamp and release thereof may

thereby be obtained by spring-loaded abutments located in the path of the axial movement of a respective rod and disposed so as to be actuated during the final movement thereof in the inserted condition.

In the alternative, electrical means may be used as interlocks, such as electromagnetic means or electromagnetic clutch means which are energized as long as the rods of one set are withdrawn to hold the rods of the other set in place. Of course, pneumatic or hydraulic interlock means of conventional construction may also be utilized instead of the mechanical or electrical construction,

Furthermore, the apertures or holes prepunched in the paper may be so spaced as to fit report binders whereby hole punching to bind the reports may be completely eliminated.

Additionally, it is also possible that only one set of rods is actually required. This one set may be successively switched from the two innermost to the two outermost holes in the transverse members 23 and 24. During each such switching operation, only the bottom-most sheet of paper or carbon will be released.

Consequently, while I have shown and described one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications within the spirit and scope thereof and I therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A multi-stock form composed of a sheet of carbon paper between each two adjacent sheets of printing paper, wherein each individual sheet has regularly-spaced, transversely-extending, perforated lines forming the folding and eventual tearing edges of a fan-folded report, each sheet being provided with a first set of apertures spaced from and on opposite sides of every other of said perforated lines and a second set of apertures extending from opposite sides of said every other perforated line up to the respective perforated line so that two such apertures form one larger aperture, each sheet of printing paper within said form having said sets of apertures arranged identically and each sheet of carbon paper within said form having the relative positions of the two said apertures of each set reversed from the arrangement of the said sheets of printing paper.

2. An arrangement for the separation of continuous multi-part stock forms, comprising, in combination, frame means provided with aligned apertures, forms composed of continuous sheets of printing paper, said sheets being provided with regularly-spaced transversely extending means to enable assembly thereof in the fan-fold condition, and said sheets being each provided with two types of aperture means within the area of each alternate transversely extending means, one type of aperture means extending in sets of two up to said transversely extending means from opposite sides thereof and the other type of aperture means being spaced therefrom, all aperture means being aligned and the relative position of the two types of aperture means being reversed in said sheets of carbon paper with respect to the sheets of printing paper, and alternate rod-like support means operable to engage in said sheets and supported in the apertures of said frame means to support all but the lowest of said sheets and enable separating out of the respectively lowest sheet.

3. An arrangement for the separation of continuous multi-part stock forms, comprising, in combination, frame means provided with aligned apertures, forms composed of continuous sheets of printing paper, said sheets being provided with regularly-spaced transversely extending means to enable assembly thereof in the fan-fold condition, and said sheets being each provided with two types of aperture means within the area of each alternate transversely extending means, one type of aperture means extending in sets of two up to said transversely extending means from opposite sides thereof and the other type of aperture means being spaced therefrom, all aperture means being aligned and the relative position of the two types of aperture means being reversed in said sheets of carbon paper with respect to the sheets of printing paper, and alternate rod-like support means operable to engage in the aperture means in said sheets and supported in the apertures of said frame means including first insertable and retractable means operable to engage one type of said aperture means and second insertable and retractable means operable to engage the other type of said aperture means to support all but the lowest of said sheets and enable separating out of the respectively lowest sheet.

4. A method of separating continuous multi-stock forms composed of a sheet of carbon paper between each two adjacent sheets of printing paper, comprising the steps of orienting the same forms, in a fan-folded condition, so that the fold line of the said forms are disposed in a horizontal plane, and supporting all but the lowest sheet of said forms by alternately supporting only, at least, the lowest of said sheets of carbon paper, whereby the lowermost sheet of said multi-stock form is permitted to be separated out.

5. A method of separating continuous multi-stock forms composed of a sheet of carbon paper between each two adjacent sheets of printing paper, comprising the steps of orienting the said forms, in a fan-folded condition, so that the fold lines of the said forms are disposed in a horizontal plane, and supporting all but the lowest of said forms by alternately supporting only the lowest of said sheets of printing paper and the lowest of said sheets of carbon paper, whereby the lowermost sheet of said multi-stock form is permitted to be separated out.

6. A method of separating continuous multi-stock forms composed of a sheet of carbon paper between each two adjacent sheets of printing paper, comprising the steps of orienting the said forms, in a fan-folded condition, so that the fold lines of the said forms are disposed in a horizontal plane, and supporting all but the lowest sheet of said forms by alternately supporting only said sheets of printing paper and said sheets of carbon paper, whereby the lowermost sheet of said form is permitted to be separated out.

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