June 14, 1966 C. N. HANNON ETAL 3,255,569

MECHANISM FOR REMOVING AND SIMULTANEOUSLY FOLDING AND TYING NEWSPAPERS FROM MULTIPLE STACKS THEREOF

Filed March 18, 1963 4 Sheets-Sheet 1

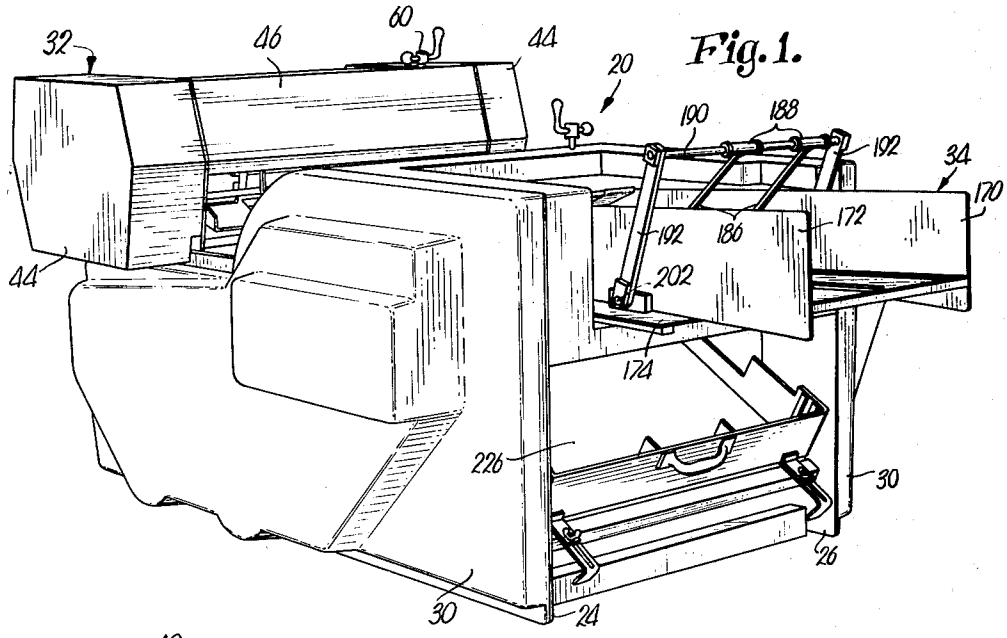


Fig. 1.

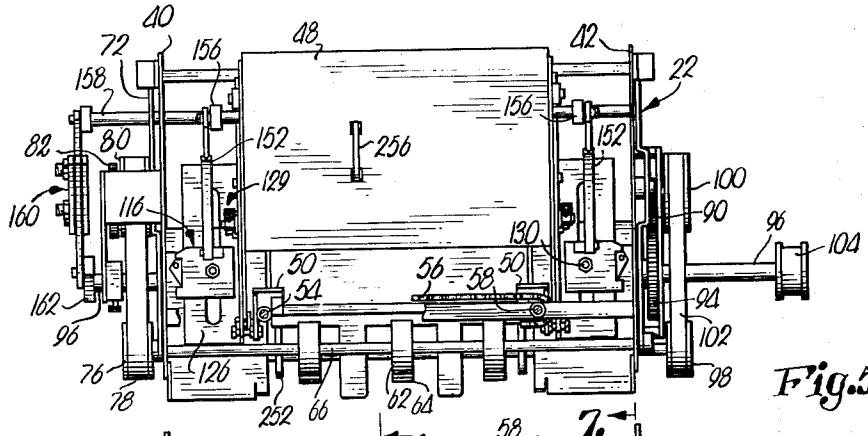


Fig. 5.

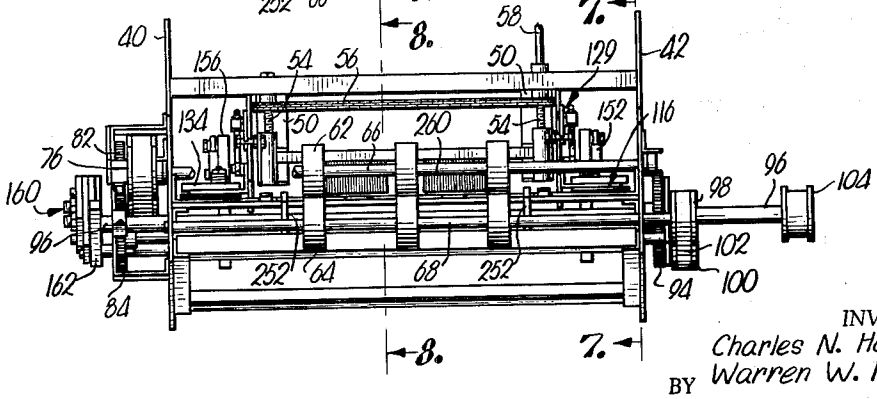


Fig. 6.

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Warren W. Hannon
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Howes, Schmidt, Johnson & Howes.
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June 14, 1966 C. N. HANNON ETAL 3,255,569

MECHANISM FOR REMOVING AND SIMULTANEOUSLY FOLDING AND TYING NEWSPAPERS FROM MULTIPLE STACKS THEREOF

Filed March 18, 1963 4 Sheets-Sheet 2

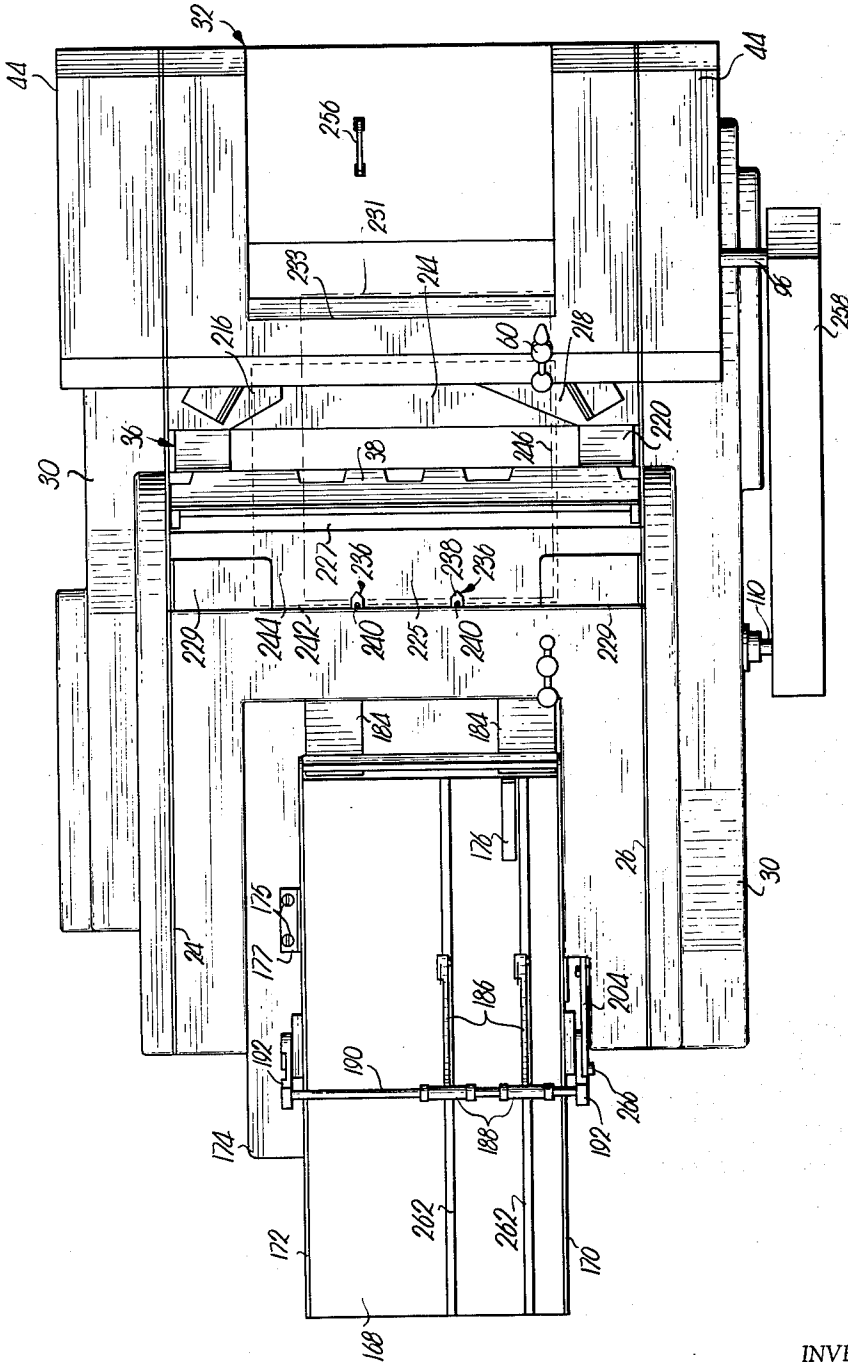


Fig. 2.

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June 14, 1966 C. N. HANNON ETAL 3,255,569

MECHANISM FOR REMOVING AND SIMULTANEOUSLY FOLDING AND TYING NEWSPAPERS FROM MULTIPLE STACKS THEREOF

Filed March 18, 1963 4 Sheets-Sheet 3

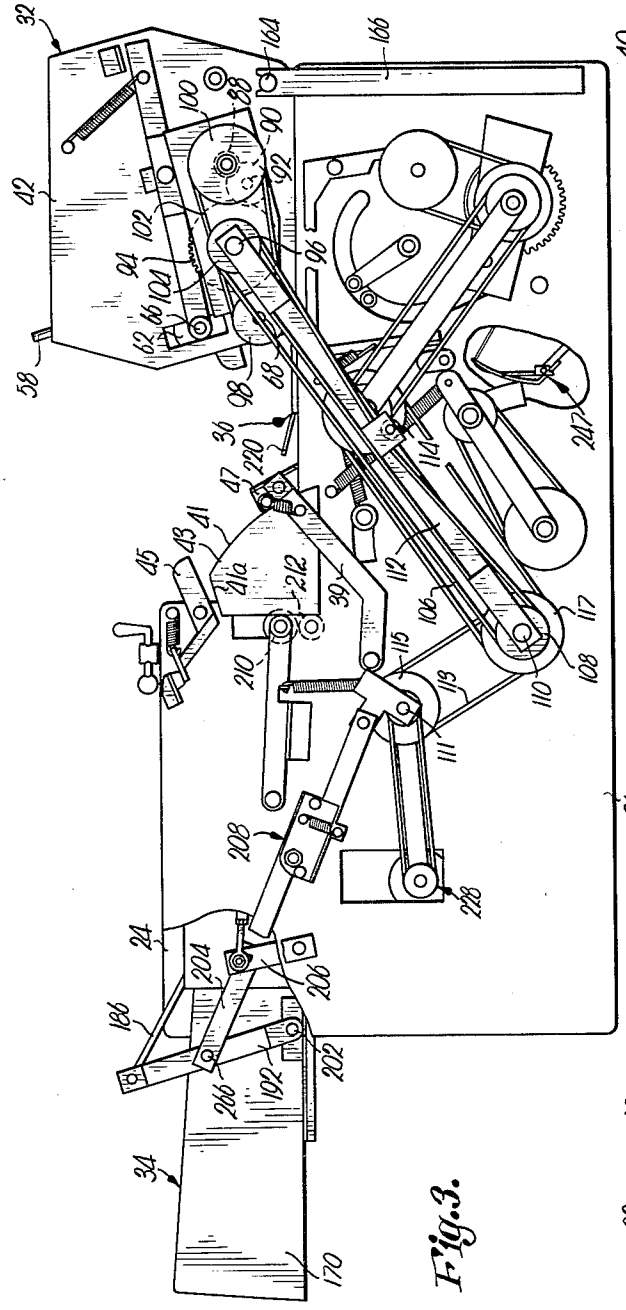


Fig. 3.

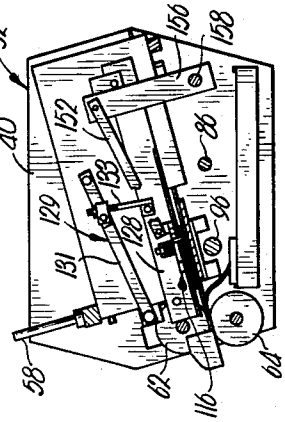


Fig. 2.

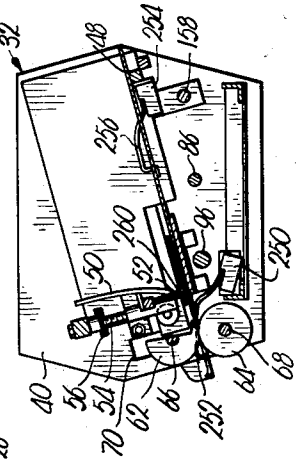


Fig. 8.

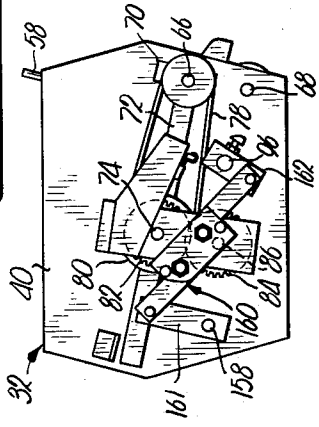


Fig. 4.

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June 14, 1966 C. N. HANNON ETAL 3,255,569

MECHANISM FOR REMOVING AND SIMULTANEOUSLY FOLDING AND TYING NEWSPAPERS FROM MULTIPLE STACKS THEREOF

Filed March 18, 1963 4 Sheets-Sheet 4

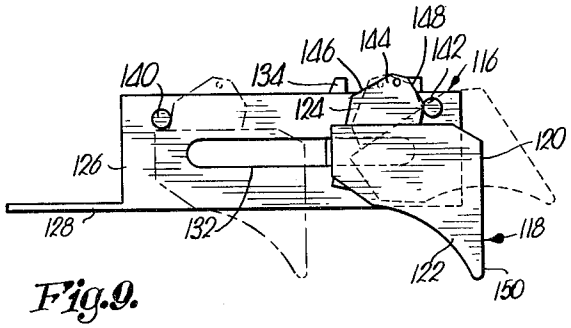


Fig. 9.

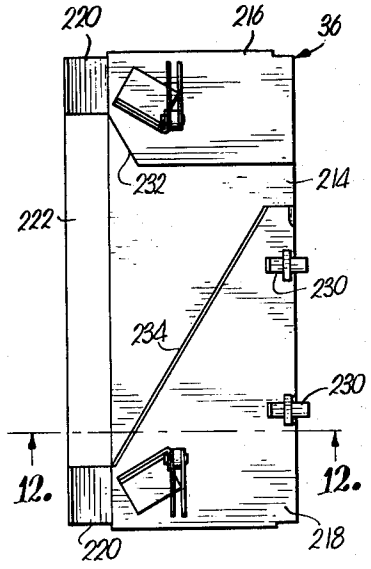
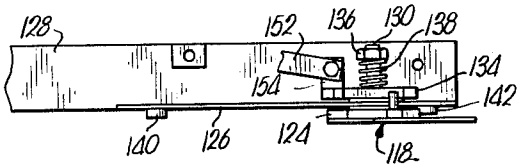


Fig. 11.

Fig. 10.



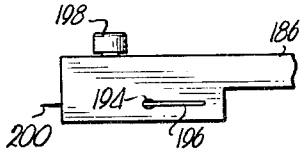


Fig. 14.

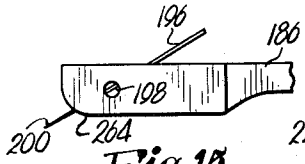


Fig. 15.

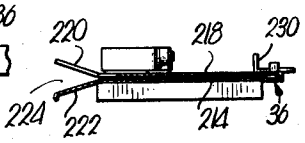


Fig. 12.

Fig. 13.

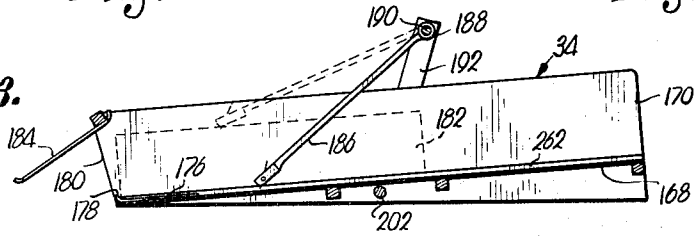


Fig. 18.

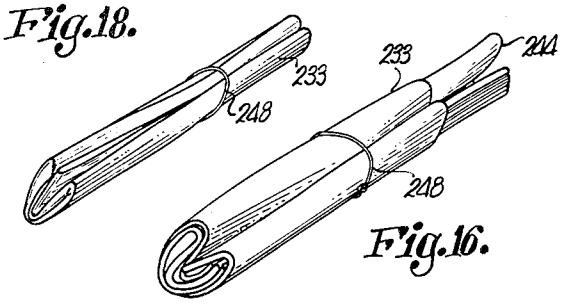


Fig. 16.

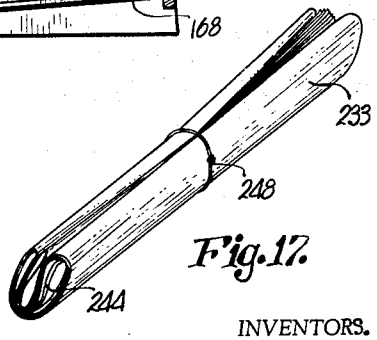


Fig. 17.

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United States Patent Office 3,255,569 Patented June 14, 1966

3,255,569

MECHANISM FOR REMOVING AND SIMULTANEOUSLY FOLDING AND TYING NEWSPAPERS FROM MULTIPLE STACKS THEREOF

Charles N. Hannon, Olathe, Kans., and Warren W. Hannon, 501 S. Chestnut, Olathe, Kans.; said Charles N. Hannon assignor to said Warren W. Hannon

Filed Mar. 18, 1963, Ser. No. 265,801
5 Claims. (Cl. 53—117)

This invention relates to a machine for folding and tying newspapers and particularly, to apparatus capable of removing individual sections of the paper from separate stacks thereof and then automatically wrapping the two sections together and binding the same into a unitary, throwable bundle.

In U.S. Patent No. 3,161,000 entitled Method and Apparatus for Folding and Securing Newspapers or the Like, issued Dec. 15, 1964, structure is disclosed for folding an individual newspaper from a stack of the same, whereupon a securing member is then placed around the newspaper to present a package which can be readily thrown by a carrier. However, this prior machine was necessarily limited to folding of newspapers from a single stack, necessitating preinsertion of the individual sections of each newspaper prior to placement of the same into the machine for folding and tying thereof.

However, many newspaper operations today involve printing of different sections of individual papers at timed intervals, not only to make most efficient use of the press facilities, but also because of the fact that in many cases the press capacity of a particular newspaper may not permit printing of all the sections immediately prior to delivery thereof. For example, Sunday editions of a paper normally have a number of different sections with all but the late news sections being printed well prior to the final delivery time, and even in midweek periods when the presses are not running at full capacity. Publishers have employed various methods to minimize the time required to stuff the individual sections into form to be delivered to the carrier, but all of the methods have been expensive and time consuming. One method has been to employ extremely complicated and expensive mechanical stuffing machines capable of inserting numerous sections into an outer section, but these machines have been of limited use and often were discarded because of the high cost, difficulty of maintaining the same in proper operation, and inability of the mechanism to handle relatively large newspapers of many sections. The overall size of stuffing machines of this type has discouraged many publishers from even attempting to use the same, but in those instances where they are employed, it is necessary that the stuffed papers immediately be packaged for transport to the individual carriers, and this means that the publisher must have a relatively large number of trucks available at the time of final printing of the last section and stuffing of the individual sections of the paper, so that all papers can be delivered to the carriers in time for them to fold and tie the papers into a throwable package before proceeding on their respective routes. The time factor becomes very critical in the newspaper plant at the time of stuffing of the sections because of the necessity of the papers being delivered to the carrier in time for him to fold and then deliver a paper to his last customer before an early hour when most people arise. The competition between news media, requiring newspapers to publish news as late as possible prior to the printing of the paper, has significantly decreased the amount of time available to the publishers to prepare the papers for delivery to the carrier, and thus the problems of getting multi-

section newspapers to the carriers at a required time, have become extremely critical, especially in recent years when the overall size of individual papers has increased.

Some papers, in an attempt to solve the problems referred to above, have employed work crews assembled on a Saturday, for example, to stuff the various sections of a newspaper and working at a speed to keep up with the press run of the final editions of the Sunday paper. Although a human work crew is more flexible than the mechanical stuffing machines described above, the problem of getting the assembled paper to the carriers between the time of printing of the last section and the time when they must have the papers in order to fold the same for delivery purposes, has not been eased to any degree by utilization of a stuffing crew.

With the advent of very large newspapers, especially on Sundays, for example, publishers have also been faced with the problem of storage facilities for large volumes of paper which are printed during the week in preparation for assembly of the final Sunday edition. It can be understood that when a newspaper of several hundred pages is to be delivered to customers, even through a number of sections are printed during the midweek, low press run periods of operation of the printing facilities, the paper does not have adequate storage space available to retain all of these sections in a readily accessible location for stuffing on Saturday afternoons and evenings.

Many publishers would desire to deliver these individual sections to the carriers during the week, if possible, for a number of important reasons, including decreasing the number of trucks required by the publisher to handle the volume of the newspapers at the final delivery hour on Saturday evening or Sunday morning, to minimize the storage space needed to handle the papers, and to significantly increase the time period the paper has between the printing of the final edition and the period when the papers must be in the carriers' hands for folding purposes.

It is, therefore, a primary object of the present invention to provide mechanism for removing and simultaneously folding and tying newspapers from multiple stacks thereof to overcome many of the problems enumerated above. Since the machine is capable of removing individual newspaper sections from individual stacks thereof, and then folding and tying the sections into a unitary, throwable package, the publisher may deliver the sections to the carriers at any time interval deemed expedient, whereupon the carriers can then assemble the sections and form a throwable package therefrom in a completely mechanized operation in far less time than was required for the carriers to roll and tie the newspapers by hand, as was the prior practice. Furthermore, the publisher can deliver the final sections of the newspaper to the carrier at a later hour than heretofore, with the carrier still having adequate time in which to mechanically wrap and tie the papers for delivery so that his last customer still receives his paper at a required early hour.

It is another significant object of the invention to provide mechanism as described, which is adaptable not only for removing individual sections of a newspaper from separate stacks thereof, and then folding them into a composite package, but is also utilizable to wrap and tie newspapers in a single, stuffed section at the time of delivery of the papers to the carrier so that the machine has utility not only for multisectioned Sunday editions, but also for all papers delivered during the week which contain substantially less pages and can be handled without the problem obtained with Sunday editions.

The present mechanism also permits the delivery of zone supplements to different areas of the newspapers' trade territory in those instances where newspapers have

a policy of selling advertising only for selected areas, thus permitting the individual carrier to mechanically assemble the zone supplement along with the regular edition of the newspaper without increasing his workload or extending the time required to fold and tie the newspapers prior to delivery thereof. Thus, another important object of the invention is to provide a machine for removing and simultaneously folding and tying newspapers from the multiple stacks which materially increases the flexibility of operation of a newspaper without burdening the carriers and at the same time decreasing the actual time employed in folding and tying newspapers of any number of separately printed and distributed sections.

Another object of this invention is to provide mechanism for folding and tying newspapers permitting a carrier to combine and fold newspapers from different publishers for delivery to the same customers with all of the operation being handled mechanically by the folding and tying apparatus, so that the carrier can handle a much larger number of papers in the same period of time without any increase in personnel and oftentimes permitting the utilization of significantly less help.

It is a further important object of the invention to provide a machine for removing and simultaneously folding and tying newspapers from multiple stacks thereof, wherein the individual sections are shifted from respective stacks onto a table in superimposed relationship, and then mechanically folding and tying, thereby permitting mechanical folding of papers of much larger size than would be the case if the sections were interleaved, because of the tendency of the outer sheet to be torn during attempts to fold the newspaper in half, one or more times, as has been the prior practice.

It is also an important object in this respect to provide mechanism which will automatically place a protective wrapper around the folded sections, thereby not only providing for protection of the newspaper against the elements when delivered by the carrier, but also oftentimes serving to reinforce the outer leaves of the paper during wrapping thereof, to prevent tearing of the outer pages of the multisectioned paper in those cases where the paper may contain many hundreds of pages and, therefore, be of sufficient over-all size to make it very difficult to fold the paper into a throwable bundle.

A particularly important object of the present invention is to provide mechanism of the type referred to above, which may conveniently comprise a series of cooperable, inter-related mechanical units which may be removed from the base machine to present apparatus substantially as disclosed in U.S. Patent No. 3,161,000, so that papers of interleaved sections may be properly folded and tied during those periods when it is not necessary for the carrier to assemble, fold and tie multisection newspapers where the sections are delivered to him either at separate times or in individual bundles.

A still further important object of the invention is to provide mechanism for removing and simultaneously folding and tying newspapers from multiple stacks thereof, which is uniquely adapted for folding newspapers having sections of various sizes so that two relatively thick sections can be moved into superimposed relationship and then folded upon themselves and tied, using certain components of the apparatus, or a relatively thick section and a thin section may be also folded, using other components of the apparatus, and two relatively thin sections may be shifted into proper superimposed relationship and subsequently folded and tied, employing other combinations of the operating components of the assembly.

Another object of the present invention is the provision of a machine of the type described which may be constructed, utilizing as the basic portion thereof, mechanism as described in Patent No. 3,161,000 with a minimum of modification to the latter, to permit manufacture and distribution of the present apparatus at a minimum cost.

A further object of the present invention is the provision of a newspaper folding and tying machine which utilizes a pair of spaced, newspaper-containing hoppers and shiftable structure engageable with individual newspapers in each of the hoppers for advancing an individual newspaper to a folding and tying location on the machine, such structures being coupled to the same power source whereby the advancement of individual newspapers from the hoppers is synchronized to assure that the individual newspapers are delivered to the folding and tying location at the proper time and without jamming the machine, thus providing for continuous, uninterrupted operation of the machine until the supply of newspapers has been folded and tied.

A further object of the present invention is the provision of a machine of the type described which is provided with a pair of newspaper-containing hoppers, one of which is removably carried on the machine whereby the machine may be utilized for folding a single newspaper when said one hopper is removed in situations where it is not feasible or desirable to fold a pair of newspapers from separate stacks thereof.

Yet another object of the present invention is the provision of platform means for receiving a pair of individual newspapers from spaced, separate stacks of such newspapers and including adjustable stop means on the platform means for correctly positioning the newspapers thereon, whereby newspapers of varying sizes may be utilized with the present machine by adjusting the stop means to compensate for variations in such sizes.

Another very important object of the invention is to provide apparatus for removing and then folding and tying newspapers either from multiple stacks or from a single stack, which is adapted for folding the papers into a package most conducive for throwing thereof, depending on the initial thickness of the paper to be folded, with relatively thick papers being folded in half twice across the major width thereof, while relatively thinner papers are folded three times across the minor width thereof to present a more compact package.

Other objects of the present invention will become apparent as the following specification progresses, reference being had to the accompanying drawings, wherein:

FIGURE 1 is a perspective view of the machine of the present invention for folding and tying a pair of individual newspapers into a throwable bundle and illustrating a pair of spaced, newspaper-containing hoppers for providing a supply of newspapers on opposed sides of a folding and tying station;

FIG. 2 is a top plan view of the machine illustrated in FIG. 1 and showing in dashed lines the relative positions of a pair of individual newspapers disposed in position at the folding and tying station prior to the folding operation;

FIG. 3 is a side elevational view of the machine showing the relative positions of the hoppers and further illustrating the power means for actuating structures coupled with the hoppers for advancing individual newspapers therein to the folding and tying station therebetween;

FIG. 4 is an elevational view of one side of the newspaper containing hopper disposed at the right-hand end of the machine as viewed in FIG. 3, illustrating a portion of the structure for advancing an individual newspaper to the folding and tying station;

FIG. 5 is a partial plan view of the hopper illustrated in FIG. 4 and showing the drive means coupled with the newspaper-advancing structure thereof;

FIG. 6 is an end elevational view of the hopper illustrated in FIG. 5;

FIG. 7 is a cross-sectional view taken along line 7—7 of FIG. 6;

FIG. 8 is a cross-sectional view taken along line 8—8 of FIG. 6;

FIG. 9 is an enlarged, bottom plan view of the newspaper-advancing structure for the hopper illustrated in

FIGS. 4–8 and showing several positions of the structure in dashed lines;

FIG. 10 is a side elevational view of the structure illustrated in FIG. 9;

FIG. 11 is a top plan view of the platform for supporting the pair of individual newspapers prior to the folding and tying of the latter and illustrating the adjustable stops on the platform for properly positioning the pair of newspapers so that the same may be folded at the proper locations;

FIG. 12 is a cross-sectional view taken along line 12—12 of FIG. 11;

FIG. 13 is a cross-sectional view of the newspaper-containing hopper located at the left-hand end of the machine as viewed in FIG. 3 and illustrating in dashed lines a stack of newspapers thereon and further illustrating the structure for advancing an individual newspaper therefrom toward and onto the platform of FIGS. 11 and 12;

FIG. 14 is an enlarged, fragmentary, top plan view of the newspaper-engaging portion of the structure for advancing individual newspapers from the hopper of FIG. 13;

FIG. 15 is a side elevational view of the structure shown in FIG. 14;

FIG. 16 is a perspective view of a present bundle formed by a pair of newspapers folded and tied in the machine utilizing both paper-receiving and advancing hoppers thereon;

FIG. 17 is a perspective view of a bundle formed by a pair of newspapers where the two sections are of relatively thick size and only one of the paper-advancing and receiving hoppers is employed in conjunction with the paper-receiving and advancing mechanism used in the machine disclosed in Patent No. 3,161,000; and

FIG. 18 is a perspective view of a single section of newspaper folded three times across the minor width thereof by using only one of the paper-receiving and advancing hoppers forming a part of the present invention.

The present invention provides a newspaper-folding and tying machine which utilizes a pair of hoppers removably secured to a support on opposed sides of a folding and tying station having newspaper-folding means and tying means spaced from the folding means. Each hopper is adapted for containing a stack of individual newspapers and is provided with shiftable structure for engaging and advancing an individual newspaper from the corresponding stack toward and onto the platform at the folding and tying station. A single power source carried within the machine is coupled with the structures of both of said hoppers so that the movements of the structures are synchronized to assure that the individual newspapers are advanced from the hoppers to the folding and tying station at the proper time and without jamming the machine.

Adjustable stops are provided on the platform for compensating for variations in sizes of newspapers and for properly positioning the pair of individual newspapers prior to the folding and tying thereof.

The structure for advancing the individual newspapers from one of the hoppers includes a reciprocable plate movable into and out of the path of travel of the newspapers and having an edge engageable with the line of fold of the lowermost newspaper for advancing the newspaper itself toward and onto the platform when the plate is moved to one end of its path of travel. When the plate is moved to the opposite end of its path of travel the plate is disposed out of the path of travel of the newspaper so as to clear the stack of newspapers and to subsequently move between the folds of the next adjacent newspaper to be advanced to the platform.

The structure for advancing an individual newspaper from the other of said hoppers includes a rod having a needle-shaped element at the end thereof for piercing and subsequently moving the uppermost newspaper of the corresponding stack toward and onto the platform in stacked relationship on the newspaper from the first-mentioned hopper. Provision may be made with the present invention for covering the pair of individual newspapers with a wrapper as the pair is being folded so that the securing member which binds the pair together may also surround the wrapper to maintain the latter on the newspapers as a protection against moisture, dirt or the like.

The newspaper-folding and tying machine which forms the subject of the present invention is broadly denoted by the numeral **20** and includes a support **22** having a pair of spaced, normally upright walls **24** and **26** interconnected by a number of spaced crosspieces. Side panels **30** are coupled with side walls **24** and **26** as shown in FIG. 1, to present a neat and workmanlike appearance to machine **20**. Side panels **30** cover and thereby conceal a number of working parts located directly adjacent to the exteriorly of side side walls **24** and **26**.

Machine **20** is provided with newspaper-folding mechanism and newspaper-tying means therewithin between side walls **24** and **26**, such folding mechanism and tying means being substantially identical in all respects with the folding mechanism and tying means of the machine disclosed in Patent No. 3,161,000. In view of the similarities in structures of the two machines, the details, description and manner of operation of the folding mechanism and tying means of said application are hereby incorporated by reference in the present application. Reference to such folding mechanism and tying means herein will, therefore, be made only insofar as the same applies to the description and operation of machine **20** of the present invention.

Machine **20** further includes a pair of newspaper containing hoppers **32** and **34** mounted in any suitable manner between sides **24** and **26** at the ends of machine **20** and on opposed sides of a central, plate-like platform broadly denoted by the numeral **36**.

Platform **36** is disposed for receiving a pair of individual newspapers from hoppers **32** and **34** respectively, prior to the folding of the pair of individual newspapers by the folding mechanism of machine **20** in the same manner as newspapers are folded in our aforesaid patent. A first tucker blade **38** is swingably mounted between side walls **24** and **26** for folding the pair of newspapers along a central line of fold transversely of the longitudinal axis of machine **20**. A second tucker blade (not shown) beneath blade **38**, folds the pair of individual newspapers along a second line of fold transverse to the longitudinal axis of machine **20**. The tying mechanism of machine **20**, located adjacent the second tucker blade, wraps and ties a flexible securing member about the pair of individual newspapers after the latter have been folded by the second tucker blade.

Tucker blade **38** is pivotally carried by a pair of arms **39** on opposite sides of walls **24** and **26**, with the cams **47** on blade **38** riding along the cam surfaces **41** of upright plates **43** on the upper margins of plates **24** and **26** during oscillation of blade **38**. The stop elements **45** overlying and in spaced relationship to the inclined cam margins **41*a*** of plates **43**, cooperate with the margins **41*a*** to define elongated slots for receiving respective cams **47** when the blade **38** is shifted to the upper end of its path of travel. The elements **45** operate to tilt the tucker blade **38** in a counterclockwise direction viewing FIG. 3, when blade **38** is moved toward the upper end of its path of travel so that the lower, horizontal edge of the blade **38** is maintained in substantial spaced relationship above the surface of platform **36** at the time individual papers are shifted onto the same as will be described.

Hopper **32** includes a receptacle having a pair of sides **40** and **42** which are normally covered by suitable side panels **44** as is clear in FIG. 1. A pair of end walls **46** (FIG. 1) interconnect sides **40** and **42** of hopper **32** to present the receptacle or container for receiving a supply of newspapers in a vertically stacked condition.

A plate 48 within hopper 32 and inclined to the vertical, provides a bottom for hopper 32 and thus serves as a platform for supporting the stack of newspapers, with the lowermost newspaper in an inclined position. A pair of guides 50 are shiftably carried in any suitable manner on sides 40 and 42 within hopper 32 for up and down movement to thereby shift the lowermost edges 52 of guides 50 toward and away from plate 48. The guides 50 thereby serve to direct the lowermost newspapers in the stack thereof within hopper 32, downwardly toward the newspaper outlet above plate 48. Screw means 54 is provided for each guide 50 and is interconnected with the screw means of the adjacent guide 50 by an endless link chain 56, as shown in FIG. 5. A shaft 58, having a handle 60 thereon, is rotated to simultaneously raise or lower guides 50 to vary the distance between plate 48 and edges 52. Brushes 260 carried by guides 50 and depending therefrom, project toward the upper face of plate 48 and define the outlet for the lowermost newspaper in hopper 32. Thus, the spacing between plate 48 and the lower edges of brushes 260 may be varied, depending upon the thickness of the newspaper which it is desired to pass through the outlet space between plate 48 and brushes 260.

A pair of vertically spaced rollers 62 and 64 are carried by hopper 32 adjacent the outlet thereof formed by plate 48 and edges 52. Rollers 62 and 64 are mounted on shafts 66 and 68 respectively, the latter in turn being rotated in opposed directions so that the uppermost roller 62 is rotated in a clockwise sense, while the lower roller 64 rotates in a counterclockwise sense when viewing FIGS. 7 and 8. Shaft 68 remains stationary as the same rotates about its longitudinal axis. Shaft 66 is permitted to move through a limited vertical distance within slots 70 in sides 40 and 42 by virtue of being coupled with a swingably mounted spaced bar 72 rotatable about a shaft 74 spanning the distance between sides 40 and 42 as is clear in FIG. 4. By virtue of this construction, newspapers of varying thicknesses may be passed outwardly of hopper 32 between rollers 62 and 64, the latter, by virtue of their rotation, augmenting the force required for directing the lowermost newspaper out of hopper 32.

A pulley 76 is rigid to shaft 66 and an endless, flexible belt 78 is trained over pulley 76. Belt 78 is further trained over a pulley 80 rigid to shaft 74, the latter in turn having a spur gear 82 thereon in mesh with a spur gear 84 rigid to a shaft 86.

Shaft 86 spans the distance between sides 40 and 42 and carries thereon a spur gear 88 at the end thereof adjacent side 42 as is clear in FIG. 3. Spur gear 88 is in mesh with a spur gear 90 mounted on a stub shaft 92 projecting laterally from side 42. Spur gear 90 is in mesh with a spur gear 94 carried by a shaft 96, the latter is turn spanning the distance between sides 40 and 42. A pulley 98 is carried at the end of shaft 68 adjacent side 42 and is interconnected with a pulley 100 on shaft 86 by an endless, flexible belt 102 as is clear in FIG. 3. A pulley 104 is carried on shaft 96 in outwardly spaced relationship to the plane of pulleys 98 and 100 as is clear in FIGS. 5 and 6. An endless, flexible belt 106 is trained about pulley 104 and about a pulley 108 carried at the outer end of a shaft 110, the latter being the output shaft of a prime mover such as an electric motor or the like. A spacer bar 112 interconnects shafts 96 and 110 to maintain the latter at a proper spacing at all times. An idler pulley 114 is carried on side wall 26 in any suitable manner and engages belt 106 to maintain proper tension on the latter. Rotation of shaft 110 is sufficient to rotate shaft 96, the latter in turn rotating shafts 66 and 68 by rotating shaft 86 and shaft 74.

Mechanism for advancing the lowermost newspaper from hopper 32 is broadly denoted by the numeral 116 and includes a reciprocable plate 118 carried by each of the sides 40 and 42 and illustrated in FIGS. 9 and 10. Each plate 118 is provided with a main body portion 120 and a triangularly-shaped end portion 122 integral with portion 120. Plate 118 is secured at portion 120 thereof to a support 124 on one side of a laterally extending shelf 126 having a normally vertically disposed flange 128 thereon. Plate 124 is coupled by means of a bolt 130 extending through a longitudinally disposed slot 132 in shelf 126 to another supporting plate 134 located on the normally uppermost side of shelf 126 as is clear in FIG. 10. A nut 136 maintains a coil spring 138 against plate 134 and a round bolt 130 to bias plates 124 and 134 together.

A pair of spaced pins 140 and 142 are carried on shelf 126 adjacent corresponding ends of slot 132 and depend therefrom as is clear in FIGS. 9 and 10. Pins 140 and 142 are alternately engaged by an extension 144 projecting laterally from body portion 120 of plate 118 when the latter approaches the corresponding end of its path of travel. Extension 144 is provided with a first cam edge 146 for engaging pin 140 to cause plate 118 to swing in a clockwise sense about the axis of bolt 130 when viewing FIG. 9. Extension 144 is provided with a second edge 148 for engaging pin 142 to cause plate 118 to swing in a counterclockwise sense about the axis of bolt 130 when viewing FIG. 9.

Flanges 128 are disposed adjacent sides 40 and 42 by virtue of being connected to shiftable structure broadly denoted by the numeral 129 and including a link 131 adjustably secured to a corresponding flange 128 by a threaded shank 133 as is clear in FIG. 7. One end of the link 131 is coupled with the corresponding screw means 54 for shifting the adjacent guide casting 50. Link 131 is thus raised or lowered as guide casting 50 is raised or lowered.

Furthermore, plates 118 are so disposed that the transverse edges 150 of portions 122 will engage the lowermost newspaper on the inner surface thereof at the line of fold, such line of fold being transverse to the longitudinal axis of machine 20.

Plates 118 are reciprocated along the lengths of shelves 126 by means of links 152 pivotally connected at proximal ends thereof to an ear 154 projecting upwardly from plate 134 as is clear in FIG. 10. Links 152 are secured at the opposite ends thereof to arms 156 (FIG. 5) rigid to a shaft 158 spanning the distance between side walls 24 and 26. Shaft 158 projects outwardly from side wall 24 and is coupled with one end of break-away linkage broadly denoted by the numeral 160 through an arm 161. Linkage 160 is pivotally secured at the opposite end thereof to an arm 162 rigid to shaft 96.

Rotation of shaft 96 under the influence of shaft 110 is sufficient to rotate arm 162 through a complete circle to in turn swing shaft 158 in opposed directions through a limited arc. The reciprocation of shaft 158 in turn reciprocates links 152 to thereby shift plates 118 in opposed directions. It is to be noted that when each plate 118 is swung to the dashed line position of FIG. 9 after edge 148 engages pin 142, the bias force of spring 138 maintains plate 118 in the position until edge 146 engages pin 140 after plate 118 has been moved to the opposite end of its path of travel under the influence of linkages 152. It can be seen, therefore, that portions 122 of plates 118, normally in the path of travel of the lowermost newspaper when the plates are in the solid positions illustrated in FIG. 9, will move out of the path of travel of the newspapers and then outwardly of machine 20 to the left-hand dashed line position of FIG. 9. Thereupon, the plates 118 will once again move across the path of travel of the lowermost newspaper and between the folds of the latter for subsequent engagement with the inner surface thereof at the line of fold.

Hopper 32 is provided with a pair of pins 164 projecting outwardly from sides 40 and 42 respectively, and receivable within the bifurcated, upper ends of a pair of elongated members 166 secured to side walls 24 and 26 as is clear in FIG. 3. The force applied to pulley 104 by

belt 106 is sufficient, along with the placement of pins 164 within the bifurcated ends of members 166 for removably maintaining hopper 32 on support 22.

Hopper 34, as shown in FIGS. 1, 2 and 13, includes a bottom 168 and a pair of opposed sides 170 and 172 secured to and extending upwardly from bottom 168. Sides 170 and 172 engage a plate 174 as shown in FIG. 1, sides 170 and 172 being rigidly secured to plate 174 by screws 175 passing through an apertured bracket 177.

When hopper 34 is disposed on plate 174, bottom 168 is slightly inclined as shown in FIG. 13. A plate-like element 176 having a transverse lip 178 is secured to bottom 168 adjacent the open end 180 of hopper 34 to retain the lowermost newspaper of a stack 182 of newspapers contained between sides 170 and 172 and illustrated in dashed lines in FIG. 13. A pair of deflector plates 184 are secured to and extend outwardly and downwardly from the upper margins of sides 170 and 172 adjacent open end 180 as is clear in FIG. 13. Plates 184 are disposed for downwardly deflecting the uppermost individual newspaper as the latter is removed from stack 182.

Means for directing the uppermost newspaper off stack 182 and through the open end 180 thereof includes a pair of rods 186 pivotally secured at proximal ends thereof to collars 188 releasably secured to a shaft 190 spanning the distance between sides 170 and 172 and coupled at the ends thereof with arms 192 at proximal ends of the latter as is clear in FIGS. 2 and 13. The opposite end of each rod 186 is enlarged as shown in FIGS. 14 and 15, and is provided with a bore 194 therethrough at an angle relative to the longitudinal axis thereof. A needle-shaped element 196 is received within bore 194 and releasably maintained in a fixed position by a setscrew 198 threaded into the corresponding end of rod 186 and bearing against element 196. The sharpened, lowermost end 200 of each element 196 is adapted for piercing the uppermost newspaper of stack 182 and for advancing such newspaper toward and through the open end 180 of hopper 34 as the rods 186 move toward end 180 under the influence of arms 192.

Each arm 192 is pivotally secured at the opposite end thereof on one of the sides 170 and 172 by means of a shaft 202 which spans the distance between the last-mentioned sides. A link 204 is pivotally secured at the ends thereof to a corresponding arm 192 and to an arm 206, the latter in turn being pivotally mounted adjacent one end thereof to side wall 26 as is clear in FIG. 3. Breakaway linkage 208 is coupled with arm 206 and to shaft 111 for reciprocating arm 206 to thereby reciprocate arms 192 and rods 186. Shaft 111 is driven by shaft 110 through belt 113 trained over pulleys 115 and 117 on shafts 111 and 110 respectively. Linkage 208, as well as arm 206, forms a part of the structure for advancing the lowermost newspaper of a stack disposed between side walls 24 and 26 at a location in which the innermost end of hopper 34 is disposed when machine 20 is utilized in the manner set forth in our aforesaid patent. By adding link 204 to arm 206, no further modification is required in order to actuate rods 186 from the already existing structure so as to advance an individual newspaper from stack 182.

The uppermost newspaper is advanced toward and between a pair of vertically spaced rollers 210 and 212 shown in dashed lines in FIG. 3, the uppermost roller 210 being shiftable relative to the lowermost roller 212 in the same manner as roller 62 is shiftable toward and away from roller 64. Rollers 210 and 212 rotate in opposed directions by structure disclosed in our aforesaid patent so as to augment the force required for advancing a newspaper from hopper 34 toward and onto platform 36.

It is to be noted that the stack 182 of newspapers contained within hopper 34 is disposed so that the lines of fold of the newspapers are adjacent side 170. By shifting collars 188, rods 186 may be disposed so that elements 196 will pierce the uppermost newspaper in positions relative to the lines of fold thereof sufficient to impart a force adequate to move the paper off the stack 182.

Platform 36 illustrated in FIGS. 11 and 12 includes a lower plate 214 and a pair of side plates 216 and 218 located above and to the side of plate 214 as is clear in FIG. 11. Each of plates 216 and 218 is provided with an upwardly extending projection 220, while the lower plate 214 is provided with a downwardly extending portion 222 which forms with projections 220, a throat area 224 for guiding an individual wrapper of sheet material between plate 214 and plates 216 and 218, when it is desired to utilize such a wrapper for covering the folded pair of individual newspapers initially deposited on platform 36.

Platform 36 further includes a plate 225 illustrated in FIG. 2 adjacent to and spaced from plate 214. Plates 214 and 225 are substantially in the same horizontal plane and separated by a space 227 through which tucker blade 38 passes during the first folding operation of the newspapers on platform 36. Plate 225 is substantially coextensive with plate 174, the junction (not shown) between plates 174 and 225 being disposed to permit a wrapper to pass onto plate 225 and under projections 229 shown in FIG. 2, on opposed sides of machine 20 in overlying relationship to plate 225. Projections 229 serve to guide the wrapper as the same is passed onto plate 225 and into the throat area 224 prior to moving onto plate 214.

To this end, a number of wrappers are disposed in stacked relationship within an inclined hopper denoted by the numeral 226 below hopper 34 as is clear in FIG. 1. Means broadly denoted by the numeral 228, shown in FIG. 3, is utilized for advancing an individual wrapper from the top of the stack thereof in hopper 226 toward and onto plate 214 beneath plates 216 and 218.

A pair of L-shaped stops 230 is carried by plate 218 and located in the path of travel of the individual newspaper moved off the top of stack 182 in hopper 34. Stops 230 may be adjustable so as to be moved toward and away from hopper 34 to compensate for varying widths of newspapers which may be contained within hopper 34. Stops 230 are adapted for engaging one side edge 231 of the newspaper 233 shown in dashed lines in FIG. 2, which newspaper issues from the top of stack 182 under the influence of rods 186. It is to be noted that the edges 232 and 234 of plates 216 and 218 respectively, are beveled downwardly so that the newspaper from hopper 34 will not be jammed between plates 214 and plates 216 and 218 as the newspaper travels toward stops 230.

Another pair of stops 236 is carried by machine 20 by structure extending inwardly from side walls 24 and 26 and is illustrated in FIG. 2. Stops 236 include a pair of resilient fingers 238 having projections 240 thereon which are disposed for engaging the edge 242 representing the line of fold of the newspaper 244 issuing from hopper 32 and illustrated in dashed lines in FIG. 2.

The structures of hoppers 32 and 34 are disposed for advancing respective individual newspapers in such a manner that newspaper 233 is deposited on platform 36 below newspaper 244. The line of fold 246 of newspaper 233 is perpendicular to the edge 242 representing the line of fold of newspaper 244.

In operation, a stack of newspapers 233 is deposited in hopper 34, and a stack of newspapers 244 is deposited in hopper 32. The guides 50 in hopper 32 are adjusted, as well as the positions of plates 118 so that a single newspaper may pass outwardly from hopper 32 below brushes 260 as plates 118 are shifted toward platform 36. The stack of newspapers 233 is disposed within hopper 34 in a position such that the lowermost newspaper 233 engages lip 178 of element 176.

The prime mover coupled with shaft 110 is then energized by suitable control structure and, as a result, rollers 62 and 64 are caused to rotate in opposed directions. Similarly, rollers 210 and 212 are also caused to rotate in opposed directions in a manner to advance an indi-

vidual newspaper toward platform **36**. As shaft **111** rotates, break-away linkage **208** rotates in a direction to shift arms **192** toward platform **36**. This action in turn causes elements **196** to pierce the uppermost newspaper **233** in stack **182** and to move the same toward and between rollers **210** and **212**. Such newspaper **233** continues on to platform **36** until the same engages stops **230**, at which time the newspaper **233** is in proper position for subsequent folding by the first tucker blade **38**.

Simultaneously with the movement of the uppermost newspaper from hopper **34**, plates **118** advance the lowermost newspaper from the stack of newspapers **244** in hopper **32** into the space between plate **48** and brushes **260** for movement between rollers **62** and **64**. The lowermost newspaper **244** continues to advance onto platform **36** until the edge **242** engages stops **236**. The pair of individual newspapers **233** and **244** are now in position to be folded by the first tucker blade **38**.

The folding operation of machine **20** then takes place to fold the pair of stacked individual newspapers **233** and **244** along a pair of transverse lines of fold. Subsequently thereto, a securing member **248** is wrapped and tied about the folded pair of newspapers by tying mechanism **247**, shown in FIG. 3, so that the pair of newspapers form a unitary, throwable bundle as illustrated in FIG. 16. Such bundle may then be thrown by a carrier when the latter is on foot or within a moving vehicle.

The present machine is also particularly useful for folding newspapers of the order of 8 to 40 pages, where mechanism as disclosed in Patent No. 3,161,000 is not especially useful for papers of this size because when relatively thin newspapers are folded twice transversely across the major width thereof, the resulting package is relatively flexible and not easily thrown from a moving vehicle. However, by utilizing only hopper **34** on machine **20** and inactivating hopper **32** or removing the same from the machine, the thin papers may be placed in hopper **34** and delivered therefrom onto the folding platform, as has been previously described, whereby such papers will be folded three times transversely across the narrow width thereof to present a much more compact package, as illustrated in FIG. 18. It is to be noted that forward motion of a paper from hopper **32** onto the folding platform **38** by the oscillating delivery mechanism associated therewith, is arrested by stops **236** so that tucker blade **38** initially folds the front two-thirds of the paper whereby the folding mechanism internally of the machine **10**, then again folds the paper in half to cause the paper to be folded three times, as is apparent in FIG. 18.

The relatively long arm **186** of the oscillating delivery mechanism of hopper **34** and located on shaft **190** a substantial distance above the plane of plate **168**, is of importance because of the way in which machine **20** may be operated continuously without interruption for insertion of papers in hopper **34**. The hopper **34** is sufficiently long to permit placement of two vertical stacks of newspapers thereon, one stack **182** being located in a forward position as shown in FIG. 13, where the piercing elements on arms **186** may engage and displace the uppermost newspaper from stack **182**, while the second stack is located immediately to the rear thereof. Thus, as the arms **186** move the last paper of stack **182** forwardly, the operator of machine **20** may simply place the second stack into the disposition initially occupied by stack **182** for continuous delivery of papers to platform **36**.

Machine **20** is also operable to deliver two relatively thick newspapers onto platform **36** with the fold margins thereof being shifted toward each other and then past one another as the papers are shifted into stacked relationship, by simply removing hopper **34** from machine **20** and employing hopper **32** and the newspaper receiving and advancing mechanism forming a part of machine **20**, as explained in detail in Patent No. 3,161,000. It is to be recalled that the paper advancing mechanisms of hopper **32** and the structure originally provided on machine **20**, as disclosed in the above-identified patent, are identical, and, therefore, the reciprocable newspaper-advancing blades on each side of the stacks of newspapers in the opposed hoppers operate to move two newspapers simultaneously onto platform **36** from opposite directions.

The papers are initially positioned in the hopper **32** as well as the original hopper of machine **20**, in disposition with the fold lines of newspapers facing toward each other, so that during shifting of the individual papers onto platform **36** by the rollers, such as **62** and **64**, the fold edges of the newspapers are shifted toward each other to preclude possible interleaving of the newspapers as the same are shifted into superimposed, generally aligned relationship.

The package resulting from folding two newspapers delivered from the hopper **32** and the original hopper of machine **20**, as illustrated in FIG. 17, wherein it is evident that a much neater and evenly folded bundle is obtained notwithstanding the fact that the two newspapers delivered from individual hoppers are relatively thick and present substantial resistance to folding along the side margins thereof where the individual sheets of the newspapers are joined. If an attempt was made to fold both of the newspaper sections with the side, interconnected margins thereof in superimposed relation, it would be very difficult to break these edges by the tucker blades of the machine and there would be a tendency for the margins to crack and tear as the newspapers were folded in half. However, by directing the newspapers onto the platform **36** in reversed relationship so that the transverse fold margins thereof are located in spaced relationship, the side interconnecting margins of the sheets of the individual newspapers are located on opposite sides of the stack to be folded, whereby the force necessary to fold the newspapers in half is maintained at a minimum and there is less tendency for the papers to crack or tear along such side margins.

By virtue of the way in which the two superimposed newspapers located on platform **36** are subsequently folded within the machine **20**, there is no tendency for the end edges of the papers to "feather" during handling or throwing of the final package since the end edges of the papers are located inside of the paper where they are restricted against feathering by the transverse fold portion of the outer newspaper, as is shown in FIG. 17.

When it is desired to utilize machine **20** in the manner following the teachings set forth in our aforesaid patent, hoppers **32** and **34** are removed from between side walls **24** and **26** after belt **106** has been removed from pulley **104** and after link **204** has been disconnected from the corresponding arm **192**. Also, hopper **34** is disconnected from plate **174** by removing screws **175** from plate **174**. Newspapers may then be deposited between side walls **24** and **26** at the usual location, i.e., the area at which the innermost end of hopper **34** is disposed. Reciprocable plates similar to plates **118** are coupled with arms **206** for advancing the lowermost newspaper from the stack toward and onto the platform **36**, whereupon the folding and tying operations then take place.

Machine **20** may, therefore, be utilized for folding a pair of individual newspapers in the manner hereinabove described or, the machine may be utilized for folding only a single newspaper in the manner set forth in our aforesaid patent after the hoppers **32** and **34** have been removed.

If it is desired to cover the pair of newspapers **233** and **244**, a wrapper is advanced onto platform **36** into a position beneath newspapers **233** simultaneously with the movement of the last-mentioned newspaper toward and onto platform **36**. The movement of the wrapper is accomplished by the actuation of means **228** for advancing

the uppermost wrapper of the stack located in hopper **226**.

Safety features may be incorporated in the present invention to assure proper feeding of newspapers **244** from hopper **32** for instance. To this end, a pair of microswitches **250** may be utilized beneath plate **48** and each provided with a shiftable contact arm **252** located within the path of travel of the lowermost newspaper **244**. Arms **252** are positioned so that, if the same are not simultaneously shifted by the lowermost newspaper **244**, such as when the newspaper is askew or out of alignment, the machine **20** will be deactuated until the lowermost newspaper **244** is properly aligned for movement onto platform **36**.

A microswitch **254** having a shiftable contact arm **256** extending above plate **48**, provides means for sensing the time when hopper **32** is emptied. Thus, when switch **254** is actuated by the upward swinging movement of arm **256**, machine **20** is shut down until additional newspapers **244** are deposited in hopper **32**.

Pulleys **104** and **108** are adequately protected by a housing **258** shown in FIG. 2, notwithstanding the fact that shafts **96** and **110** project outwardly a sufficient distance to permit the use of belt **106**. Housing **258** is removable to permit the removal of hopper **32** from machine **20** when it is desired to fold and tie only a single newspaper.

The brushes **260** which extend partially across the space between edges **52** and plate **48**, decrease the criticality of adjustment of guide **50**, while at the same time preventing more than one newspaper **244** from being advanced toward and onto platform **36**.

In addition, hopper **34** may be provided with a pair of parallel ribs **262** on bottom **168** as is clear in FIGS. 2 and 13. Ribs **262** provide means along which the rounded edge **264** at the bottom end of each of the rods **186** may slide in the event that stack **182** in hopper **34** is depleted. This assures that elements **196** will be protected at all times since the ends **200** of elements **196** will be spaced above, but in relatively close proximity with bottom **168** when there are no newspapers in hopper **34**.

In the event that machine **20** is to be utilized for folding a single newspaper when hoppers **32** and **34** are removed from support **22**, a stack of newspapers may be disposed on plates **174** and the above-mentioned plates, similar to plates **118** which are coupled with arm **206**, are shifted under the influence of linkage **208** and shaft **111** in opposed directions to advance the lowermost newspaper from a stack on plate **174** toward and onto platform **36**.

Plate **174**, therefore, serves either to support hopper **34** when it is desired to fold and tie a pair of newspapers together from individual stacks, or to support a stack of newspapers when it is desired to fold only an individual newspaper from the stack. When hopper **34** is to be removed from support **22**, the pivot pin **266** which interconnects link **204** with arm **192**, is removed and link **204** is then permitted to rest on plate **174** and to slide thereover when arm **206** is reciprocated.

Tucker blade **38** engages the pair of individual newspapers **233** and **244** situated on platform **38** along a line substantially midway between opposed edges of newspapers **244**. It is evident, therefore, that the blade **38** will not engage newspaper **233** along a line midway between corresponding opposed edges. However, the notched wheels below the blade **38**, as disclosed in Patent 3,161,000 will fold the excess portion of newspaper **233** over the major portion of the two newspapers **233** and **244** so that the second tucker blade may again fold the papers in half just prior to tying of the bundle by the string-tying mechanism.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A folding and tying machine for newspapers having multiple leaves folded in half to present at least one hard edge comprising:

a pair of spaced first platforms, each adapted for supporting a separate supply of newspapers in stacked relationship;

a second newspaper supporting platform between said first platforms;

a plurality of reciprocable pusher elements on each of said first platforms engageable with the stack of newspapers thereon and operable to enter into the leaves of an individual newspaper of the stack for directing said individual newspaper from the stack toward and onto said second platform substantially simultaneously with and in stacked relationship to the individual newspaper from the other of said first platforms;

means engageable with the pair of individual newspapers on said second platform for folding said pair and tying the same with a securing member to form a unitary, throwable bundle; and

power means operably coupled with said folding and tying means and said elements for synchronously reciprocating the latter and operating said folding and tying means.

2. A folding and tying machine as set forth in claim **1**, wherein one of said first platforms is disposed for containing the stack of newspapers thereon with the hard edges thereof extending parallel to the path of movement of the individual newspaper onto said second platform, said one of said first platforms having two of said elements thereon each including an elongated member having end means for piercing the uppermost paper of the stack on said one platform, one of said end means being disposed for piercing said uppermost paper adjacent the hard edge thereof for urging the latter toward and onto said second platform.

3. A folding and tying machine as set forth in claim **2**, wherein the other of said first platforms is disposed for containing the stack of newspapers thereon with the hard edges extending transversely to the path of movement of the individual newspaper onto said second platform, said other of said first platforms having two of said elements thereon each including blade means disposed to be received within the folds of an individual newspaper of the stack on said other platform and engageable with said individual newspaper at opposed ends of said hard edge thereof for urging the latter toward and onto said second platform.

4. A folding and tying machine as set forth in claim **3**, wherein said power means includes a single motor having an output shaft, there being means operably coupling the shaft to said folding and tying means for actuating the latter in response to operation of the motor, and separate coupling means operably joining the shaft to said piercing members, and to said blade means respectively for reciprocating the latter toward and away from each other in synchronized motion during rotation of the shaft.

5. In a folding and tying machine for newspapers having multiple leaves folded in half to present at least one hard edge:

a newspaper supporting platform with an outlet, said platform being adapted for alternately supporting thereon either a stack of folded newspapers with the hard edges of the latter disposed proximal and substantially parallel to said outlet or a removable hopper;

a pair of reciprocable pusher blades carried by said platform and disposed to be received within the folds of an individual newspaper of said stack adjacent the hard edge of said newspaper at opposed ends thereof for directing the latter through said outlet along a path of movement substantially perpendicular to said hard edge;

power means having a rotatable shaft and including an element coupled with said blades and operable to reciprocate said blades synchronously in response to the rotation of the shaft;

a newspaper hopper with an outlet removably carried

on said platform in the space adapted to be occupied by said stack, with the hopper outlet in substantial alignment with the platform outlet, said hopper being adapted for containing a different stack of newspapers thereon with the hard edges of the latter extending away from and substantially perpendicular to said outlets;

a pair of reciprocable pusher members having pointed end means, said members being carried on said hopper and adapted for piercing the uppermost paper of said different stack for directing said uppermost paper through said outlets along a path of movement substantially parallel to the hard edge of said uppermost paper, one of said end means being disposed for piercing said uppermost paper adjacent the hard edge thereof; and

a shiftable mechanism operably connected to said

pusher members and reciprocable therewith, said mechanism being releasably coupled with said element and operable to synchronously reciprocate said members in response to the rotation of said shaft.

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