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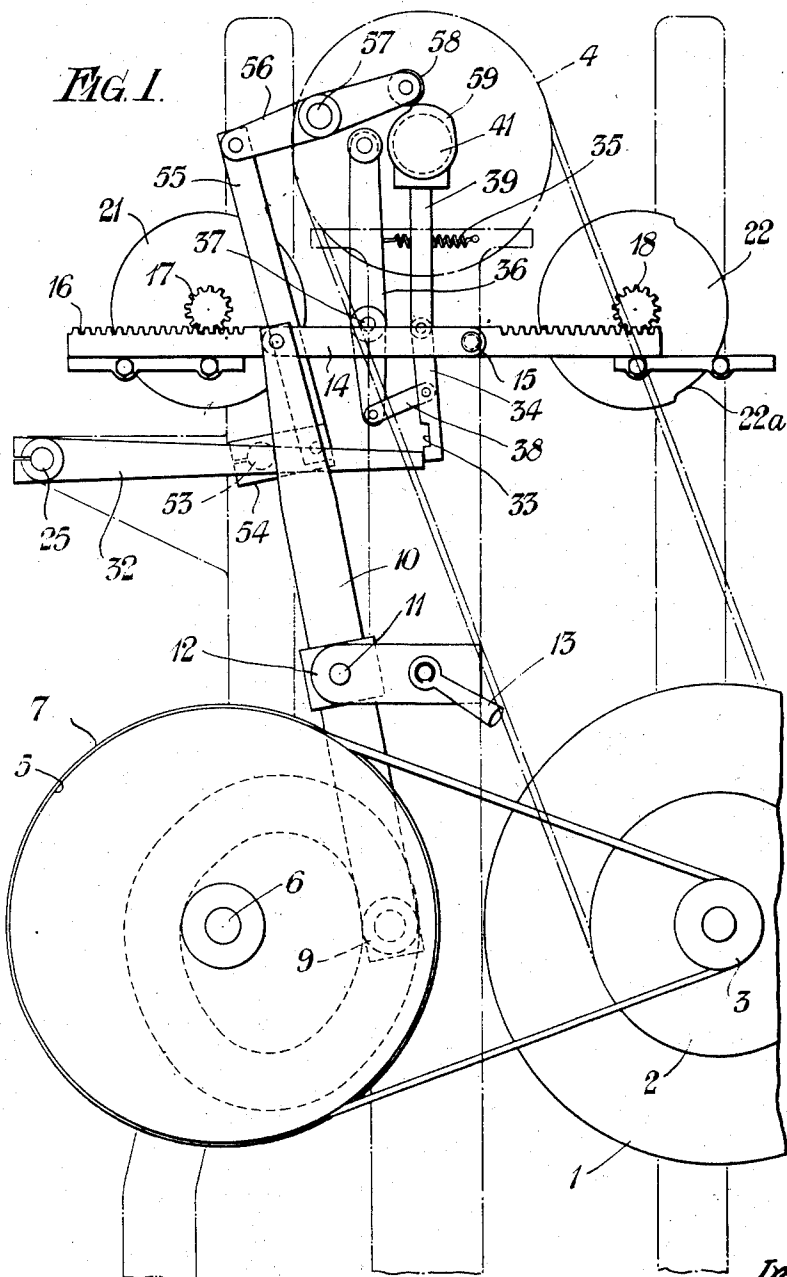
F. K. DANIELS

2,569,976

MEANS FOR AUTOMATICALLY AND INTERMITTENTLY FEEDING
BLANKS OF CARDBOARD OR SIMILAR SHEET MATERIAL

Filed Sept. 20, 1947

5 Sheets-Sheet 1



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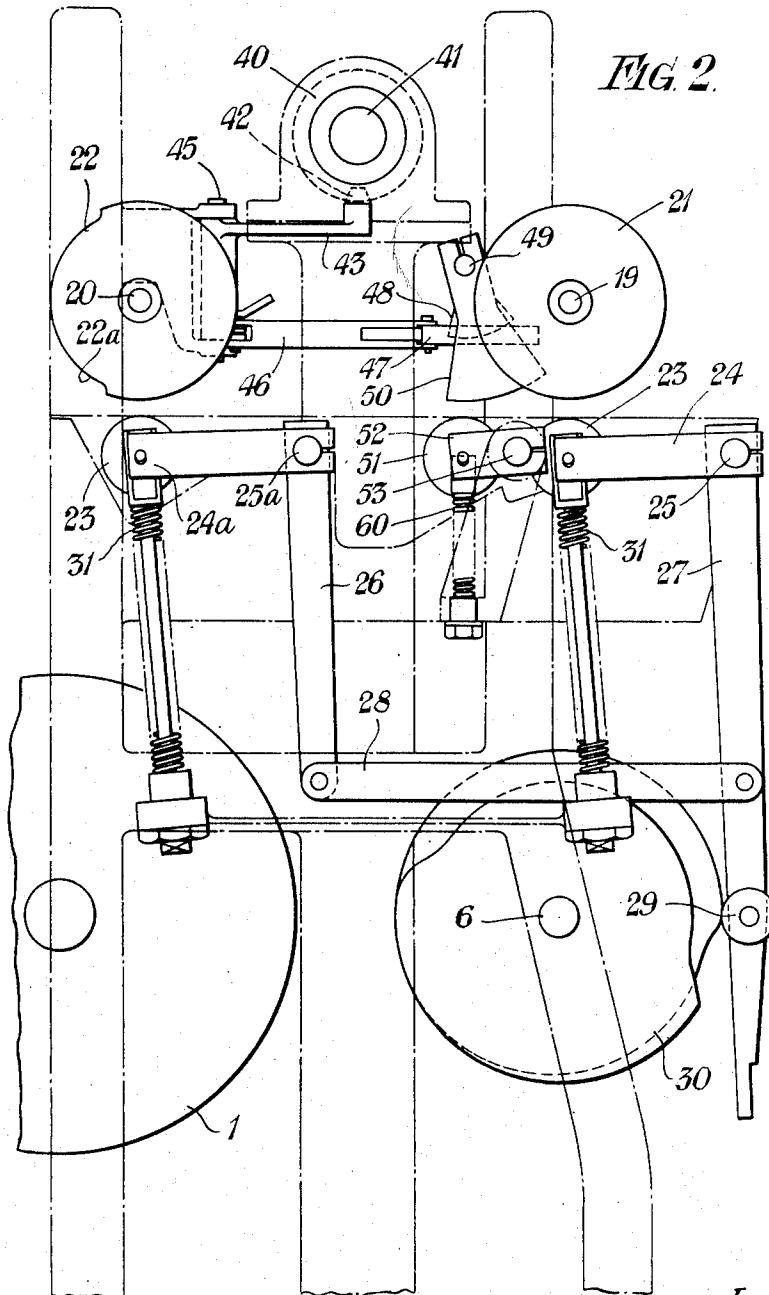
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

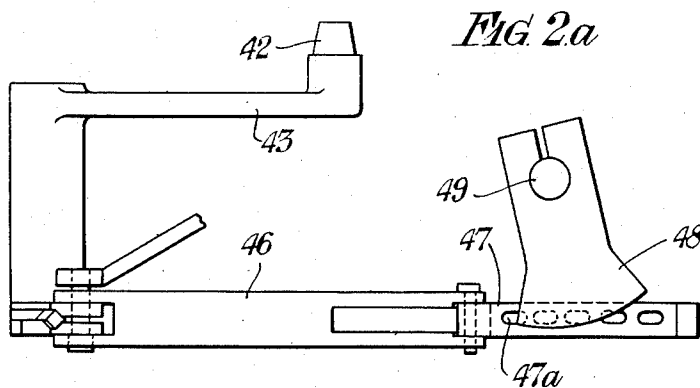


Fig. 2b.

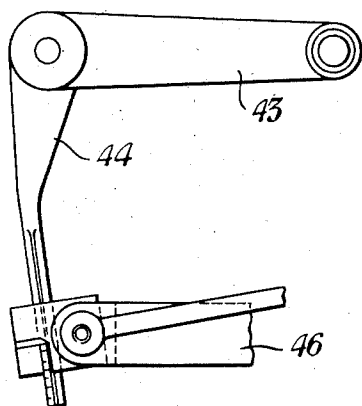


Fig. 4.

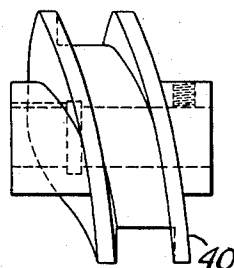
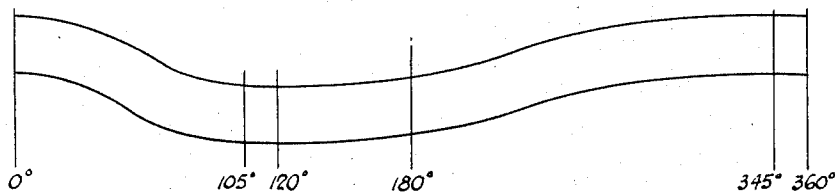


Fig. 5.



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5 Sheets-Sheet 4

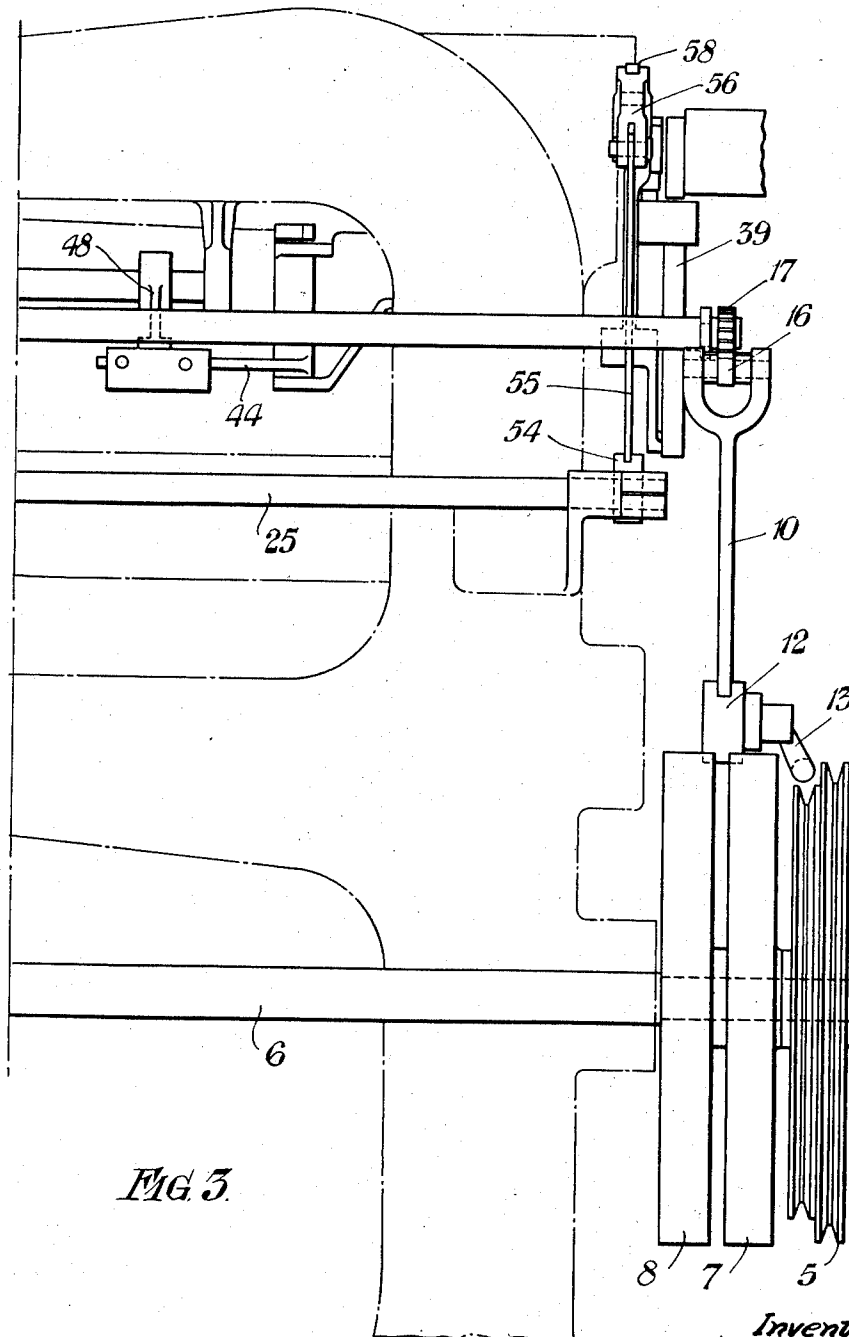


FIG. 3.

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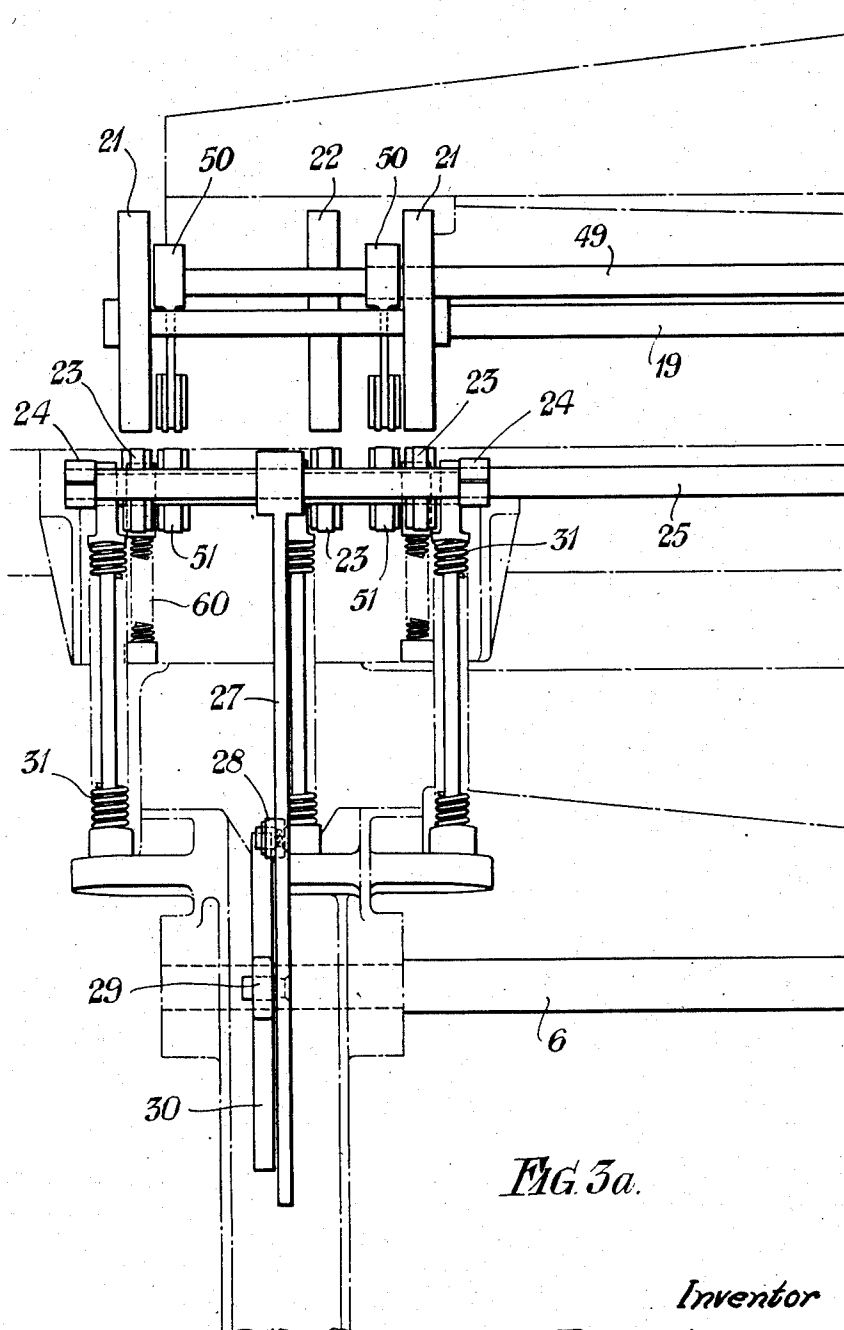
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,569,976

MEANS FOR AUTOMATICALLY AND INTERMITTENTLY FEEDING BLANKS OF CARDBOARD OR SIMILAR SHEET MATERIAL

Flavius Kingsford Daniels, London, England, assignor to Vickers-Armstrongs Limited, London, England, a British company

Application September 20, 1947, Serial No. 775,354
In Great Britain September 26, 1946

10 Claims. (Cl. 271—51)

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This invention relates to means for automatically and intermittently feeding blanks of cardboard or similar sheet material.

It is often required to feed sheet blanks of cardboard or similar material intermittently through a machine to be operated on in various ways in sequence, to produce finished blanks or articles. The speed at which these operations have to be performed usually precludes the use of positive means for moving the blank from one position to another, and resort must be had to means depending on frictional grip of the material. Any marking of the surface of the material is also usually inadmissible or very undesirable. In the simplest and most usual form such means comprise rollers or discs adapted to grip the material, either positively or resiliently, the discs or rollers revolving continuously or intermittently in the appropriate direction, to perform the feeding forward of the material as required. In the case of discs or rollers revolving continuously one of the cooperating rotating members of any pair must be brought directly into or out of contact with the blank as required. Further, it is almost always necessary to provide means for adjusting the amount of forward feed to any value between given limits. The feeding means described, in their various known forms, all suffer from the defect that they do not commence the feeding of a stationary blank from a position of rest of the rollers or discs, or that the motion of the blank is uncontrolled at some point in the feed. Hence in the general case, positive feed free from slip between the blank and its feeding means with consequent wear and change of condition of the gripping surfaces, under all conditions, cannot be attained.

Whilst such known means can be made practically satisfactory for blanks of small weights, as soon as heavier weights and high speeds are required, they become unsatisfactory in practice, and wear and tear on the feeding mechanism becomes severe.

An object of the present invention is to overcome these defects.

According to the invention, at least one of each pair of co-operating rotary feed elements, which may be feed discs or rollers, is given a positive intermittent rotary motion, which is preferably oscillating rotary motion, with a stationary dwell at each extremity of the rotary motion. In the one direction of rotation, positive feeding is arranged to take place, whilst the other direction of rotation is not associated with feeding and is merely a return motion. The return motion of

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the feed disc or roller could, if required, be dispensed with by appropriate timed disconnection of the oscillating driving means, but this is constructively less simple and convenient, and complete oscillating motion of the rollers or discs is preferred.

In carrying the invention into effect, the amplitude of oscillation is preferably adjustable to any value between specified limits, and this must, and in the case of oscillatory motion, can, readily be done without introducing any variation in the time relationship or character of the oscillatory motion. Co-operating with each oscillating feed disc or roller is a second feed disc or roller, so mounted and actuated that it comes into and out of co-operation with its co-acting oscillating member during the periods when the latter is stationary.

Such second disc or roller is preferably brought into action non-positively i. e. through resilient pressure, but is positively withdrawn. These second co-operating feeding elements may themselves be positively driven, but may alternatively and preferably be mounted in frictionless bearings. This combination of members, together with the character of their motions as specified, gives the conditions required to remove the defects referred to above.

Before each feeding oscillation the stationary blank is gripped by a determinate force between each pair of temporarily stationary feeding elements forming a co-operating pair, there being usually a number of such pairs. By this means the system consisting of a blank and feeding means, is as a whole controllably accelerated from rest. The force required to accelerate the blank without slip between the blank and feeding means, is a determinate one for any particular set of conditions, and the same is true for the deceleration to the position of rest on completion of the required motion. If the gripping pressures and frictional forces induced thereby are such as to be slightly in excess, in total, of the resistance to motion of the blanks, then the feeding means are completely positive (i. e. non-slip) for all cases up to and including the maximum requirements. Consequently, no wear or polishing of the feeding means are possible, as no relative motion between blank and feeding means can take place at any point of the feed motion. Further, the gripping force required and consequent wear and tear on the driving mechanism are reduced to the physical minimum for the requirements.

By way of illustration, the application of the

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invention to the automatic feed mechanism of a machine for stitching box blanks will now be described with reference to the accompanying drawings. In these, the framework of the machine is shown in chain dotted lines.

Figure 1 is a rear elevation showing the driving arrangements in particular.

Figure 2 is a front elevation of the mechanism.

Figure 2a is an extracted detail of Figure 2 on a larger scale.

Figure 2b is a partial plan view of Figure 2a.

Figures 3 and 3a show a side elevation of the mechanism.

Figure 4 is an enlarged view of a cam extracted from Figure 2.

Figure 5 is a development of the surface of the cam shown in Figure 4.

Referring to Figure 1, the pulley 1 is continuously driven from a source of power. It has integral with it two other pulleys 2 and 3. Of these, pulley 2 is connected with and drives a clutch pulley 4 which, when the clutch is engaged, drives the means of feeding the blanks for spacing the stitches along the blank, to which further reference will be made hereinafter, and conveniently also in this case, the stitching mechanism itself. The details of the clutch form no part of the present invention and are not shown in the accompanying drawings. Pulley 3 is connected to and drives continuously a pulley 5 on a shaft 6 driving the means for feeding the blanks on first entering the machine into the position for driving the first stitch, and also the ejecting means to remove the previously stitched blank, in the manner now to be described.

The pulley 5 is secured to the shaft 6 and has adjacent to it a pair of opposed but otherwise similar cams 7, 8, also secured to the shaft 6 (see also Figure 3). The cams, the contour of which is shown in dotted lines in Figure 1, engage a cam roller 9 mounted at the lower end of a rocking lever 10, pivoted at 11.

Adjustability of the pivot centre is provided by the bracket 12, the relative vertical position of which can be varied and set by the screw clamp 13. The upper end of the lever 10 is connected by links 14 and the pin 15 to a toothed rack 16, the motion of this rack being therefore a reciprocating one in a horizontal direction, the amplitude of which may be initially set by adjusting the bracket 12, but the time period of which is always fixed by cams 7, 8. The cams 7, 8, are so designed that there is a dwell, or stationary period, at each change of direction of motion. Meshing with the rack 16 are two pinions 17, 18, attached to shafts 19, 20, respectively. Shaft 19 carries at its forward end a pair of feed discs 21, the function of which is to feed forward the entering blank to the position required for driving the first stitch. Shaft 20 carries at its forward end a pair of delivery discs 22, only one being shown in Figure 3 to avoid confusion. The motion of both pairs of discs, being derived from the rack 16, is oscillatory with a stationary dwell at each reversal of rotational motion.

Referring now more particularly to Figures 2 and 3a, working in conjunction with the feed and delivery discs are pressure rollers 23, between which and the discs the blanks are to be gripped. One pressure roller is shown for each disc, it being understood that one pressure roller and the delivery disc referred to above have been omitted from Figure 3a for the sake

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of clearness. The pressure rollers 23 are carried at the ends of levers 24, 24a, secured to shafts 25, 25a, suitably disposed relative to the feed and delivery discs. Also secured to these shafts are levers 26, 27, which are linked together by the freely pivoted link 28.

The lever 27 carries near its lower end a cam roller 29, which co-operates with the cam 30 secured to the shaft 6. When cam roller 29 moves to the left (Figure 2) all four pressure rollers move upwards simultaneously under the influence of compression springs 31. The times at which the closing and opening of the pressure rollers take place relative to the oscillatory motion of the feed and delivery discs is controlled by the cam 30 in such a manner that the closing and opening take place respectively during alternate stationary dwell periods of the disc motion.

It is to be understood that all the elements so far mentioned, except the pressure rollers and their connections, are continuously performing their prescribed motions when pulley 1 is revolving under power. For the purpose of initiating a controlled sequence of operation, the pressure rollers 23 and their connections have subsidiary controls in addition to cam 30 as shown in Figure 2, which represents the starting position for a sequence. These subsidiary controls, forming no part of the present invention, are not referred to in detail, but their function will be briefly indicated.

To initiate a sequence of operations, means are provided, but not shown in the drawings, whereby the insertion of a blank between the feed discs 21 and their co-operating pressure rollers 23 actuates the said subsidiary controls, which causes both sets of pressure rollers to co-act with their respective discs under the influence of the cam 30 and springs 31 during the period of dwell prior to the forward oscillation of the discs 21 and 22, the rollers then closing to grip the blank. Two simultaneous actions now take place.

The inserted blank is carried forward by the feed discs 21 to the position for inserting the first stitch, and the previously stitched container is ejected by the delivery discs 22. Since the feed and delivery discs have a precisely similar oscillatory motion derived from the rack 16, this motion must in both cases be one of acceleration and deceleration with a point of maximum peripheral velocity. The delivery discs preferably have part of their periphery relieved as at 22a so as to release the blank being ejected at the point of maximum velocity so that the blank leaves the delivery control with maximum velocity and momentum and is thrown clear of the machine. At the completion of the forward oscillation, i. e. the working stroke, the pressure rollers open due to the action of cam 30, the subsidiary controls re-assert themselves, and this mechanism is back in its original condition ready for the insertion of another blank.

It is to be understood however that the blank which has been inserted is now in position for the driving of the first stitch, and that during the stitching and stitch spacing operations which now follow no further movement of the pressure rollers 23 takes place even though cam 30 is continuously revolving on shaft 6. This condition of the mechanism is due to the influence of the subsidiary controls above referred to which maintain cam roller 29 out of working contact with cam 30 until the stitching operations have been

completed and a fresh blank has been inserted. The said controls then operate to allow cam roller 29 to co-act with cam 30, thus initiating a new sequence of operations beginning with the initial forward feed of the new blank and the ejection of the old one, and so on as described above.

The synchronisation of the stitching and stitch spacing mechanism with the feed mechanism above referred to will now be described.

Referring to Figures 1 and 3, secured to the extremity of shaft 25 is a lever 32. When the pressure rollers rise as already described, the end of lever 32 rises and engages with a recess 33 in link 34 which is pulled into engagement by means of the spring 35 acting through the two-armed lever 36 pivoted at 37 and the link 38. The upper end of the link 34 is attached to a clutch bolt 39 which controls a clutch (not shown) for engaging the drive of the stitch spacing and stitching mechanisms. Upon the opening of the pressure rollers 23 at the end of the working stroke of the discs 21, 22, as already described, the end of the lever 32 descends carrying with it the link 34 and consequently the clutch bolt 39, which engages the clutch thus putting into action the stitching and stitch spacing mechanisms, the former being arranged to drive a stitch at the commencement of the revolution of the stitching cycle, i. e. before further movement of the blank has taken place. The remainder of the revolution of this cycle is available for moving the blank intermittently between insertion of the stitches to obtain the determined stitch spacing.

For the latter purpose a cam 40 (Figure 2) is mounted on the clutch shaft 41. The side view of this cam does not appear in Figure 3, but a side view on a larger scale is shown in Figure 4. The development of the cam surface is shown in Figure 5. The cam engages the nose 42 of a cranked lever 43, 44, pivoted in the frame of the machine at 45 and shown separately in Figures 2a and 2b.

The lower arm 44 of the lever is connected by a freely pivoted link 46 to a slider 47 which is constrained to reciprocate horizontally and which is adjustably connected to a quadrant 48 mounted on a shaft 49. The adjustable connection is provided by one of a row of holes 47a in slider 47 engaging a corresponding pin on quadrant 48. The shape of cam 40 is such as to impart to the quadrant 48 and shaft 49 an oscillatory motion of a similar character to that above specified, namely one in which a stationary dwell period occurs at the end of each half oscillation before motion in the reverse direction commences. Figure 5 shows how the dwell periods occur in a single revolution of the cam 40.

Secured to shaft 49 and suitably disposed relative to the feed and delivery discs are the stitch spacing feed sectors 50 (Figures 2 and 3). The forward oscillation of these is arranged to start immediately upon the completion of the insertion of a stitch. The actual mechanism for driving the stitch is not shown, but it will be understood that this mechanism is driven by shaft 41 and that sectors 50 are timed by cam 40 to move after the first stitch has been driven. Working in conjunction with these feed sectors are pressure rollers 51 carried in the levers 52 which are secured to the shaft 53. At the other end of the shaft 53 (Figure 1) is secured a lever 54 which is connected by a link 55 to one arm of a lever 56 pivoted on the framing at 57 and carrying on its other arm a cam roller 58 co-acting with a cam 59 secured to the clutch shaft 41.

This cam controls the opening and closing of the pressure rollers 51 mounted in the levers 52, the closing force being provided by springs 60 (Figures 2 and 3).

As it is desirable to vary the pitch of the stitches, the connection of link 46 is adjustable along the arm 44 as shown in Figure 2b, this being additional to the adjustment of sector 48 already described. By this means the amplitude of the oscillatory motion of the spacing feed sectors 50 may be varied without altering the period of the oscillation. The opening and closing of the pressure rollers 51 relative to the feed sectors takes place during the periods when the latter are stationary, this synchronism being achieved by the relative timing of the cams 40 and 59 to this end.

The clutch driving the stitching and stitch spacing mechanism is preferably thrown out of action by independent means, after the required number of stitching operations have been performed. A self-contained mechanism for this purpose, which can be pre-set to give the required number of operations, is the subject of a contemporary invention and is the subject of our British patent specification No. 645,939. For the purpose of the present invention, any means may be utilised for this purpose, which restores the clutch connections after the completion of the required number of operations, to their original condition, before another blank is fed to the machine.

In the appended claims the expression rotary feeding elements includes discs, rollers, and in general any rotary element whose working surface is or describes a surface of revolution or a part thereof, such as a segment, whether the whole or only a part of the surface of revolution comes into contact with the workpiece.

I claim:

1. In mechanism for automatically and intermittently feeding sheet material, a pair of rotary feeding elements adapted to receive the work between opposite surfaces thereof, one of the said elements having a fixed axis of rotation and the other of said elements being a pressure roller whose shaft is mounted on a support movable towards and away from the said fixed axis, means for positively driving said first element to perform intermittent rotary movements about said fixed axis, said positive driving means comprising a rack and pinion gear connected to said first feeding element and a cam mechanism for reciprocating said rack with a stationary dwell period before each change of direction, means for controlling the motion of said pressure roller to and from its associated feeding element, and a second cam mechanism, operatively connected to the first-mentioned cam mechanism, for actuating said control means in timed relationship with the reciprocation of said rack, so that the pressure roller is caused to apply gripping pressure to the work during a stationary dwell period, to maintain the pressure during the ensuing feed motion of the work, and to remove the pressure in the next succeeding stationary dwell period after the feeding elements have been brought to rest.

2. Mechanism according to claim 1, including an oscillating lever connected between the first of said cam mechanisms and the rack, said oscillating lever having an adjustable pivot for varying the amplitude of oscillation of said lever.

3. In mechanism for automatically and intermittently feeding sheet material, a pair of rotary

feeding elements adapted to receive the work between opposite surfaces thereof, one of said feeding elements being positively driven to perform intermittent rotary motion with a stationary dwell period before and after each rotary movement and the other feeding element being a pressure roller mounted on a movable support and movable into and out of engagement with the work during the said stationary dwell periods, a driven cam shaft, lever means cooperating with cams on said driven shaft for imparting the said respective motions to said pair of feeding elements, a second pair of rotary feeding elements also adapted to receive and feed forward work therebetween and disposed adjacent said first pair of elements, an actuating cam shaft for the second pair of elements, lever means co-operating with cams on the latter shaft for imparting motion to said second pair of elements, a clutch for controlling said actuating cam shaft, and clutch operating means connected between said clutch and the pressure roller of said first pair of elements, said clutch operating means being timed to engage said clutch and cause said second pair of feeding elements to come into operation during the stationary dwell period within which the pressure roller of the first pair of feeding elements is removed from the workpiece.

4. In mechanism for automatically and intermittently feeding sheet material, a pair of rotary feeding elements adapted to receive the work between opposite surfaces thereof, one of said feeding elements being positively driven to perform intermittent rotary motion with a stationary dwell period before and after each rotary movement and the other feeding element being a pressure roller mounted on a movable support and movable into and out of engagement with the work during the said stationary dwell periods, a driven cam shaft, lever means co-operating with cams on said driven shaft for imparting the said respective motions to said pair of feeding elements, and to cause the pressure roller to apply gripping pressure to the work during a stationary dwell period, to maintain the pressure during the ensuing feed motion of the work, and to remove the pressure in the next succeeding stationary dwell period after the feed elements and the work have been brought to rest, a second pair of rotary feeding elements the axes of which are substantially parallel to and laterally offset from the axes of the first mentioned pair of feeding elements, said second pair of elements also being adapted to receive and feed forward the work therebetween, an actuating cam shaft for said second pair of elements, lever means co-operating with cams on said actuating shaft for imparting motion to said second pair of elements to cause the latter to receive and feed the work, a clutch for controlling said actuating cam shaft, a clutch bolt for said clutch, a latch device on said clutch bolt, a lever mounted to move with the pressure roller support of said first pair of feeding elements, said lever being engageable with said latch device so that when the latter pressure roller is displaced from the work during a stationary dwell period of said first pair of feeding elements the clutch is engaged to produce actuation of said second pair of feeding elements.

5. In mechanism for automatically and intermittently feeding sheet material, a pair of rotary feeding elements adapted to receive the work between opposite surfaces thereof, one of said feeding elements being positively driven to per-

form intermittent rotary motion with a stationary dwell period before and after each rotary movement and the other feeding element being a pressure roller mounted on a movable support and movable into and out of engagement with the work during the said stationary dwell periods, a second pair of rotary feeding elements laterally offset from said first pair and normally at rest during operation of said first pair, a common driving shaft for both pairs of feeding elements, a driven cam shaft for said first pair of feeding elements, lever means co-operating with cams on said driven cam shaft for imparting said respective motions to said first pair of feeding elements, a separate cam shaft for said second pair of feeding elements, lever means co-operating with cams on said separate cam shaft for imparting motion to said second pair of feeding elements to cause the latter to receive and feed the work, a clutch for controlling the said separate cam shaft, and clutch operating means connected between said clutch and the pressure roller of said first pair of feeding elements, said clutch operating means being timed to engage said clutch and cause said second pair of feeding elements to come into operation during the stationary dwell period within which the pressure roller of said first pair of feeding elements is removed from the work.

6. Mechanism for automatically and intermittently feeding sheet material, comprising at least two pairs of rotary feeding elements each pair being adapted to receive the work between opposite surfaces thereof, and each pair consisting of a roller positively driven to perform intermittent rotary motion with a stationary dwell period before and after each rotary movement and a non-positively driven pressure roller mounted on an axis movable with respect to said first roller so as to apply a gripping pressure to the work in a stationary dwell period before rotary motion is imparted to the said first roller to advance the work, to sustain the pressure while the advance of the work takes place, and to remove the pressure in the next succeeding dwell period after the feeding elements have been brought to rest, separate shafts for driving the respective pairs of rollers, a clutch for controlling the shaft of one pair of rollers, and clutch operating means connected between said clutch and the pressure roller of the other pair and operated by the latter pressure roller to engage said clutch and cause said one pair of rollers to come into operation during the stationary dwell period of said other pair, within which period said latter pressure roller is removed from gripping relation with the work.

7. In mechanism for automatically and intermittently feeding sheet material, the combination of a pair of rotary feeding elements adapted to receive the work therebetween, means for positively driving at least one of said feeding elements to perform intermittent rotary motion, said positive driving means comprising a continuously driven shaft and a cam mechanism which connects said driven shaft and a shaft of the positively driven element, said cam mechanism causing the latter element to perform intermittent rotary movements separated by stationary dwell periods, each intermittent movement consisting of an acceleration from rest and a deceleration to rest, pressure applying means, and a separate cam mechanism operatively connected to the first-mentioned cam mechanism for driving the pres-

sure applying means in timed relationship with said positively driven feeding element to apply a determinate gripping pressure through the feeding elements to the work in one of said stationary dwell periods, to maintain said pressure during the next ensuing rotary movement, and to release said gripping pressure in a succeeding dwell period.

8. In mechanism for automatically and intermittently feeding sheet material, the combination of a pair of rotary feeding elements adapted to receive the work therebetween, means for positively driving at least one of said feeding elements to perform intermittent rotary movements separated by stationary dwell periods, said positive driving means comprising a continuously driven shaft and a driving gear transforming the continuous motion of said driven shaft into intermittent motion of the shaft of said positively driven feeding element of which gear the components are accelerated from a position of rest in one of said stationary dwell periods and decelerated to a position of rest in the next succeeding stationary dwell period, pressure applying means, a cam mechanism operatively connected to said positive driving means for driving the pressure applying means in timed relationship with said positively driven feeding element to apply a determinate gripping pressure through the feeding elements to the work in the first of said stationary periods, to maintain the said pressure during the ensuing rotary movement of the feeding elements, and to release said gripping pressure in a succeeding dwell period.

9. In mechanism for automatically and intermittently feeding sheet material, the combination of a pair of rotary feeding elements adapted to receive the work therebetween, means for positively driving at least one of said feeding elements to perform intermittent rotary movements separated by stationary dwell periods, said positive driving means comprising a continuously driven shaft, a cam on said shaft having two stationary dwell sections, a cam follower lever and a rack and pinion gear connected to said lever, pressure applying means, a second cam on said driven shaft, lever means connected between said second cam and said pressure applying means, said second cam having sections which cause said lever means to drive the pressure applying means in timed relationship with said positively driven

feeding element to apply a determinate gripping pressure through the feeding elements to the work in one of said stationary dwell periods, to maintain said pressure during the next ensuing rotary movement of said feeding elements and to release said gripping pressure in a succeeding dwell period.

10. In mechanism for automatically and intermittently feeding sheet material, a pair of rotary feeding elements adapted to receive the work between opposite surfaces thereof, one of said feeding elements having its axis of rotation fixed with respect to the direction of feed and the other of said feeding elements being mounted for bodily movement in a direction towards and away from said fixed axis, means for positively driving said first rotary feeding element to perform regular oscillatory movements about said fixed axis with a stationary dwell period before each change of direction, each of said oscillatory movements consisting of an acceleration from rest in one of said stationary dwell periods and a deceleration to rest in the next succeeding stationary dwell period, means operatively connected to the drive means of said first feeding element, for bodily moving the other feeding element of said pair intermittently towards and away from the axis of said first feeding element during said stationary dwell periods to apply a gripping pressure to the work in a stationary dwell period before commencement of a half oscillation, to sustain the pressure during the ensuing half oscillation in which forward feed of the work takes place, and to remove the pressure in the next succeeding stationary dwell period after the feeding elements have been brought to rest.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
762,055	Hibbard	June 7, 1904
1,060,276	Moore	Apr. 29, 1913
1,947,015	Littell	Feb. 13, 1934
2,006,040	Crane	June 25, 1935
2,274,834	Ira	Mar. 3, 1942
2,330,119	Giffan	Sept. 21, 1943