

Sept. 4, 1945.

A. P. BAMFORD

2,384,231

APPARATUS FOR APPLYING SHEET MATERIAL TO OTHER MATERIALS

Filed July 11, 1942

5 Sheets-Sheet 1

FIG. 1

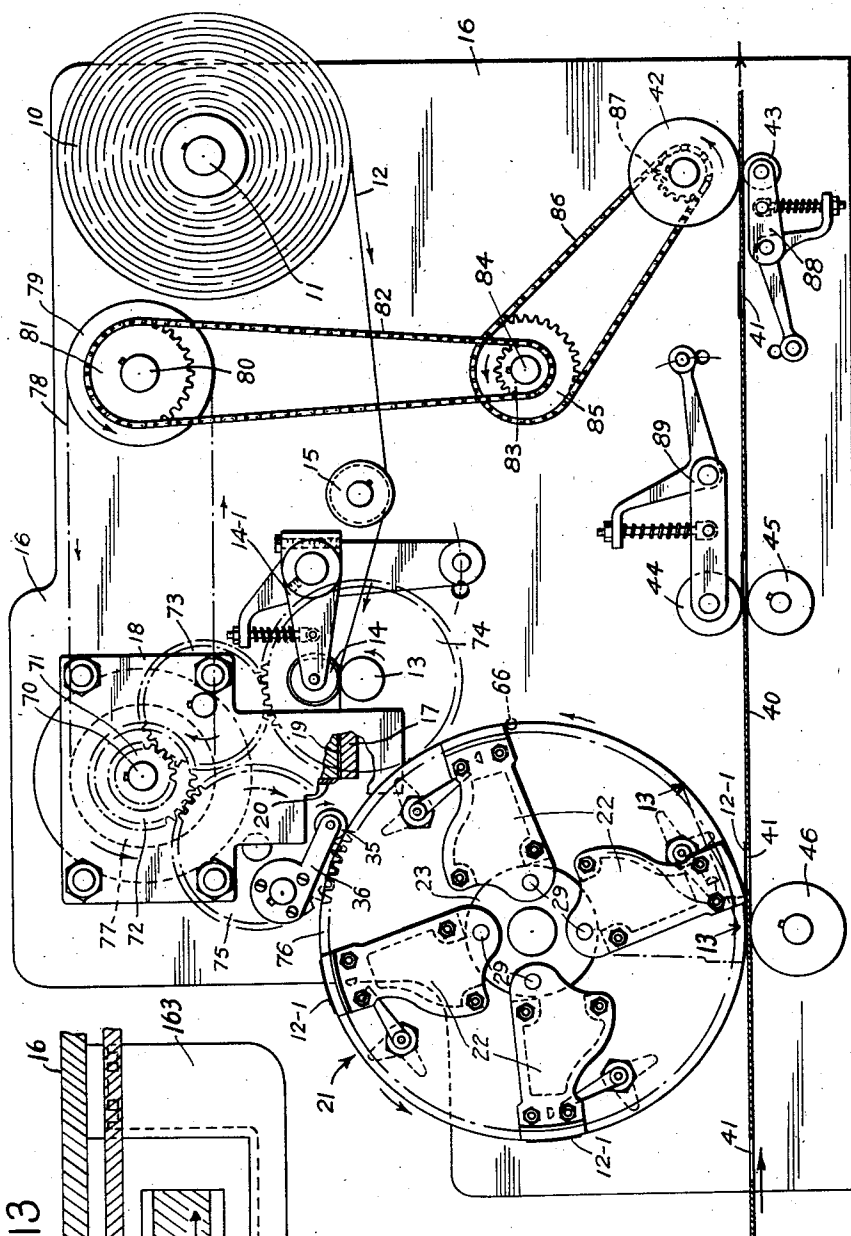
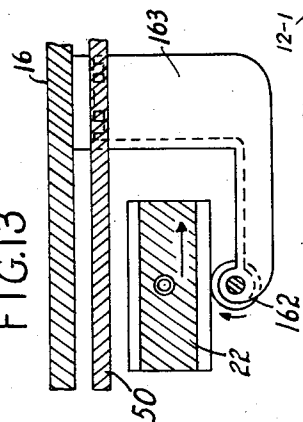


FIG. 13



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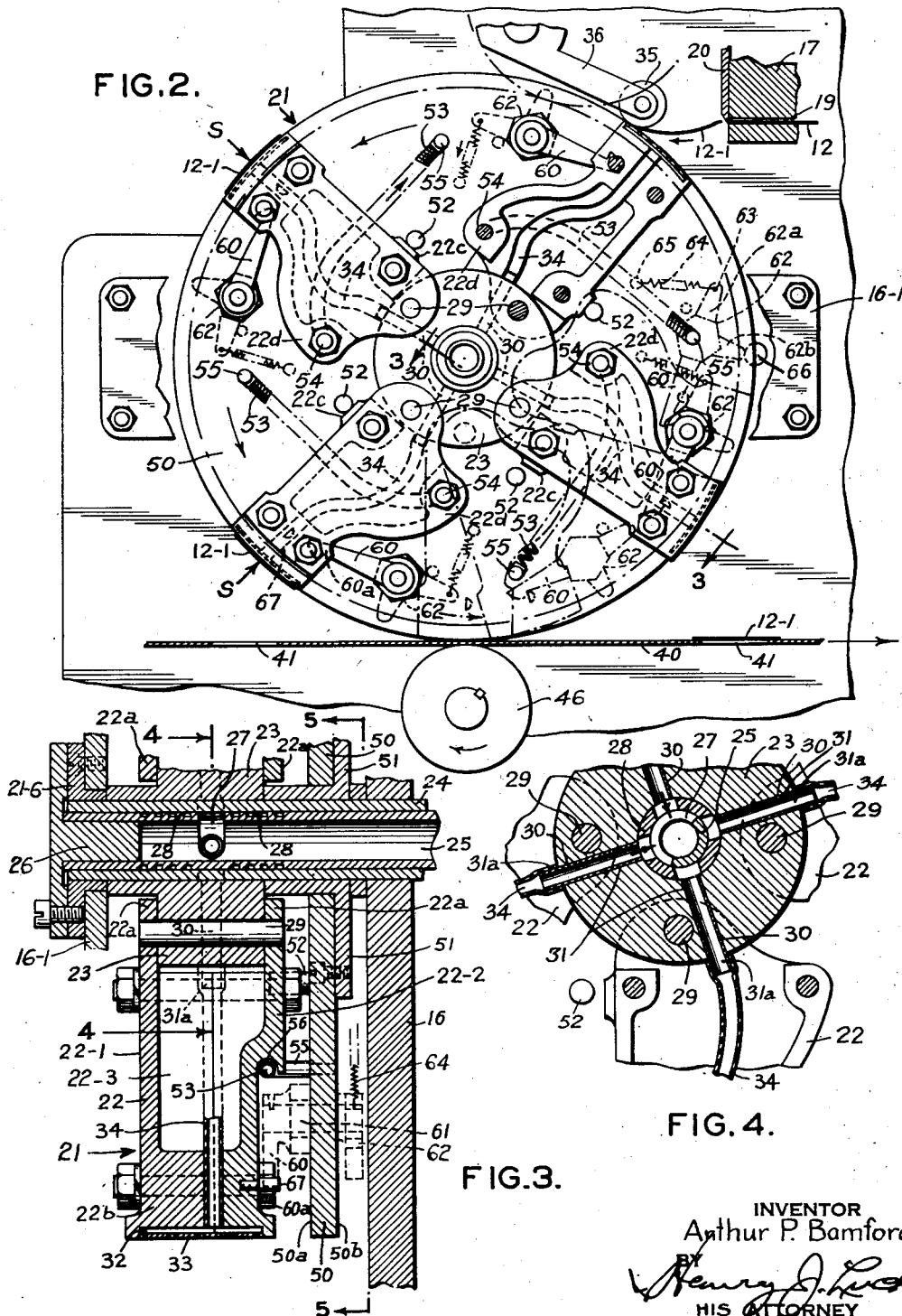
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

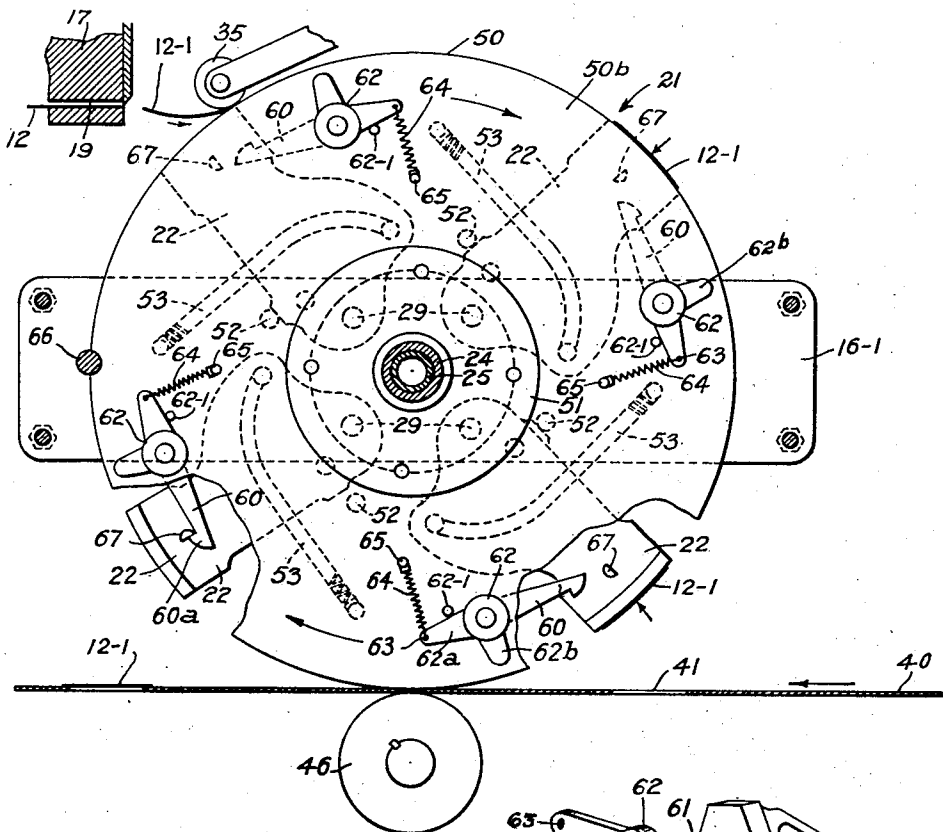


FIG.5.

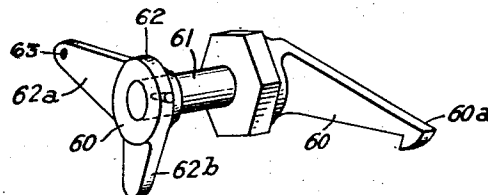


FIG. 6.

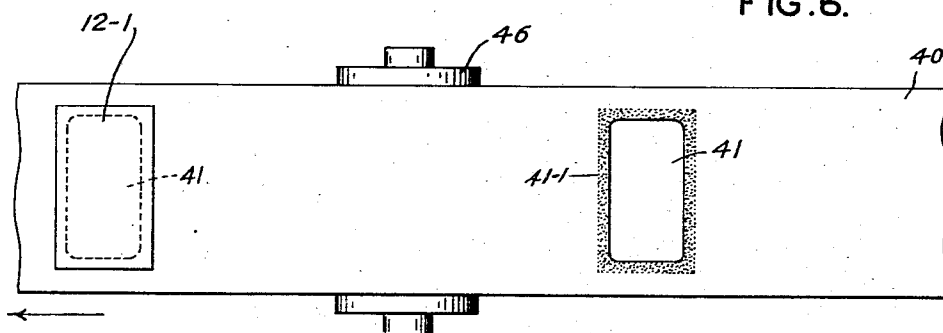


FIG.7.

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5 Sheets-Sheet 4

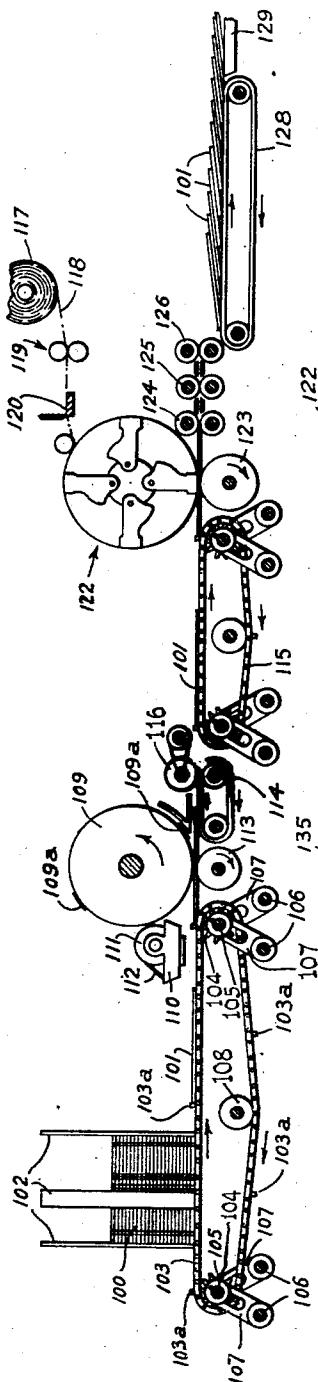


FIG. 8.

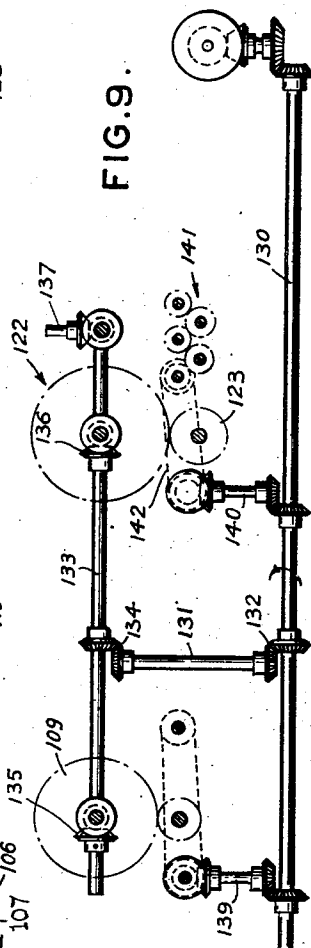
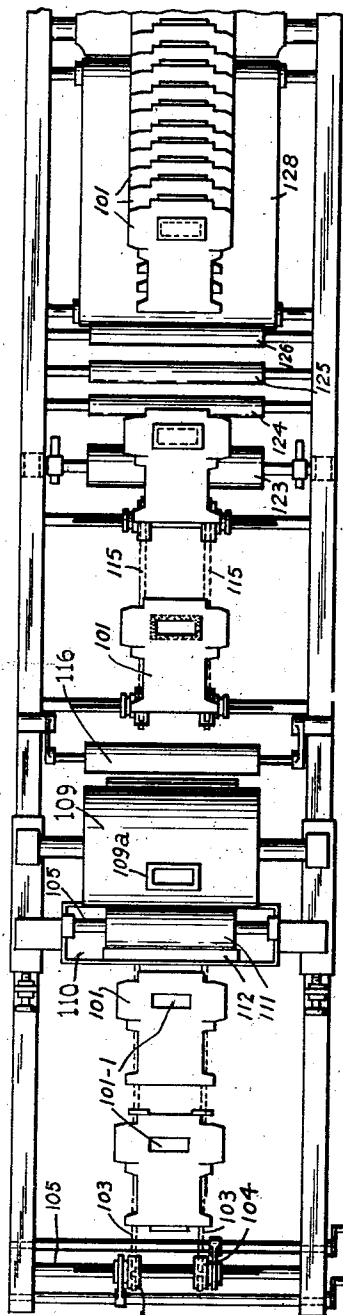


FIG. 9.

FIG. 10.



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5 Sheets-Sheet 5

Fig. 11.

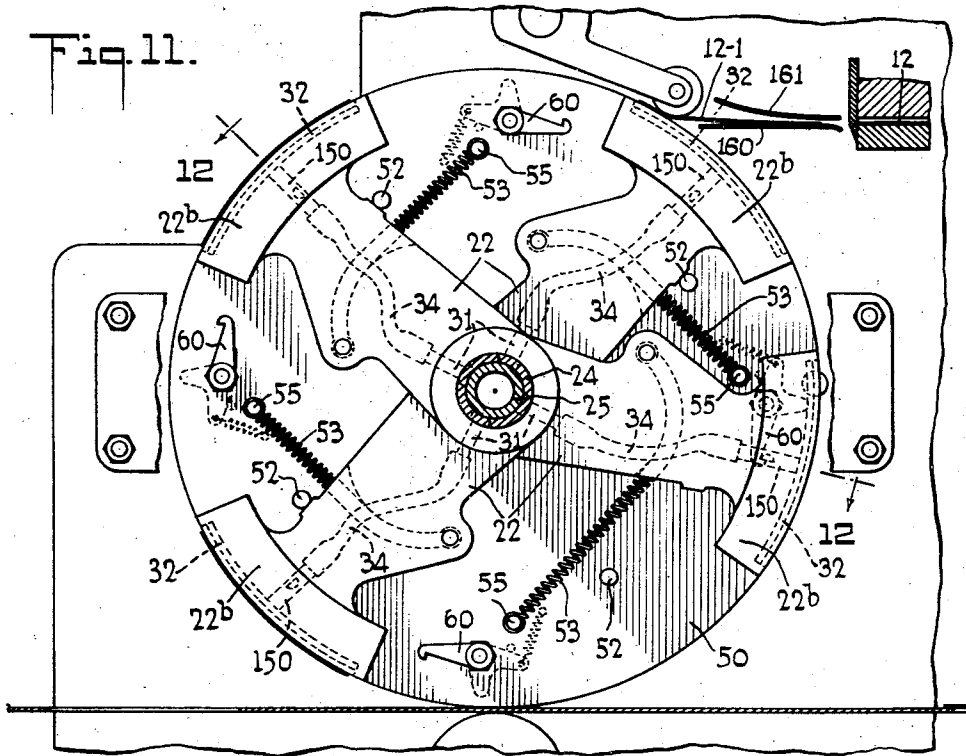
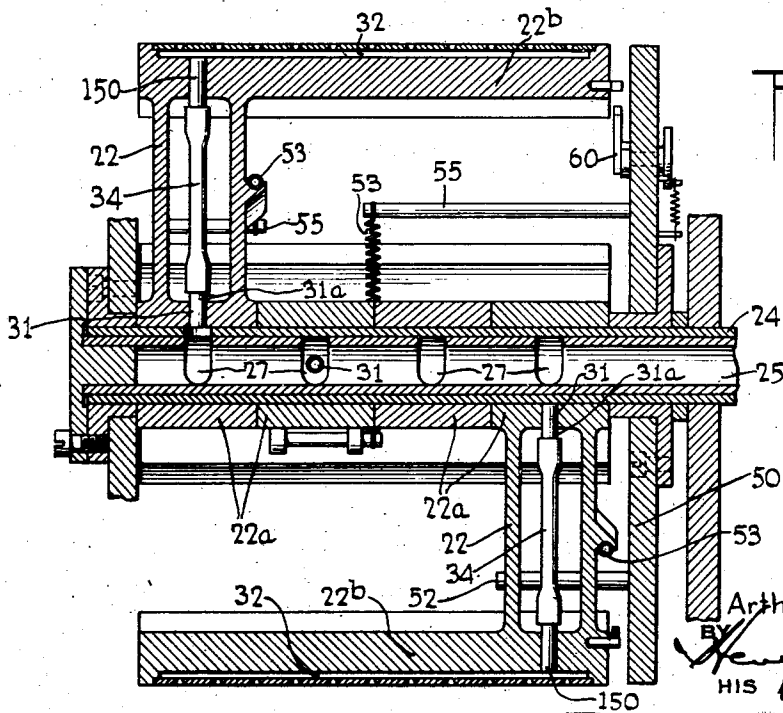


Fig. 12.



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2,384,231

APPARATUS FOR APPLYING SHEET MATERIAL TO OTHER MATERIALS

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Application July 11, 1942, Serial No. 450,570

12 Claims. (Cl. 93—36)

This invention relates to the art of operating upon moving material, and particularly to the attaching of individual sheets of material to suitable base material while the latter moves relative to the individual sheets to be attached.

The invention is somewhat related to that disclosed in detail and claimed in my U. S. Patent Number 2,289,336, issued July 14, 1942, entitled Apparatus for applying sheet material to other material; however, there are certain important differences in the specific aspects thereof, however, which will be made clear hereinafter.

Here, similar to the prior invention set forth in my above referred to patent, the individual sheets to be attached are usually and preferably flexible or pliable, a specific example of material used being sheet cellulose acetate. The base material may vary considerably in character so long as there are surface areas suitable for receiving the individual sheets to be attached. Thus, the base material may be a continuous web of sheet material, such as paper or paper-board, having a series of individual surface areas to which the respective individual sheets are to be attached, as, for example, in the manufacture of "windowed" cartons, or it may be a series of individual pieces of sheet material, such as paper-bag or carton blanks cut out from sheet paper or paper-board material. Again, it may be a series of individual articles, each having one or more suitable sheet-receiving surfaces.

The objects of the present invention, are in general, the same as those set forth in my stated patent but they include others as well.

It is a particular object of this invention to provide for the applying of individual sheets having relatively short lengths, to sheet-receiving areas of base material which are relatively widely spaced, so that articles may be produced which are relatively long as compared with the lengths of the respective individual sheets applied thereto.

It is also an object to provide for accommodating a wide variety of work on a single machine. For example, it may be desired to utilize the machine for a few hours in the work of attaching individual sheets at intervals of a certain spacing along the length of a base web, say at intervals of 24 inches, and, thereafter, for the same type of work, but applied to a base web where the intervals between sheet-receiving areas are shorter or longer than the certain spacing, as, for instance, 12 inches or 36 inches.

It may also be desired to apply individual sheets having a certain length, and, thereafter, by the

same machine, to apply individual sheets which are shorter or longer than the given length.

Thus, it can be seen that machines constructed in accordance with the present invention are not limited to the applying of individual sheets having certain given lengths which cannot be varied, for any given unit, nor to the applying of individual sheets at relatively closely spaced intervals.

In the specific disclosure of my patent, a continuous strip of the sheet material to be applied is fed onto a suction-cylinder applicator while the latter is rotating adjacent the path of travel of the base material, the speed of travel of the base material being considerably faster than the speed of rotation of the applicator. As the applicator rotates, the so fed and carried end of the continuous strip is successively severed to provide the individual sheets, the severing being accomplished just prior to the time the applicator carries the sheet material into the attaching zone. As thus severed from the continuous strip, each individual sheet is individually carried by a sector-like section of the suction cylinder applicator, such sector-like section being articulatively mounted for individual movement relative to its supporting structure and to the other sector-like sections of the applicator. Accordingly, during the respective attaching operations the respective sector-like sections concerned are free to move forward limited distances relative to the remainder of the applicator, and at the greater speed of travel of the base material. This freedom of forward movement is limited in extent by reason of the close spacing of the sector-like sections, made necessary by the construction and function of the applicator.

The applicator of the present invention is so designed and constructed, however, as to allow considerable leeway of forward movement for the individual, articulatively-attached sections or arms which carry the individual sheets to be applied, and such sections are so attached to the framework of the applicator as to be capable of the relatively great forward movement which may be demanded of them during the sheet-applying operations. The sheet material to be applied is fed to the applicator, not in a continuous strip which must be severed on the applicator, but in the form of pre-cut individual sheets adapted to be individually carried by the respective articulatively attached sections or arms of the applicator.

Because of the relatively wide spacing between these respective sections or arms of the appli-

cator, it is possible for a section or arm to attain the very high speeds at which it is often desirable to pass base materials through the sheet applying zone.

For example, in attaching relatively short tags, say $1\frac{1}{2}$ " in length, to a web of paper-bag material at relatively long bag-length intervals, say 36", it is necessary to pass the web material through the applying zone of the apparatus at a very high speed relative to the speed at which the tag applicator, considered as a whole, normally rotates.

Another advantage of the present invention resides in the fact that the individual sheets to be applied may be positioned on the supporting pad surfaces of the respective sections or arms as desired. Thus, an uncovered margin may be left on a supporting pad surface for contacting the base material in advance of the carried individual sheet, which has been found to be desirable in many instances.

Further objects and features of the invention will be apparent from the following detailed description of the preferred specific embodiments illustrated in the accompanying drawings.

In the drawings:

Fig. 1 represents a side elevation of a preferred form of the invention as embodied in apparatus for applying "window-pane" sheets of cellulose acetate over sequentially spaced "window-frame" apertures in a continuous base web of sheet paper-board material, the view illustrating the "window-pane" sheet applicator with associated mechanism, portions of the apparatus lying in the foreground being removed to reveal the applicator in its entirety;

Fig. 2, an enlarged fragmentary detail view, taken similarly to that of Fig. 1, and particularly illustrating the applicator and directly cooperating mechanism;

Fig. 3, a section taken on the line 3—3, Fig. 2, and enlarged, portions removed for Figs. 1 and 2 being here illustrated in section;

Fig. 4, a vertical section taken on the line 4—4, Fig. 3;

Fig. 5, a section taken on the line 5—5, Fig. 3, but illustrating the entire applicator, and showing the circular back-plate thereof, with the mechanism it carries, in elevation; parts are broken away to reveal certain of the applicator arms, and other hidden parts are indicated by dotted lines;

Fig. 6, a detail perspective view of the latch mechanism per se;

Fig. 7, a top plan view of the base web, taken from the standpoint of Fig. 5;

Fig. 8, a side elevation of another preferred form of the invention as embodied in apparatus for operating upon a series of individual blanks, each provided with a "window-frame" aperture;

Fig. 9, a skeletonized view in side elevation of suitable drive mechanism for the apparatus illustrated in Fig. 8;

Fig. 10, a top plan view of the apparatus of Fig. 8;

Fig. 11, a view similar to that of Fig. 2, but illustrating another embodiment of the invention; and

Fig. 12, a sectional view taken on the line 12—12, Fig. 11.

Fig. 13, a detailed sectional view taken on the line 13—13, of Fig. 1, but illustrating an arrangement which may be substituted for the latch structure.

The illustrated specific forms of apparatus merely exemplify the possibilities inherent in the generic concepts of the invention.

In the apparatus of Figs. 1 through 7, the sheet cellulose acetate is conveniently provided in the form of a roll 10 mounted on a suitable spindle 11 so that a continuous strip 12 may be unreeled therefrom. The strip 12 is passed through a pair of feed rollers, 13 and 14, respectively, passing under a guide roller 15 en route, and is thence fed to a severing device for the successive severing of individual sheets therefrom. The spindle 11 and several rollers 13, 14, and 15 are all mounted on shafts extending from supporting frame structure 16.

The severing device here comprises a block 17, see Figs. 1, 2 and 5, extending from a bracket frame member 18, which is, in turn, bolted to the frame structure 16. Such block 17 has a broad horizontal slot 19 extending therethrough, through which is threaded the free end of strip 12. A flat blade 20 is suitably mounted (not shown) against that lateral side of the block 17 from which the free end of strip 12 emerges, for reciprocation across the discharge end of the slot 19. Acting in cooperation with the outer edge of the bottom of slot 19, such blade 20 functions as a shear blade to completely sever the emergent length of strip 12 from the main body thereof.

An applicator of rotary type is indicated generally 21, and is mounted for rotation adjacent the discharge portion of the severing device for successively picking up the individual sheets as they are successively "clipped off" from the free end of strip 12, and for carrying them sequentially.

The applicator 21 of the instant apparatus serves the same purposes as the suction cylinder applicator of the machines disclosed in my aforementioned patent, so far as the carrying and applying functions of the latter are concerned, and is, similarly, of suction type. It plays no part, however, in the severing of the individual sheets from the strip of sheet material to be applied.

As aforesaid, it is here desired that the individual carrying and applying members of the applicator be allowed sufficient freedom of forward movement during the respective applying operations to enable the machine to apply individual sheets at relatively widely spaced intervals as well as to accommodate a considerable variety of work. To this end, the individual carrying and applying members are advantageously provided in the form of a plurality of arms, radiating from a central axial support much as spokes of a wheel radiate from the hub thereof. The several arms are respectively articulatively mounted relative to the axial support for individual movement relative to one another and to the axial support. Means are provided for limiting and guiding the desired respective movements of the arms, but there is no intervening structure which unduly limits the freedom of movement. The number of arms provided for any given applicator will depend upon the particular circumstances of use, but in no instance will so many be supplied that the required freedom of movement will be impaired.

The applicator 21 of Figs. 1 through 7 is designed for relatively short sheets which are to be applied at intervals more widely spaced than contemplated by my aforementioned patent, but relatively closely spaced as compared to the

widest spacing possible pursuant to this invention. It comprises four sheet-carrying and applying arms, each designated 22, pivoted to a central axial support or hub 23 and extending radially therefrom substantially along diameters thereof which mutually intersect at right angles. Thus, a sheet-carrying and applying arm is provided for each quadrant of the circular path of rotation of the applicator. It will be observed that the sheet-carrying and applying arms of the applicator are arranged in mutually seriatim relationship about the periphery of the applicator, that is to say, without any other part of the applicator interposed between the sheet-carrying and applying arms.

The hub 23 is fixed to a tubular shaft 24, see especially Fig. 3, for rotation therewith, such tubular shaft 24 being mounted on a stationary axial suction tube 25, encircling the same in a close sleeve fit and being adapted to rotate thereon as an axis. The axial suction tube 25 extends through the frame structure 16 and connects with a source of suction, such as an ordinary vacuum pump (not shown). A cap 26 seals the opposite end of such axial suction tube 25 against infiltration of atmospheric air. Such cap is secured to the frame end-plate 16—1, Figs. 2 and 3, through the intermediate bearing ring 21—6, in which the said opposite end of axial suction tube 25 is journaled.

The wall of axial suction tube 25 is apertured intermediate its ends, partially circumferentially, as at 27, and is grooved annularly around its outer surface, as indicated generally 28, at opposite sides of the aperture, thereby providing air seals between the stationary tube 25 and the rotary shaft 24 for precluding infiltration of atmospheric air between the two.

The hub 23 has passages formed transversely through its body portion for tightly receiving securing-pins 29, such pins serving to secure and pivot the sheet-carrying and applying arms 22. Extending through the hub 23, preferably perpendicular to its axis and adjacent the respective pin-receiving passages, are other tubular passages 30 into which are fitted suction tubes, indicated 31, respectively, see Fig. 4. Corresponding passages are provided through the wall of tubular shaft 24, and suction tubes communicate with the interior of axial suction tube 25 through the circumferential aperture 27 thereof, at regular intervals during the rotation of the applicator. The suction tubes 31 have ends 31a which protrude from the circumferential outer surface of the hub 23.

Each of the sheet-carrying and applying arms 22 is formed of two recessed half pieces 22—1 and 22—2, which coordinate to produce a hollow interior 22—3, see Fig. 3. The half pieces are conveniently secured together by means of bolts, as illustrated, which pass through suitably provided openings. Each of the arms 22 has spaced ears 22a and 22a at one end thereof, forming a coupling member, and has, at the other end thereof, a pad-receiving formation 22b.

The ears 22a and 22a of each arm are respectively apertured in mutual alignment for loosely receiving a securing pin 29, and for consequent pivotal coupling to the rim of hub 23. Each pad-receiving end 22b is recessed to form a relatively broad and shallow suction chamber 32 when a perforated pad 33 is inset into position as illustrated.

A passage extends from the hollow 22—3 of

each arm, through the pad-receiving end thereof, to communication with the suction chamber 32, and a flexible air-tight tube 34, preferably rubber, is passed through such passage and through the hollow interior 22—3 of the arm, into sealed connection with the protruding end 31a of the particular insert tube 31 concerned. Thus, the suction chamber 32 of the pad end of each arm 22 communicates directly with the interior of axial suction tube 25, through the circumferential aperture 27 thereof, at regular intervals as the applicator rotates, and creates a strong suction effect at the outer carrying-surface of its perforated pad plate 33 during such intervals.

It can now be seen that as the applicator 21, Fig. 1, rotates relative to the severing device, each of the arms 22 picks up and tightly holds an individual severed sheet 12—1 of the strip 12, it being realized that the aperture 27, Fig. 3, is so located with respect to the severing device as to provide suction for the pads 32 of the arms, through such portion of their rotative path as will produce the desired result. It should be noted that, by suitably regulating the timing of the strip feed relative to the applicator rotation, the sheets 12—1 may be positioned as desired relative to the respective suction pad surfaces, preferably spaced backwardly from the forward edges thereof to provide advance marginal areas of such suction pad surfaces for initial contact with the base material.

Adjacent the discharge end of the severing device, a pressure roller 35 is secured for free rotation at the end of a supporting yoke 36 and for coaction with the suction pad pick-up surfaces of the several sheet-carrying and applying arms 22 as they rotate into the sheet pick-up zone, see particularly Fig. 2. The supporting yoke 36 is secured to the frame structure 16, and so positions the bed roller 35 with respect to the severing device as to cause each individual sheet 12—1 to be picked up immediately after it has been severed from the main strip 12.

The base web 40, to which the individual sheets 12—1 are successively applied in spaced sequence, travels in immediate adjacency to a portion of the circumferential path of rotation of applicator 21 which is located remote from, and substantially opposite, the sheet pick-up zone adjacent the severing device. It is continuous in length, so far as the operation of the machine is concerned, and has the "window-frame" apertures 41 formed therethrough as spaced intervals along its length, see especially Fig. 7. Such window-frame apertures are preferably punched out by suitable means as the web travels through the apparatus toward the "window-pane" applying zone thereof. Suitable punching mechanism and suitable mechanism for taking care of the unprocessed and processed portions of the web are well known, and, therefore, are not illustrated.

The base web 40 is here shown as passing through a pair of feed rollers comprising the upper and lower rollers 42 and 43, respectively, and through a pair of pressure rollers comprising the upper and lower rollers 44 and 45 respectively, the latter being disposed adjacent the applicator 21 for "ironing out" the applied "window-pane" sheets 12—1 over the "window-frame" apertures 41 and for insuring tight adhesion thereof to the base web. A bed roller 46 is provided immediately below the applicator 21 for cooperation with the sheet-carrying and ap-

plying arms thereof during the sheet applying operations.

The applicator 21 includes a circular back-plate 50, see especially Fig. 3, mounted on a hub 51 which is keyed to the shaft 24 for rotation therewith and with the hub 23. Such back plate serves to carry instrumentalities which limit and guide the individual rotative movements of the several sheet-carrying and applying arms 22 with respect to one another and to the applicator as a whole.

The above-mentioned instrumentalities comprise limit-stop posts, indicated 52, respectively, Fig. 2, rigidly secured to the back-plate 50 and protruding from the effective face 50a thereof for definitely limiting the extent of backward movement of the several arms 22. Such arms may have respective bosses 22c formed on their back sides for service as buffer plates when the arms are brought back smartly against the limit-stop posts 52. It should be noted that the limit-stop posts 52 are so located in the back-plate 50 as to maintain their respectively associated arms 22 in radial positions as respect the circular path of movement of the applicator.

The arms 22 are normally held against their respective limit-stop posts 52 by means of respective coil springs 53, each of which is secured at one of its ends to a forwardly projecting portion 22d of its associated arm, as by engagement with the bolt 54 of that arm, and is secured at its other end to its respective one of anchor posts 55 of back plate 50. Such anchor posts 55 are preferably threaded into the back plate 50 at positions located in back of their respectively corresponding limit-stop posts 52, whereby there is afforded sufficient reach for each of the coil springs 53. In extending between their respective points of anchorage, such coil springs rest within respective guide grooves 56, Fig. 3, formed externally of the inner half pieces 22—2 of the respective arms 22.

The radial limit-stop position in which each arm 22 is normally maintained is the sheet pick-up position for the arm, and is maintained during the pick-up operation and at all other times except during and immediately following the sheet-applying operation.

Since the individual sheets are attached to the base material in spaced sequential alignment, the base material is caused to travel through the apparatus faster than the applicator rotates. Accordingly, if the sheets are to be properly and nicely applied to the base material, the respective applicator members which individually carry and apply the sheets must be allowed or made to travel at the same speed as the base material during the applying operations.

With this in mind, the sheet-carrying and applying arms 22 are respectively articulatively mounted to allow freedom of forward movement thereof during the respective sheet-applying operations.

It should be noted that each "window-frame" aperture 41 of the base web 40 has its margins coated with adhesive, see 41—1, Fig. 7, by suitable well-known means (not shown), immediately prior to its passage through the sheet-applying zone of the apparatus, and, also, that the aperture 27 of the axial suction tube 25 extends circumferentially in such a manner, see Fig. 4, as to supply suction, indicated by the arrows S, S, in Fig. 2, to the respective arms during the course of their travel from the sheet pick-up zone to

the sheet-applying zone, but as to cut off such suction within the sheet-applying zone, the exact point of suction cut-off being determined by the result desired, namely, the smooth and positive attachment of each "window-pane" sheet over a "window-frame" aperture in the base web.

Accordingly, since the respective sheets 12—1 are held to their respective carrying and applying arms 22 of the applicator 21 by the force of suction, as well as securely held to the base web 40 by adhesion, during the respective sheet-applying operations, such arms 22 will be respectively swung forwardly relative to the other arms and to the applicator as a whole, at the speed of travel of the base web until the suction grip is released, as explained above.

Because of the spacing of the several sheet-carrying and applying arms 22 relative to one another, the extent of forward movement or swing thereof may be lesser or greater as the particular use to which the machine is put requires. Thus, the speed of travel of the web 40 might be increased to accommodate a longer spacing of the sequential "window-frame" apertures relative to one another, or may be slowed down to accommodate a shorter spacing without necessitating any change in the applicator 21.

In the operation of the applicator 21 following each sheet-applying operation, it is necessary that the particular sheet-carrying and applying arm concerned be held in its forwardly moved position for a limited time so that it does not interfere with the forward movement of the next rearwardly placed arm on the next succeeding sheet-applying operation. Latch mechanism may be provided for this purpose.

Spaced forwardly of each of the several sheet-carrying and applying arms 22 as they rest in their normal limit-stop positions, is a latch arm 60, see Figs. 2, 3, 5 and 6, rigidly secured to one end of a short shaft 61, which is journaled for rotative movement in back plate 50, the stated one end projecting outwardly from the face 50a of the back plate 50. The short shaft 61 extends completely through back plate 50, so that its other end projects at the face 50b thereof. Rigidly secured to such projecting shaft end is a bell crank 62 having the arms 62a and 62b. The arm 62a is provided with an aperture 63 within which is secured one end of a coil spring 64, the other end of such coil spring being secured to a pin 65 which extends from the face 50b of back plate 50. Such coil spring 64 normally maintains the bell crank 62 with its arm 62a abutting against a stop pin 62—1, that is to say, in such position that the arm 62b thereof projects outwardly for engagement, once in every complete revolution of back plate 50, with a stationary trip-post 66, Figs. 2 and 5, which projects from the supporting frame structure 16. The position of trip post 66 is determined by the point in the rotative path of the applicator 21 at which it is desired to allow the respective forwardly swung arms 22 to return to their respective normal limit-stop positions following the respective sheet-applying operations.

The latch arm 60 has, in each instance, a latch head 60a which stands ready to snap into engagement with a pin 67 carried by the particular arm 22 concerned when such arm is advanced sufficiently far forward for such engagement.

It will be seen, therefore, that, as the respective arms 22 are pulled forwardly relative to the other arms, and to the applicator 21 as a whole, during

the respective sheet-applying operations, the respective latch heads 68a engage the respective pins 67 and prevent the respective arms from swinging backwardly into their respective normal limit-stop positions subsequent to the respective sheet-attaching operations. These advanced positions of the respective arms 22 are maintained until the respective latch arms 60 are carried sufficiently far around the rotative path of the applicator that their respective extending bell crank arms 62b contact trip-post 66, thereby opening the respective latches and releasing the respective arms 22 so such arms can return to their normal limit-stop positions against the respective limit-stop pins 62, under the influence of the respective coil springs 53.

For any given operation of the apparatus, the speeds of travel of the base web and the applicator must be correlated relative to each other in such a ratio as to accommodate the particular work concerned. The respective motivating mechanisms may be mutually correlated in various ways, depending upon the specific structural characteristics of the apparatus employed.

As here illustrated, see Fig. 1, a main drive shaft 70, journaled in frame structure 16, has gears 71 and 72 rigidly mounted thereon. The gear 71 meshes with an intermediate gear 73, which, in turn, meshes with the driven gear 74, mounted rigidly on the shaft upon which roller 13, of the pair of feed rollers 13 and 14, is mounted. Accordingly, the strip material 12 is fed to the severing device under the control of the main drive shaft 70. Roller 14, which cooperates with feed roller 13, is constantly pressed theretoward by a well known spring-controlled pressure device, indicated generally 14-1, for maintaining a friction grip on the strip material 12.

The gear 72, mounted on the main drive shaft 70, meshes with intermediate gear 75, which, in turn, meshes with the driven gear 76, rigidly mounted on the tubular shaft 24 of the applicator 21. Accordingly, the applicator is driven under the control of main drive shaft 70.

Rigidly mounted on the main drive shaft 70 is a pulley 77 which connects, by means of flexible belting 78, with a pulley 79, mounted on a shaft 80, journaled in supporting frame structure 16. Also rigidly mounted on the shaft 80 is a sprocket wheel 81 which connects, by means of a link chain 82, with a sprocket wheel 83, rigidly mounted on a shaft 84. Also rigidly mounted on the shaft 84 is a sprocket wheel 85, which connects, by means of link chain 86, with a sprocket wheel 87, rigidly mounted on the shaft upon which feed roller 42, of the pair of feed rollers 42 and 43, is rigidly mounted. Roller 43 is constantly pressed toward feed roller 42 by a conventional, spring-controlled pressure device 88, a similar device, indicated 89, being provided for the roller 44 of the pair of guide rollers 44 and 45.

Accordingly, the rotation of feed roller 42, and the consequent travel of base web 40 through the apparatus, are also controlled by main drive shaft 70.

All of the above described gearing and sprocket drives are, of course, provided in suitable ratios for the particular work operated upon at any given time, the feed of strip 12, the speed of travel of base web 40, and the speed of rotation of applicator 21 being suitably correlated for proper operation of the machine as explained hereinbefore.

When it is desired to accommodate work having different intervals between areas of sheet ap-

plication on the base web, only the sprocket wheels between the feed roller 42 of the base web actuating means and the main drive shaft 70 need be replaced by those of suitable ratios.

In Figs. 8, 9, and 10 is illustrated another embodiment of the invention which is adapted for handling successive individual blanks of base material rather than a continuous base web. A stack 100 of individual carton blanks 101, piled one on top of the other and kept in stack formation by the lateral guide posts 102, rests upon a link belt conveyor comprising a pair of link belts 103, 103 mutually spaced apart in parallel relation, see Fig. 10. The individual blanks 101 of the stack 100 are successively displaced and carried forwardly from the bottom of the stack by means of studs 103a which protrude upwardly from the link belts 103 during the travel thereof through the upper portions of their endless paths. The studs 103a are spaced apart along the lengths of the respective link belts 103, 103 by a distance slightly greater than the length of an individual blank 101. The endless link belts 103 are mounted on sprockets, indicated 104, respectively, which are, in turn, mounted on shafts 105, 105 for lateral adjustment thereon relative to each other. The lateral adjustment is accomplished by means of pairs of mutually parallel threaded shafts 106, 106, to which the sprockets 104 are connected by means of slotted legs 107, 107. A tension roller 108 may be provided at a suitable location in the paths of travel of the endless link belts.

An adhesive applying device is disposed in the path of travel of the successive individual blanks 101 to and through the sheet-applying zone of the apparatus. It comprises an applying cylinder 109 which has cameo transfer dies 109a provided at diametrically opposite locations on its circumferential surface, and, further, a glue pot 110 having a transfer roller 111 operative therein. The transfer roller 111 is so disposed that, when the adhesive applying cylinder 109 rotates, the cameo transfer dies 109a roll thereagainst and receive a coating of liquid glue or other suitable type of adhesive therefrom. In the rotation of the adhesive applying cylinder 109, the cameo transfer die surfaces come in contact with and serve to transfer a coating of the liquid to the respective carton blanks 101 in accordance with a desired configuration, usually the configuration of the peripheral margins of "window-frame" openings 101-1. A doctor blade 112 controls the amount of adhesive picked up by the cameo transfer dies 109a from the transfer roller 111, and a bed roller 113 provides a support for the successive individual blanks as they pass through the adhesive-applying zone of the apparatus, all as is conventional in the art.

An intermediate belt conveyor, indicated generally 114, is provided between the bed roller 113 and a gravity actuated pressure roller 116. The latter serves to smooth out and distribute the adhesive applied to the individual carton blanks 101. A second endless link belt conveyor, which comprises the pair of parallel endless link belts 115, 115 leads directly into the sheet-applying zone of the apparatus.

The second pair of endless link belt conveyors 115, 115 is preferably identical to the first pair of endless link belt conveyors 103, 103 in its mounting and will not be additionally described in detail. The pair of individual endless link belts 115, 115 may be adjusted laterally on their mountings in the same manner as may be the pair of in-

dividual endless link belts 103, 103 on their mountings.

In this instance, the individual sheets are shown applied to the individual carton blanks in substantially the same manner as the individual sheets 12-1 of the prior embodiment are applied to the base web 40. The roll 117 of strip material 118 is mounted so that the strip may be passed between feed rollers, indicated generally at 119, and into the severing device 120. The applicator cylinder is here identical to that of the prior embodiment and is indicated generally at 122, Fig. 8. A bed roller 123 cooperates with the applicator in the respective sheet-applying operations, similarly as in the prior embodiment.

A series of pairs of pinch rollers indicated generally 124, 125, 126 serve to receive and forward the successive individual carton blanks 101 from the application zone of the apparatus, and to smooth out and insure tight adhesion of the individual "window-pane" sheets over the "window-frame" apertures of the individual carton blanks. An endless belt conveyor 128, which may move slowly relative to the movements of the other conveyors of the apparatus, serves to receive and partially stack the completely processed individual blanks 101 and forward them to a table 129 for further disposal.

As in the previously described embodiment, the various instrumentalities of the apparatus are correlated in proper ratio for operation relative to one another in effecting the results desired. Here, a main drive shaft 130, see Fig. 9, is connected to any suitable motivating means such as an electric motor, and serves to drive all the component instrumentalities of the apparatus.

An intermediate shaft 131 transmits rotative motion from main drive shaft 130, by means of miter gearing 132, to driven shaft 133, by means of miter gearing 134. Such driven shaft 133, in turn, transmits rotative motion to the adhesive-applying cylinder 109 by means of miter gearing 135, and to applicator 122 by means of miter gearing 136. It also transmits rotative movement to the feed rollers 119 by means of the intermediate shaft 137.

The main drive shaft 130 transmits rotative movement to the respective link belt conveyors by means of intermediate shafts 139 and 140, respectively, the pairs of pinch rollers 124, 125 and 126 being actuated by gears, indicated generally 141, connected with the intermediate shaft 140, as by means of a chain drive 142.

In the previously described embodiments, it will be noted that the individual sheet-carrying and applying arms 22 are pivoted to the rim of a hub, and therefore do not have their individual centers of rotation coincident with one another, nor coincident with the axis of rotation of the applicator as a whole. Under certain conditions of use, as where relatively short sheets are being successively applied to base material at relatively closely spaced intervals, such arrangement is entirely satisfactory, but where the sheets are comparatively long and the successive intervals of application are comparatively long or widely spaced, it is desirable that the individual sheet-carrying and applying arms be mounted in common on the axis of rotation of the applicator as a whole.

For this purpose, the tubular shaft 24 and stationary axial suction tube 25 may be extended in length, as illustrated in Figs. 11 and 12, to accommodate the individual sheet-carrying and applying arms 22 in side-by-side alignment and by direct rotative mounting. The secured ends 22a

of the respective arms 22 are formed accordingly, that is, as bearings encircling the tubular shaft 24, in the manner illustrated.

The elongated suction tube 25 is provided with an aperture 27 for each of the arms 25, and the bearing ends 22a of the arms 25 are provided with respective suction tubes 31 which register, respectively, with the apertures 27 at regular intervals during rotation of the applicator.

As in the prior embodiments, each arm 22 is hollow and has preferably a flexible air-tight tube 34 leading from the protruding end 31a of its suction tube 31 to communication with the broad and shallow suction chamber 32 of its pad-receiving end 22b, here by means of a short, rigid suction tube 150, corresponding to the suction tube 31. But, in the present embodiment, the pad-receiving end 22b is elongated laterally to comprehend the greater width of the applicator as a whole, resulting from the side-by-side, common axial mounting of the several arms 22.

In all other instances the present embodiment of the invention is essentially similar to the previously described embodiments. There is a back plate 50 provided with limit-stop posts 52, latch mechanism 60, and anchor posts 55 for return springs 53. Because of the extended width of the applicator as a whole, however, the posts 52 and 55 are extended in length sufficiently to accomplish their respective tasks, see Fig. 12, and because the arms 22 are articulative, or free to rotate, with respect to the supporting tubular shaft 24, the back-plate 50 being fixed, however, with respect to such shaft 24, the limit-stop posts 52 serve, additionally in this embodiment, to normally maintain rotation of such shaft 24 and such arms 22 in synchronism.

It should be noted that the applicator is shown in Fig. 11 with one of its sheet-carrying and applying arms 22 in forwardly swung position, latched against premature return, immediately following a sheet-applying operation.

As illustrated in Fig. 11, a guideway for that end of the sheet material 12 which is emergent from the severing device, may be provided to insure proper positioning of the severed individual sheets 12-1 on the respective suction pad surfaces. Such guideway may comprise a lower guide plate 160 and an upper guide plate 161.

It will be realized that in all embodiments of this invention the pad-receiving ends of the sheet-carrying and applying arms, and the suction pads thereof, should have respective areas sufficiently extensive to accommodate the largest sheets contemplated for application by the particular machine concerned. In instances where smaller sheets than the largest contemplated are to be carried and applied, suction pads having less extensive perforate areas, respectively, may be substituted for those having the greater perforate areas, or suitable imperforate hoods may be applied over the suction pads having the greater perforate areas so as to cover perforate portions thereof not covered by the sheets carried.

Also, other means than the latch mechanisms illustrated may be employed for insuring against premature return of the sheet-carrying and applying arms after respective sheet-applying operations. For example, a friction wheel 162, Fig. 13 rotating at a considerably greater speed than the speed of travel of a sheet-carrying and applying arm on its forward swing during a sheet-applying operation, and rotating in a corresponding forward direction, may be provided to give the said arm a forward kick or impetus sufficient to

prevent its premature return. The friction wheel 162 should be mounted on a suitable support, such as the bracket 163 secured to and extending from the frame structure 16, and may be driven by individual power means (not illustrated) of any well-known type.

From the above it is apparent that in the respective embodiments of the invention, the sheet-carrying and applying arms of the applicator are mutually in immediate seriatim relationship, that is to say, their respective suction chambers are arranged about the periphery of the applicator without any other part of the applicator intervening their respective suction chambers; that the respective applicator arms are normally disposed at substantially equal arcuate spacing from one another and when under rotation effected by their central axial support are free to move in the direction of rotation of the applicator, subject to the resiliency of their respective restraining coil springs, from the zone of reception of the severed sheet material or individual sheet material blanks to the zone of applying such severed or individual sheets to the moving web material, at which last-named stage the respective applicator arms are retained in position as they may be advanced in the direction of rotation of the applicator by the engagement of the respective suction chambers with the moving web material and retained in such advanced position until released by the trip-post, to again become freely movable in their rotational passage in return to the zone of reception of the severed sheet material or individual sheet blanks.

By the construction of an applicator provided with suitable rotatable supporting means on which are articulatively mounted a plurality of individual applicator arms in immediate mutual seriatim relationship and radially with respect to such supporting means, combined with means for resiliently restraining such applicator arms within determined limits of their rotative paths of travel, the applicator is adapted to apply to the moving base material runs of sheets of material of wide range of dimension without any adjustment whatsoever of the applicator.

Whereas this invention is described with respect to preferred specific embodiments thereof, it should be understood that various changes may be made in such specific embodiments and various other specific embodiments may be constructed by those skilled in the art without departing from the spirit and generic scope of the invention as set forth herein and in the claims which here follow.

I claim:

1. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith; means normally maintaining said arms in given respective positions relative to one another and to the applicator as a whole, but permitting said arms to be respectively swung forwardly during the said sheet-applying operations; and means for retaining the respective applicator arms in forwardly swung position for a limited portion of the rotative path of travel thereof following the respective sheet-applying operations.

2. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured

to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith; means normally maintaining said arms in given respective positions relative to one another and to the applicator as a whole, but permitting said arms to be respectively swung forwardly during the said sheet-applying operations; means for exerting suction at the outer ends of said applicator arms during a predetermined portion of the rotative path of travel of said arms; and means for retaining the respective applicator arms in forwardly swung position for a limited portion of the rotative path of travel thereof following the respective sheet-applying operations.

3. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith; means normally maintaining said arms in given respective positions relative to one another and to the applicator as a whole, but permitting said arms to be respectively swung forwardly during the said sheet-applying operations; means for retaining the respective applicator arms in forwardly swung position for a limited portion of the rotative path of travel thereof following the respective sheet-applying operations; and means for returning said arms to their original positions immediately following the said limited portion of the rotative path of travel thereof.

4. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith; means normally maintaining said arms in given respective positions relative to one another and to the applicator as a whole, but permitting said arms to be respectively swung forwardly during the said sheet-applying operations; a plurality of individual latch means operatively secured to said rotatable supporting means in advance of said arms, respectively; a plurality of individual latch-securing means mounted on said arms, respectively, for latching cooperation with said latch means when said arms are swung forwardly; and means for disengaging said latch means from said latch-securing means at a point within the path of rotation of said arms which is located a predetermined distance in advance of the sheet-applying zone of said applicator.

5. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith, whereby the individual sheet-applying operations of said arms will cause said arms to be respectively swung forwardly during the said sheet-applying operations; a plurality of individual latch means operatively secured to said rotatable supporting means in advance of said arms, respectively; a plurality of individual latch-securing means mounted on said arms, respectively, for latching cooperation with said latch means when said arms are swung forwardly; means for disengaging said latch means from said latch-securing means at a point within the path of rotation of said arms which is located a predetermined distance in advance of the sheet-applying zone of said applicator; and means for re-

turning said arms to their original positions immediately following the said disengagement of said latch means.

6. In apparatus for applying individual sheets of material to base material, an applicator, comprising rotatable supporting means; a plurality of individual applicator arms articulatively secured to said supporting means circumferentially thereof and in mutually spaced relationship for rotation therewith; means normally maintaining said arms in given respective positions relative to one another and to the applicator as a whole, but permitting said arms to be respectively swung forwardly during the said sheet-applying operations; a stationary suction conduit arranged axially of said rotatable supporting means and upon which said rotatable supporting means is mounted for rotation; a plurality of suction passages arranged radially within said rotatable supporting means and aligned circumferentially thereof; aperture means extending about a portion of the circumference of said suction conduit in alignment with said radial suction passages so the latter will register therewith at predetermined time intervals during rotation of said rotatable supporting means; suction pads disposed at the outer ends of said arms, respectively; and flexible suction tubes connecting said radial suction passages with said suction pads.

7. In apparatus for applying individual sheets of material to base material, an applicator, comprising a rotatable hub; a plurality of individual applicator arms articulatively secured to said rotatable hub circumferentially thereof and in mutually spaced relationship for rotation therewith, said arms being adapted for forward and backward movement relative to one another along the path of rotation of said hub; a back-plate fixedly mounted relative to said hub for rotation therewith about the same axis of rotation, said back-plate comprehending said arms and being spaced slightly apart therefrom; individual limited stop means for said arms, respectively, mounted on said back-plate adjacent said arms; individual spring means anchored to said back-plate and to said arms, respectively, for normally maintaining said arms tightly against their corresponding limit stop means; individual latch means mounted on said back-plate adjacent said arms, respectively, and lying at opposite sides thereof to which the said limit stop means lie; individual latch-securing means mounted on said arms, respectively, for latching cooperation with said latch means when said arms are swung toward said latch means; and means for disengaging the respective latch means from the respective latch-securing means at a point within the path of rotation of said arms which is located a predetermined distance in advance of the sheet-applying zone of said applicator.

8. Apparatus for applying individual sheets of material to moving base material; an applicator; means for moving the base material in operative relation to said applicator; means for feeding individual sheets of material to said applicator; said applicator comprising rotatable supporting means; a plurality of individual operating arms articulatively secured radially to said supporting means and extending therefrom in mutually immediate seriatim relationship; means for normally maintaining said arms in predetermined spaced positions relative to one another, freedom of movement of the respective arms being limited in the direction of rotation of said supporting means only by those arms which are respectively in im-

mediate advance thereof in the said direction of rotation, whereby said operating arms may be individually and successively carried by the said moving material operated upon, in the direction and at the rate of movement of said moving material; and means for restraining the respective arms during the stage of operation upon the moving material and for a limited period of rotation thereafter.

9. In apparatus for applying individual sheets of material to moving base material, an applicator, comprising an elongated suction tube stationarily mounted; a rotatably elongated sleeve closely fitted about said suction tube; a plurality of applicator arms, each having an end mounted on said sleeve for rotation relative thereto, the said ends of said arms being disposed in side-by-side relationship on said sleeve, and the respective arms extending rigidly therefrom radially of said sleeve and in mutually spaced relationship considered circumferentially of said sleeve; suction pads carried at the opposite ends of the respective arms, said suction pads being elongated in the direction of elongation of said suction tube and sleeve, and being aligned circumferentially of said applicator; means for providing suction at said suction pads within a predetermined portion of their common rotative path of travel; back-plate means fixed on said sleeve for rotation therewith; a plurality of limit-stop means extending from said back-plate means relative to the respective applicator arms and adapted to fix the normal radial positions of said respective applicator arms; spring means associated with said respective applicator arms and arranged to maintain said arms in their said normal radial positions; and means associated with said back-plate means for causing the respective arms to remain for limited periods of time, during operation of said applicator, in new positions to which they are carried within the said common rotative path of travel by reason of their respective application of said individual sheets to said moving base material.

10. Apparatus for applying individual sheets of material to moving base material, comprising an applicator; means for feeding individual sheets of material to said applicator; means for moving the base material in operative relation to said applicator; said applicator comprising elongated axial supporting means; a plurality of applicator arms journaled upon said supporting means in mutually immediate seriatim relationship for rotation therearound; suction pads carried by respective applicator arms, said suction pads being elongated, respectively, lengthwise of said axial supporting means and mutually immediately aligned circumferentially thereof; means for exhausting air from said suction pads; and means for resiliency restraining said applicator arms in their respective movements in the direction of rotation of said supporting means during the stage of transit of delivery of the sheet material to the moving base material.

11. Apparatus for applying individual sheets of material to moving base material, comprising an applicator; means for feeding individual sheets of material to said applicator; means for moving the base material in operative relation to said applicator; said applicator comprising rotatable supporting means; a plurality of individual applicator arms; means for articulatively mounting said applicator arms as individual units in immediate mutually seriatim relationship radially with respect to said rotatable supporting means; means

for resiliently restraining said applicator arms within predetermined limits of their rotative paths of travel; thereby permitting said applicator arms to swing freely, subject to such resilient restraining means, forwardly in the direction of rotation of said rotatable supporting means from the zone of reception of the individual sheet material to the zone of application of the same by said applicator arms to the moving base material.

12. Apparatus for applying individual sheets of material to moving base material, comprising an applicator: means for feeding individual sheets of material to said applicator: means for moving the base material in operative relation to said applicator; said applicator comprising rotatable supporting means; a plurality of individual ap-

plicator arms; means for articulately mounting said applicator arms as individual units in immediate mutually seriatim relationship at substantially equal arcuate spacing from one another and radially with respect to said rotatable supporting means; means for resiliently restraining said applicator arms within predetermined limits of their rotative paths of travel; thereby permitting said applicator arms to swing freely, subject to such resilient restraining means, forwardly in the direction of rotation of said rotatable supporting means from the zone of reception of the individual sheet material to the zone of application of the same by said applicator arms to the moving base material.

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