

July 28, 1936.

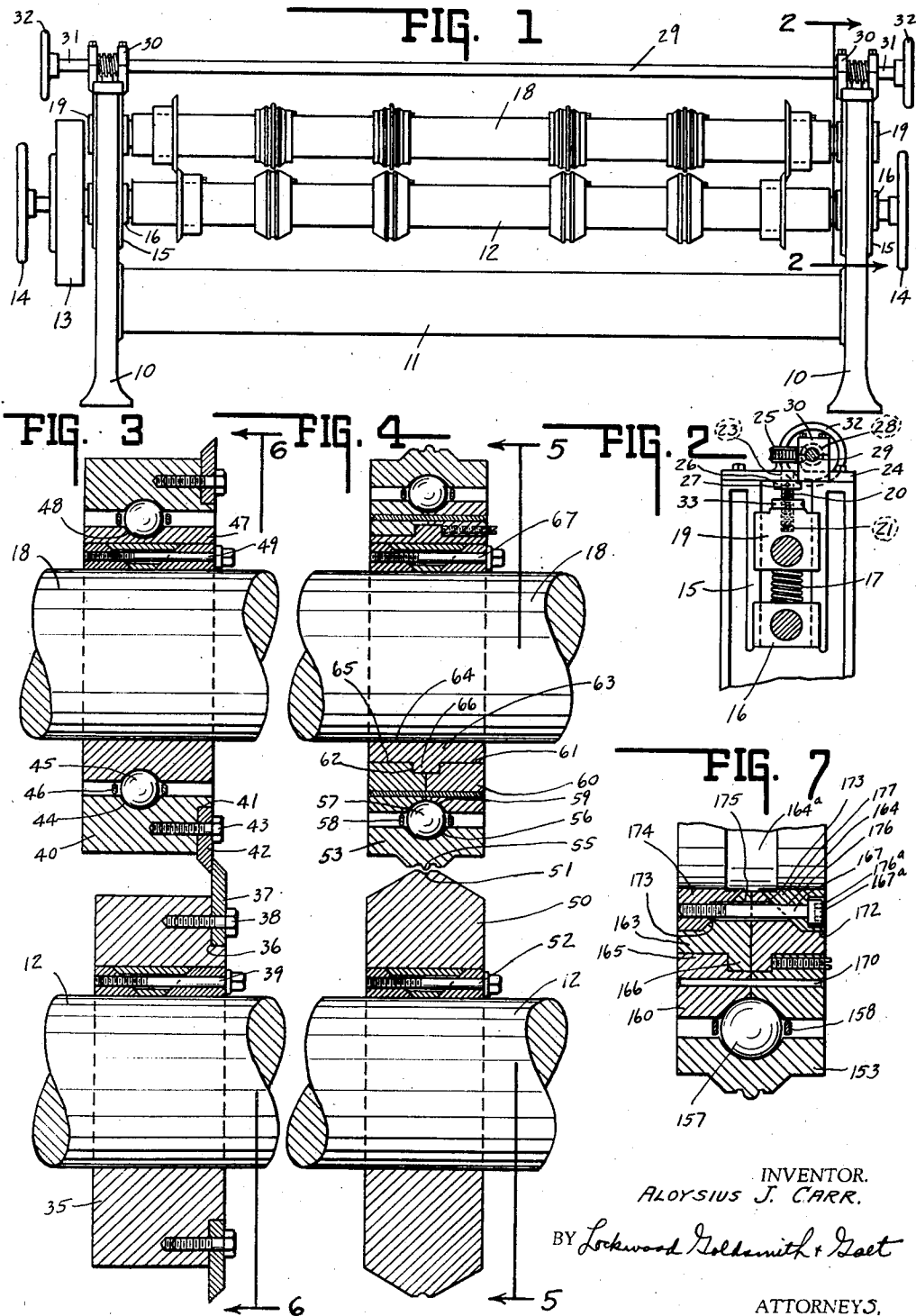
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ADJUSTABLE FREE RUNNING SELF ALIGNING CREASER OR SLITTER

Filed June 7, 1935

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 5

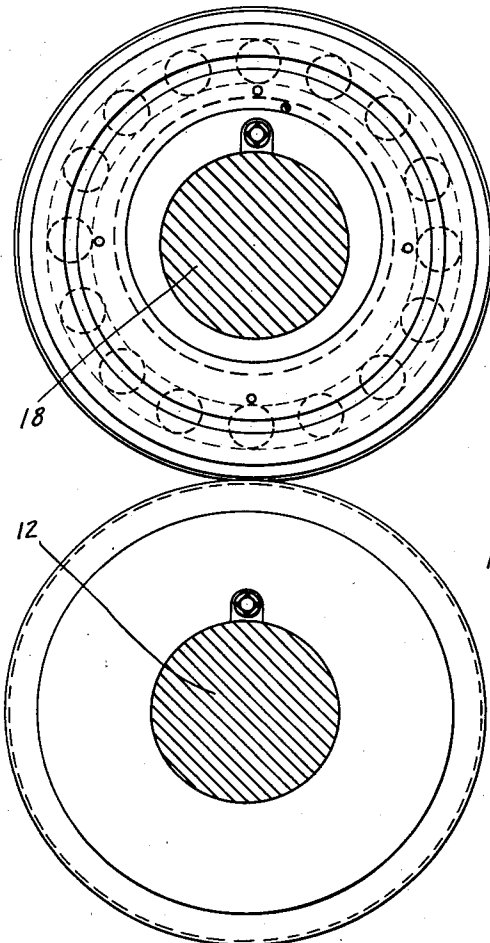


FIG. 6

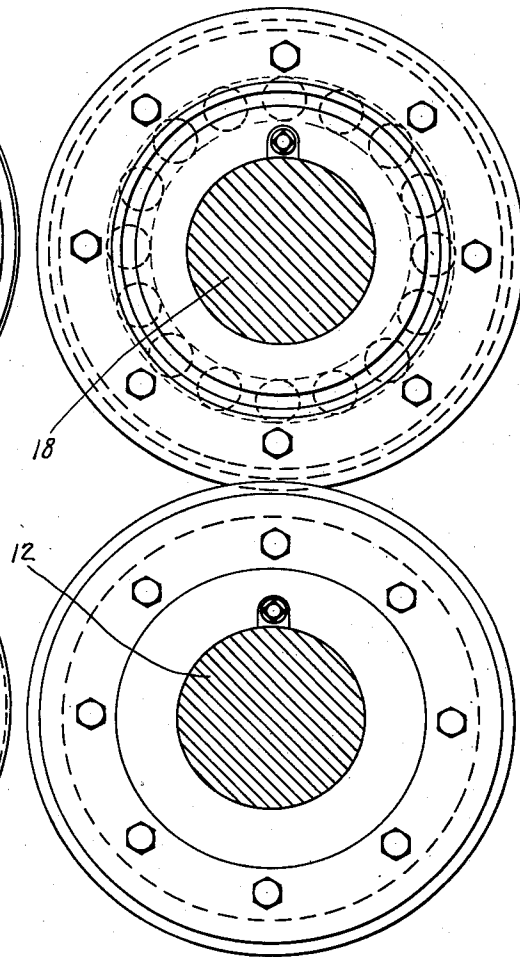
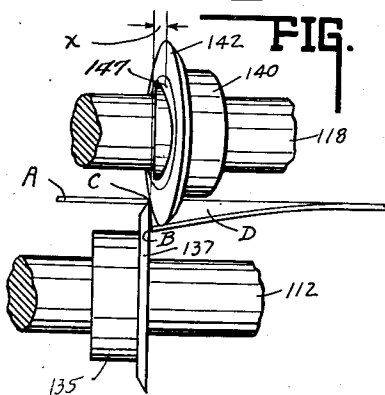


FIG. 8



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ADJUSTABLE FREE RUNNING SELF ALIGN-
ING CREASER OR SLITTER

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3 Claims. (Cl. 164—60)

This invention relates to improvements in the slitting and/or creasing and scoring portion of a composite machine for handling paper board and which, for a better understanding of the invention, may be broadly referred to as of the Langston or Swift type.

Machines of this general character are arranged to take paper material from rolls and fabricate the same into corrugated board, such as double face board, which is used for corrugated boxes, inserts, spacers, liners, partitions, and the like.

The present invention, however, is not necessarily restricted to its inclusion in a machine of this general character but when included therein has a highly desirable function, to wit, it eliminates the opening up of the adhesive connection immediately adjacent the slit or cut portion, it being understood that immediately following formation of the corrugated board it is creased or scored and slit at the desired intervals to form strips which are subsequently cut to the desired length to form box blanks, and the like, from standard width, continuously fabricated board. Usually, the "cut-off" occurs at the end of the board making machine proper, and then blanks of the desired width and length are further operated upon by notching and scoring to complete blank formation and then may be automatically folded in still a further extension of an automatic in-line machine. This subsequent treatment may be entirely automatic, manual or semi-automatic in operation as is well understood in the art.

The present invention, as before stated, is not only applicable to operate upon corrugated board of single or double face character, but is also adaptable for use in slitting and/or scoring solid fibre board.

The present invention permits the use of cheaper grades of paper than has heretofore been employed for the same purpose, because the possibility of fracture, tearing, and the like, is eliminated.

While the invention as above set forth is usually incorporated as a component part of the automatic paper board making machine, it may, when desired or required, be used independently thereof. In other words, the board may be formed and then the blanks cut off from the continuous strip. These individual blanks then may be presented to the slitting and/or scoring mechanism, the subject matter of the present invention. In such instances, the blanks pass between the complementary slitting and/or scoring devices and as

each blank engages the opposed complementary members, there is a momentary pause or cessation of movement of the blanks in its travel through the devices heretofore employed in apparatus in this art.

Heretofore also with creasing and scoring devices and/or slitting devices, the complementary members have been mounted on two substantially parallel rotating shafts, back geared to each other and arranged for adjustment relative to their spacing to accommodate different caliper of board. This adjustment, which is necessary in a commercial machine, it will be obvious except for one specific spacing, changes the theoretical pitch diameter and this change in the actual pitch diameter is an inherent objection in the present machine.

Also, it is to be understood that the complementary members are longitudinally adjustable upon the supporting shafts so the desired width between creases or scores and between slits and/or between creases and scores and slits, may be obtained. Certain of these complementary members accordingly will wear faster than others, because they will be subjected to greater use, while the remainder of the complementary members which are temporarily secured to the shaft adjacent the ends or side of the machine frame, are not in use. Thus, in the continued operation of the present machines embodying complementary slitting and scoring, the wear is not uniform and, therefore, when the shafts are adjusted for the desired caliper of board, the outermost active creasing devices, if the shaft spacing is sufficient for a satisfactory depth of crease, are satisfactorily positioned, while the innermost creasing devices will form a very light and unsatisfactory crease or score. If the shaft spacing is adjusted so the active intermediate creasing or scoring devices form a satisfactory depth of crease, then the outermost crease will form too deep a scoring or crease, with all of the well known attendant objectionable features and poor finished products.

As before stated, when blanks are presented in succession to a standard device of this general character, there is a shock immediately upon presentation to the complementary devices and this introduces a "whip" into the upper shaft particularly so the upper shaft does not rotate upon a line axis but rotates upon a slightly curved axis. Intermediate bearings to eliminate this curvature or "whip" have been found unsatisfactory because in commercial practice board is manufactured in standard width, or widths, in a board making machine, or machines, and then

the board of this standard width is slit to the desired strip width to form strips of smaller width and since the board manufacturer must change, in many cases daily, the setting of the complementary scoring, and creasing and/or slitting devices, the inclusion of intermediate bearings on either or both of the shafts to eliminate the "whip" therefrom, is impossible from a practical standpoint, since such inclusion would prevent the longitudinal adjustment of the complementary members on respective shafts.

In the conventional creaser due to shaft anchorage by a wedge construction, the mating peripheral surfaces have a minimum clearance at one time and a maximum clearance at another during each cycle. Each length of crease per cycle, therefore, has a resultant light crease and a deeper creased section; in fact, sometimes the liner at the latter position is cut.

The present invention reduces this variation in clearance by at least a half as will be pointed out hereinafter, and in addition, the improved wedge construction of the invention holds the creasers against rocking or wobbling in rotation, thereby eliminating excessive wear on the sides of creasers and producing a crease that does not look like an extended sine curve but which is the straight line crease heretofore desired.

The present slitting and/or creasing and scoring devices have other inherent objectionable features or produce an objectionable product and the purpose of this invention is to eliminate such objectionable features as much as possible and to produce as perfect a product as is commercially possible.

The chief feature of the invention consists in having one of the supporting shafts relatively stationary in normal operation and adjustably mounting—other than longitudinal adjustment or spacing of the complementary pairs of the devices on said shafts relative to each other—the complementary members on that stationary shaft relative to the adjacent mating or cooperating devices on a rotating shaft such that in the creasing or scoring operation all of the creases and scores can be of the predetermined desired depth and of minimum width.

Another feature of the invention is that since one slitter of a pair is free running, it may be biased and shifted axially approximately or rather proportionately to the sine of the angle of biasing and the free running connection arrangement permits of the same. This frees the slit board from the cutters or slitters as set forth more fully hereinafter.

Another feature of the invention is that inasmuch as one of each of the complementary members is not power rotatable but is rotatable by the contact with the board, tearing, fracturing, crushing or opening of the board is substantially eliminated and it will be obvious that since one member of each pair of complementary members rotates at the speed of the board, "whip" in the stationary supporting shaft or bowing thereof, as it were, is practically eliminated. This last feature of the invention is attained by rotatably mounting each of the several stationary shaft supported members with respect to a supporting base.

Another feature of the invention inherent in one form of the invention is that the rotatable connection between the creasing and/or scoring device and the relatively stationary supporting base is of such a character, due to commercial tolerance between parts, for example, a ball race

arrangement, that the cooperative relative relationship between operative mating, creasing or scoring devices and the slitting devices, is such that the member rotatably mounted upon its base carried by the relatively stationary shaft, tracks or follows the cooperating member and as a result thereof, no "fighting", as it were, is obtained between the adjacent pairs of rolls and/or slitting members, all of which results in the production of perfect board.

The full nature of the invention will be understood from the accompanying drawings and the following specification and claims:

In the drawings Fig. 1 is an end elevation of one embodiment of the invention, illustrating cooperating pairs of slitting and scoring or creasing devices. In this form all of the male creasing members are shown positioned on the upper shaft and the female creasing devices are illustrated as mounted on the lower shaft but it is to be understood that the mounting of any complementary pair of such devices may be reversed as to the male and female arrangement as desired or required by the finished product.

Fig. 2 is an end elevation of one embodiment of a mechanism for adjusting the spacing between the complementary devices to accommodate the particular caliper of the board to be handled by the device.

Fig. 3 is an enlarged central sectional view of a pair of slitting devices embodying the invention.

Fig. 4 is a similar view of a pair of creasing or scoring devices embodying the invention.

Fig. 5 is a transverse sectional view through the two spaced shafts and illustrates in elevation a pair of scoring devices.

Fig. 6 is a view similar to Fig. 5 but of the slitting device shown in Fig. 3, Figs. 5 and 6 being taken on lines 5—5 and 6—6 of Figs. 4 and 3, respectively, and in the direction of the arrows.

Fig. 7 is a central sectional view through a free running mounted creaser and an improved wedge construction.

Fig. 8 is a perspective view looking toward the discharge end of a pair of mating slitters, the free running slitter being biased relative to the power rotatable slitter for automatic clearance or self-freeing action.

In the drawings, 10 indicates two end frames of a machine to which the invention has been applied, 11 a cross member thereof, and 12 indicates the lower supporting shaft mounted in blocks 16, slidably supported in the ways 15 at opposite ends. The shaft at each end mounts a hand wheel 14 for "inching" purposes and the power applying device, which herein is conventionally illustrated as a pulley 13.

Superimposed thereabove, is the shaft 18 mounted in the pillow block or cross head 19, slidably supported in the ways 15. Interposed between the two adjacent blocks 19 and 16 is the spring 17 to maintain the shaft 12 in its lowermost position in the ways. Each pillow block 19 includes a threaded opening 21 and the threaded member 20 is associated therewith and extends upwardly through an opening 23 in the cross member 24 of the end frame 10. The upper end of the member 20 has rigidly secured to it the worm wheel 25. The member 20 immediately below member 24 has rigidly secured to it, as at 26, a collar 27. Thus, the threaded member 20 is held against longitudinal movement but is rotatable in the opening 23.

Meshing with the worm wheel 25 is the worm 28 carried by shaft 29 which extends across the

machine and is rotatably supported in bearings 30. The projecting ends 31 of the shaft 29 mount hand wheels 32. Thus, the shaft 29 may be turned from either side of the machine to raise or lower shaft 18 and when so raised or lowered, if the worm and worm wheel is not a sufficient lock to maintain the desired adjustment, there may be provided a lock collar 33 which is threaded on member 20 and may be screwed down tight against the cross head 19. Thus, manipulation of hand wheel 32 permits adjustment of the desired spacing between the shafts as required by the caliper of the board being manufactured or the caliper of the board blank intermittently supplied to the creasing and scoring and/or slitting devices embodying the invention.

In the present invention, see Figs. 1 and 2, the shaft 18 preferably is relatively stationary, that is, no provision is made for driving shaft 18 which heretofore has been the custom with prior standard machines—that is, by driving through back gearing so that both shafts rotate at the same speed. The practical result of this change is that the same necessitates the rotation of the complementary scoring or creasing and/or slitting member relative to the supporting substantially stationary shaft. Otherwise, tearing or fracturing will occur in the board.

To provide for this relative rotation, the complementary members are mounted so as to be free running relative to their relatively stationary axial support so that the peripheral speed of rotation of said free running complementary members is substantially the speed or rate of travel of the board operated upon thereby.

In the present form of the invention, such free running construction is facilitated by the interpositioning of anti-friction means which also provides another feature hereinafter to be pointed out.

In Fig. 3, there is illustrated a slitting construction and herein 35 indicates a slitting wheel which is suitably recessed as at 36 to receive an annular cutting blade 37 detachably secured thereto as at 38. The member 35 is suitably secured to the rotatable shaft 12 as by the triple wedge and bolt construction, indicated generally by the numeral 39. Any other suitable means for keying or securing the rotatable cutting construction to the shaft 12 may be employed.

In the upper portion of Fig. 3 there is illustrated a similar and complementary member 40 recessed as at 41 to receive a complementary annular cutting member 42 detachably secured therein as at 43. The member 40 is provided with a raceway 44 that partially seats anti-friction elements 45, herein shown in the form of balls, 46 indicating the cage therefor. An inner ball engageable member 47 has a raceway 48. It is suitably keyed to the shaft 10 by a similar triple key construction 49. Thus, the cutter 42 and the outer annular member 40 supporting same, rotate at a speed different from the cutter blade 37 and member 35, and will usually do so because the board when presented to the mating blades has its rate of travel reduced by reason of the cutting action.

As illustrated herein, the raceways 44 and 48 permit the member 40 to have slight longitudinal movement relative to the member 47 so that excessive wear upon the cutters by reason of binding action, and the like, by reason of the board passing therethrough, is reduced to a minimum. Thus the length of the life of cutters for perfect cutting or slitting is materially increased. Thus,

also, the free running cutter or slitter is relatively self aligning with respect to its complementary cutter or slitter. It will be understood, of course, that the cutter or slitter constructions on both shafts 12 and 18 may be adjusted longitudinally as required. The complementary cutters or slitters shown in Fig. 3 are illustrated in end elevation in Fig. 6.

In Figs. 4 and 5, there is illustrated a scoring or creasing arrangement form of the broad invention and a further extension thereof which may be briefly defined as an individual adjustable construction. It will be apparent that in certain instances, the latter feature may be omitted if, as and when desired, or may be incorporated therein as illustrated, or may be incorporated in the form of the invention shown broadly in Figs. 3 and 6 as well.

It is to be understood that the anti-friction constructions illustrated in Figs. 3 to 6, inclusive, are conventionally illustrated only and such changes as are commercially necessary to adapt the anti-friction connection, herein shown as balls, may be and should be made as is well understood by the roller bearing and ball bearing industry.

In this form of the invention the two mating or cooperating elements are illustrated as a scoring or creasing device. Herein 50 indicates an annular female scoring member having the peripheral groove 51 therein. It is rigidly secured to the shaft 12 by a triple wedge construction 52, similar to the anchorage 39. Thus, the annular creaser 50 is rotated with and by shaft 12 and at the same angular velocity.

A complementary male creasing member or annulus 53 has the peripheral male projecting portion 55 which cooperates with the groove 51 of the female member. The annulus member 53 includes an internal raceway 56 and seatable therein is the anti-friction construction, comprising the balls 57 retained by the cage or retainer 58. The balls 57 engage the arcuate surface 59 of the segmented internal member 60, herein shown split medianly for convenience.

Eccentrically positioned in member 60 relative to the raceway 59 is the circular opening 61. The opening 61 is provided with an internal groove 62. An inner bearing member 63 has a circular opening or bore 64 concentric with the arcuate surface or raceway 59 to receive shaft 10 and an external peripheral circular surface 65 which is eccentric thereof, the surfaces 65 and 61 being true circles of substantially the same diameter but having the same eccentricity relative to the axis of rotation of the creasing member 53. Member 63 has a tongue 66 seatable in the groove 62. A triple wedge construction 67 similar to the before mentioned wedge construction, locks the inner member 63 to shaft 10.

As previously set forth with reference to the form of the invention shown in Figs. 3 and 6, the two complementary creasing members mate or track and since one is free running relative to its support and to the power rotatable complementary member, wear is materially reduced upon both. Also, there is sufficient play in the commercial style of anti-friction races now obtainable that sufficient slight axial movement is permitted for member 53 so that it can shift axially or laterally to a slight degree which, as stated, materially reduces the wear on the creasing or scoring surfaces.

Furthermore, when a plurality of devices are

supported by two parallel shafts, there is no "fighting" between adjacent pairs of creasing or scoring devices because of this relatively slight play obtainable therein. This "fighting" heretofore has introduced into the present structures the element of chatter which results in excessively rapid wear of the cutters and/or creasers or scorers and the setting up of opposing or accumulative strains between adjacent portions of the shafts. The play permitted is also such that lateral end play in both shafts is prevented because there is no opposition to the slight shifting of the free running members to accommodate the cooperating elements, whether they be slitters or creasers to the stock being handled.

Due to the elimination of end play, chatter, as it were and furthermore due to the elimination of the necessity for rotating shaft 18, which heretofore has been the standard practice, bowing or "whipping" of the shaft 18 is prevented.

Should the shaft 18 become warped or should any particular pair of cooperating members receive more wear than others, due to their more frequent use (for the reasons previously set forth), then the predetermined space between the mating members or the predetermined positioning between the two cutting members is individual adjusted, if the form of the invention shown in Figs. 4 and 5 be incorporated in Figs. 3 and 6. Such relative adjustment may be readily obtained by loosening the cooperating lock 54 between the two eccentrically associated bearing members 60 and 63 and these two may be relatively rotated until the desired clearance or relative positioning is obtained between the members 53 and 50. In order to insure minimum clearance in the diametrical plane common to the axes of both shafts 12 and 18, the triple wedge construction 67 is released and the entire structure rotated for adjustment until that condition is secured.

Merely for the sake of clearness, all the wedge constructions, to wit, 39, 49, 52 and 67, are illustrated as lying in substantially a single common diametrical plane relative to the axes of shafts 12 and 18. Preferably, however, to insure balancing with respect to shaft 12, the wedge constructions are spaced in such a manner as to reduce the centrifugal effect thereof to a minimum as is well understood in the art. So far as the positioning of wedge constructions 49 and 67 are concerned, since there is no operative rotation thereof, during the normal operation of the machine, their relative positioning is relatively immaterial.

The eccentric arrangement conversely permits the formation of grooves, scores or pieces of different depth, as may be found desirable in certain particular instances. Usually, however, all creases and scores should be of the same depth and the adjustment provided by the eccentric arrangement is utilized for the same.

It, of course, is understood that in the continued use of, for example, the scoring devices, the surfaces wear in time and as previously stated, those devices which are used more frequently, are subject to the greatest wear so that the necessity for removing the same from the shafts for renewing the surfaces or replacing the elements, is materially deferred, since as the wear becomes cumulative, the eccentric adjustment is adjusted for greater eccentricity and thus the appropriate desired spacing or positioning between the members of the cooperating pair is maintained.

Inasmuch as there is a relatively free running arrangement provided, the creases obtainable with the present invention are very much narrower, since the desired narrow width of crease may be obtained and one element "tracks" the cooperating element, because there is no chattering or tearing of the board.

As previously set forth, in the matter of slitting or cutting, by reason of the free running arrangement, a much cleaner cut edge is obtainable by the present invention, and furthermore, whereas in present practice today, when substantially solid cutters or slitters are utilized, such as, for example, indicated in the lower portion of Fig. 3, on both the shafts, if the paper board has been prepared as board on a machine of which the slitters are an integral part, as initially set forth hereinbefore, then such slitters uniformly cause a separation of one or both liners relative to the corrugated interior portion of the board for a distance of from $\frac{1}{4}$ " to $\frac{3}{8}$ ".

This opening of the sheet or board is prevented by the present invention—that is, by reason of the free running character. Also, the lateral play formed in the free running elements automatically allows for the take-up of the board material when being creased or scored.

As a corollary thereof, excessive side pressure of the standard elements on the stock is not present in this invention and as a corollary thereof, as before stated, end thrust is reduced to a minimum or substantially eliminated. The free running connection automatically permits the free running elements to have the same peripheral speed as the stock operated upon and in intermittent presentation of stock, as before set forth, there is a minimum of shock when the cooperating elements take hold of the stock for operation, which eliminates "jumping" of the shafts.

The present invention also eliminates the driving of two shafts with the attendant introduction of opposing forces between the shafts and between the complementary members thereon and between the driving mechanism for the shafts and as will be self evident, the number of parts required, since only one shaft is driven, is materially reduced and there is also a material saving in power. The life of the machine, for all of these reasons, is materially increased because of the elimination of these various factors just summarized and also for the reason that the wear incident to the rotation of the second shaft is eliminated.

A device embodying this invention can operate upon very poor grades of paper stock without fracturing or cutting the material, such stock generally being termed "chip board". Not only is the invention capable of operating upon and has operated to crease or score composite materials, such as corrugated, solid fibre or cardboard, but it has been successfully operated on very light weight sheet metal as well.

From the foregoing description, it is also evident that the setting-up time for any desired product is materially reduced. Either hand wheel 32 is operated to position the shaft 18 at the desired distance from the shaft 12 so that the complementary creasing members will have substantially the exact distance necessary to provide the desired depth of crease for the caliper of board operated upon. Then, the complementary cutting elements and creasing elements are adjusted longitudinally upon both shafts as required, and the lower elements are locked in

that relative spaced relation. The upper elements if provided with the eccentric adjustment, are adjusted to the exact clearance or spacing or positioning necessary to form the perfect cut and the desired depth of crease, and then locked. The machine then is ready for operation.

In the operation of the machine embodying this invention, as stated, there is no opening up of the board, there is no crushing of the corrugations, there is no slight and heavy creases relative to each other when uniform creasing is desired and there is no tearing, fracturing or breaking of the board, all of which is at present obtainable with standard commercial machines.

In Fig. 7 of the drawings, there is illustrated a modified and preferred form of anchorage between the paper operating member and its primary support. Figs. 3 and 4 illustrate the conventional clamp or wedge construction. In this form, three pieces present at one locking surface, a single face contact; hence in fixed cutters and slitters, there results a rocking or wobbling due to clashing, resulting in an elongated sinuous crease or slit. In Fig. 7, a multiple contact is obtained.

In said figure, 153 indicates the male creaser member, 157-158 the antifriction connection, 160 the divided complementary member, 166 the divided tongue portions, 163 the divided support member, and 162 the annular groove for the tongue. Periphery 165 is eccentric of the axis. Members 170, of which one is illustrated, secures members 160 together. Members 171, of which one is illustrated, secure the eccentric connection in adjusted position. Shaft opening 164 is relieved at 164a and recessed at 172 at opposite sides, providing the inclined inner opposed faces 173. A complementary clamp member 174 has threaded engagement with bolt 167, extending through aperture 175. Bolt 167 extends through aperture 176 in clamp member 177 and has its head 167a nested in the aperture enlargement 176a. Drawing up upon clamp 167 forces members 174 and 177 into shaft engagement and inclined face engagement, locking the inner sectional support member 163 to the support with a non-rocking connection. Of course, this same clamp construction can be and is utilized for the power rotatable members. This improvement eliminates the tendency of the cutters and creasers to slit or crease in an elongated sinuous line.

As previously pointed out, since one of the mating operating members is free running only half of the variation in clearance is obtained with the result that the crease, especially in view of free running mounting is of uniform depth, in a straight line, and of minimum width.

In Fig. 8 is illustrated a further modification of the invention. In said figure 118 indicates a stationary support, 112 the power rotatable shaft, 135 the hub wedgingly clamped thereto and 137 the beveled cutter or slitter rigid with the hub. Upon stationary support 118 is mounted a support 147 that free runningly supports member 140 rigid with cutter or slitter 142. Members 147 and 140 have a biased connection, that is the antifriction groove construction is biased relative to a plane transverse to the longitudinal axis of member 18.

To prevent interference between cutters 137 and 142, member 147 is offset longitudinally proportionate to the sine of the angle of inclination or biasing. This offsetting is indicated at X.

The support 147 may be of the eccentric adjustable type similar to that illustrated in Fig. 4, 5, or 7.

In Fig. 8 A indicates a sheet of corrugated board, B the slit or cut and D indicates the depressed slit portion. Thus, looking at Fig. 8, the discharge end of the board is seen in elevation. C indicates the contact entrance of the two cutters into the board. As the slit portion of the board is fed toward the observer, the right hand portion is slightly depressed by tapered cutter 142 while the left hand portion rides on the tapered face of cutter 137. The action thus is self-freeing for the cutter 142 leaves the cut. Thus, tearing of the liners from the intermediate corrugated portion of the board is substantially eliminated.

While the invention has been set forth in great detail in the foregoing specification, the same is to be considered as illustrative and not restrictive in character. Various modifications of the invention hereinbefore set forth as well as illustrated and others which will readily suggest themselves to persons skilled in this art, are all considered to be within the broad scope of this invention, reference being had to the following claims.

The invention claimed is:—

1. In a paper board machine, the combination of a longitudinal support member, a rotatable board engaging member such as a slitter, creaser and the like, support means therefor, and means operatively interposed between support member and rotatable member support means for securing the latter in predetermined longitudinally adjusted position on the former comprising a pair of spaced wedge members having inwardly directed opposed inclined and aligned faces, the planes thereof being directed toward each other, said wedge members having nestable engagement with the support means and spaced contact with the support member, said support means having aligned intermediate complementary inclined bearing faces for wedge engagement, and a clamping bolt extending through one wedge member and the support means at the inclined intermediate bearing portions and operatively associated with the other wedge member.

2. In a paper board machine, fixed and rotatable shafts arranged in spaced parallel relation, a paper board engaging member affixed to said rotatable shaft, a bearing secured upon and enclosing said fixed shaft and having a circular outer face eccentric to said shaft, an annulus concentric with and enclosing said bearing, antifriction means between said annulus and bearing whereby the former may rotate freely upon the latter, the outer periphery of said annulus adapted to cooperate with said paper board engaging member in acting upon paper stock passed between them, the said bearing being capable of rotary adjustment in a plane at right angles to the axis of its supporting shaft whereby the annulus carried thereby is adjusted relative to its cooperating paper board engaging member, and means for driving said rotatable shaft.

3. In a paper board machine, fixed and rotatable shafts arranged in spaced parallel relation, a paper board engaging member affixed to said rotatable shaft, a bearing secured upon and enclosing said fixed shaft and having a circular outer face eccentric to said shaft, a wedge locking element interposed between said bearing and its fixed shaft for holding them in fixed relative posi-

tion, said wedge element being releasable from its locked position whereby adjustments of said bearing may be made longitudinally of as well as at right angles to said fixed shaft, an annulus
5 concentric with and enclosing said bearing, anti-friction means between said annulus and said bearing whereby the former may rotate freely

upon the latter, the outer periphery of said annulus adapted to cooperate with said paper board engaging member in acting upon paper stock passed between them, and means for driving said rotatable shaft.

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