June 27, 1950 G. DEARSLEY 2,512,922

PACKET MAKING OR OTHER MACHINES COMPRISING INTERMITTENTLY ROTATABLE DISKS OR TURRETS

Filed Oct. 29, 1947 5 Sheets-Sheet 1

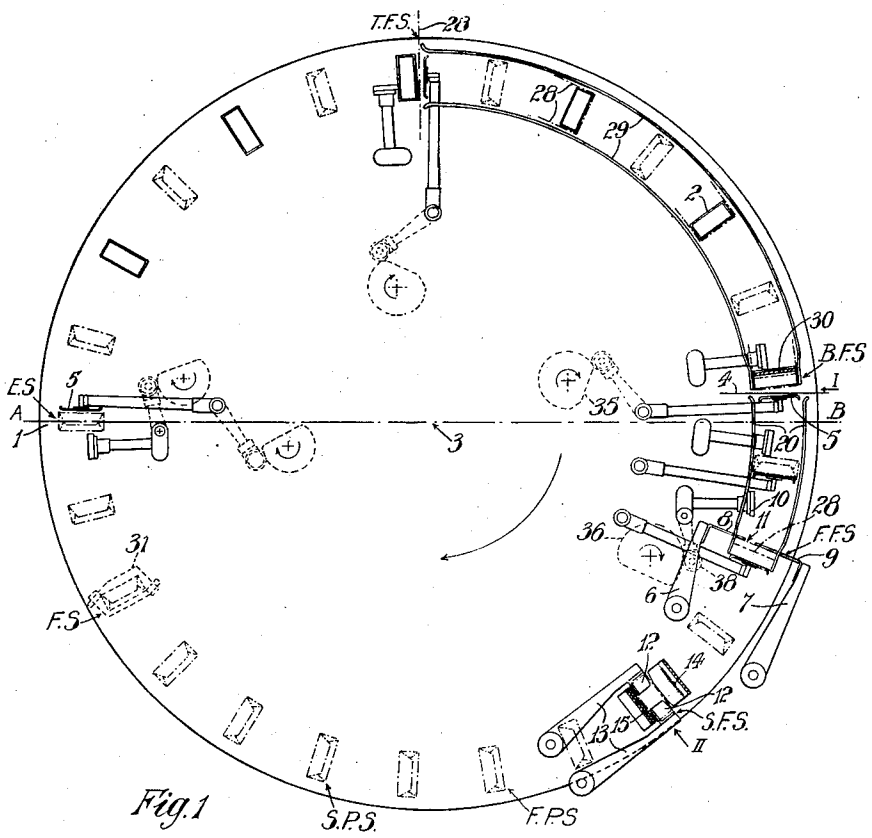


Fig. 1

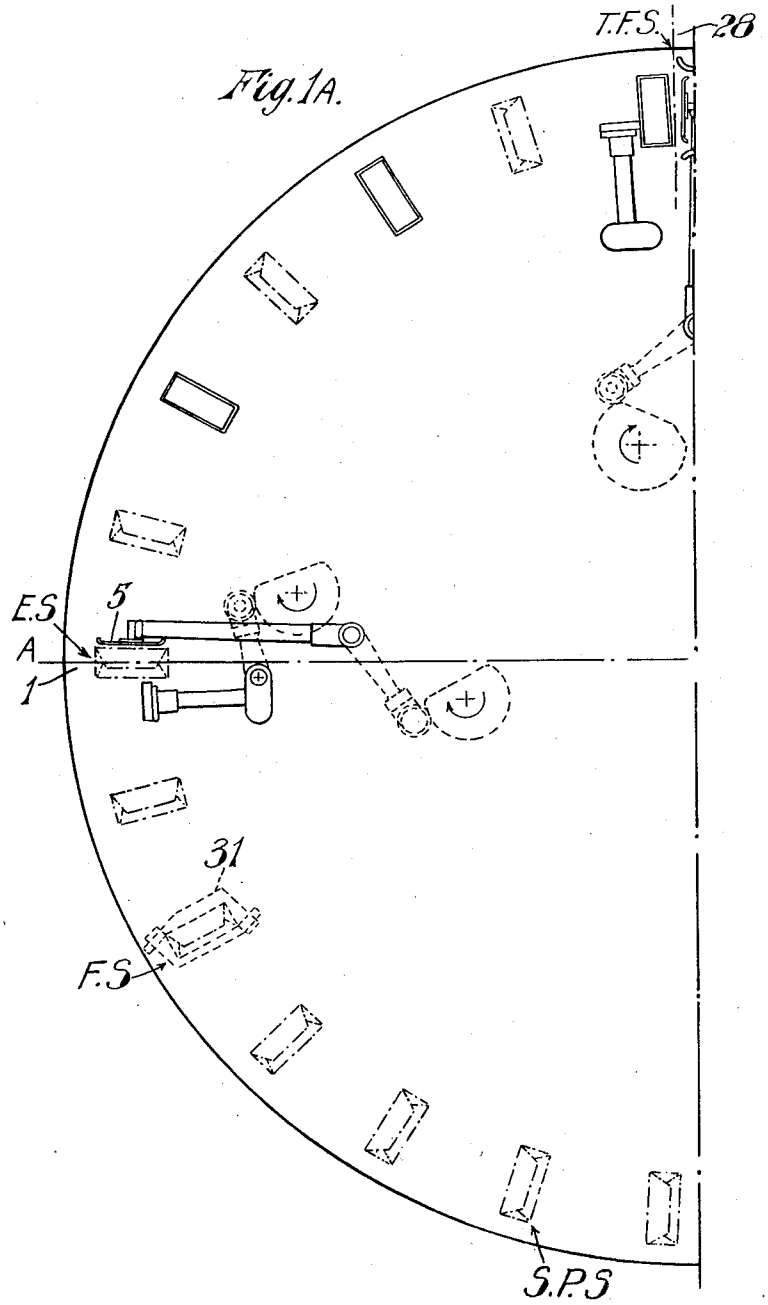
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Fig. 1A.



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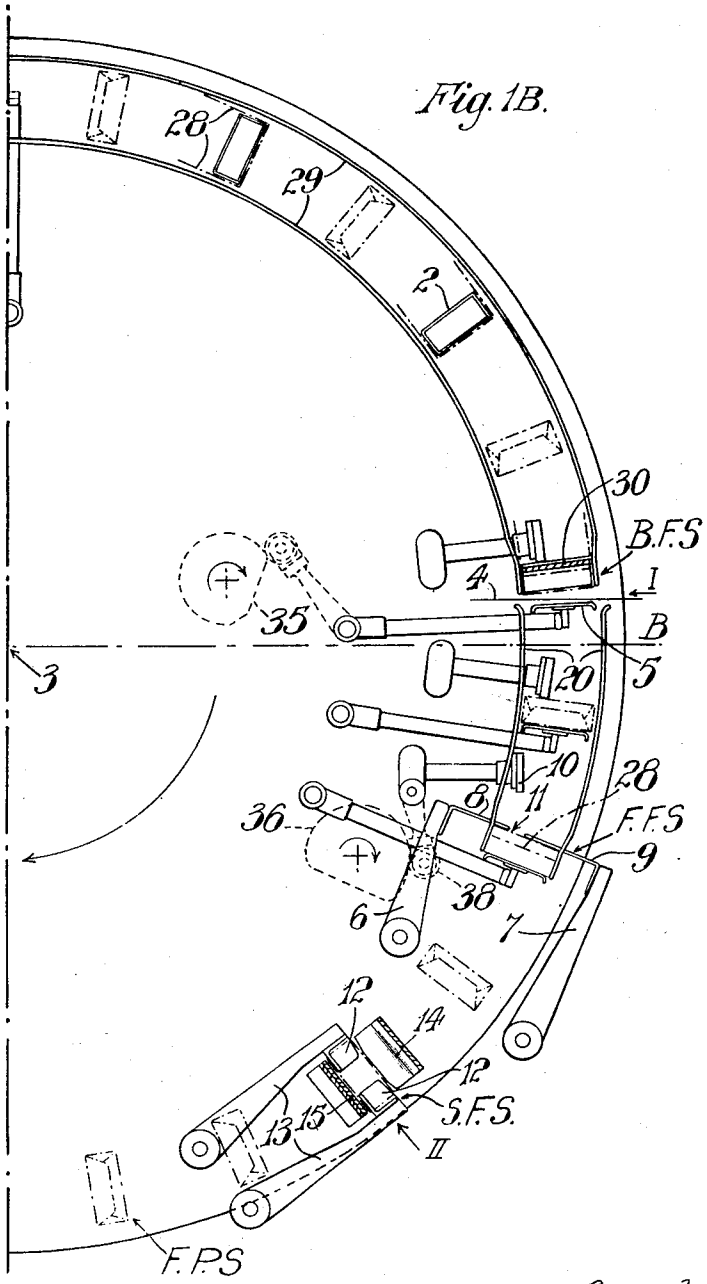
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Fig. 1B.



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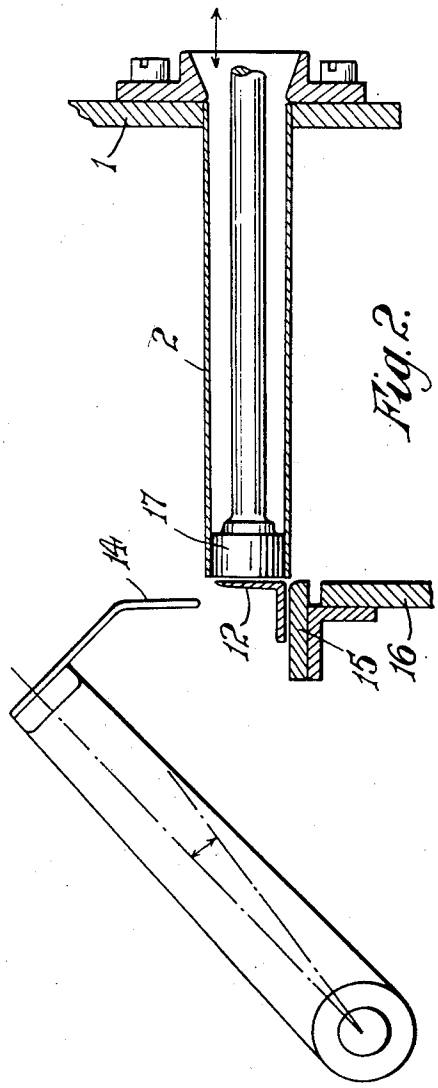


Fig. 2.

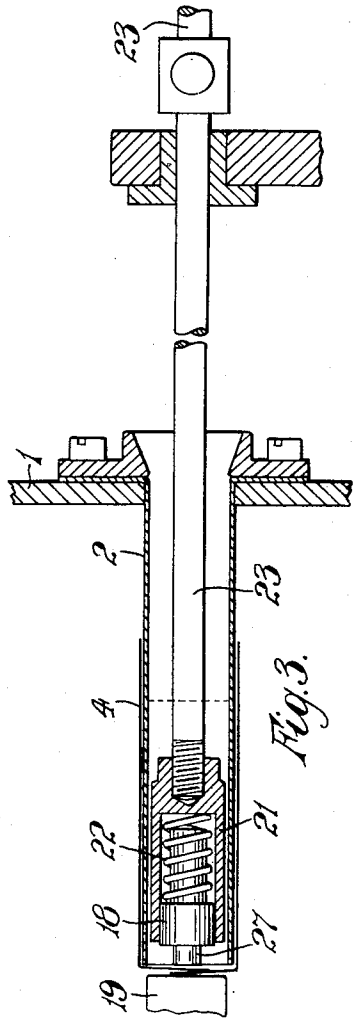


Fig. 3.

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PACKET MAKING OR OTHER MACHINES COMPRISING INTERMITTENTLY ROTATABLE DISKS OR TURRETS

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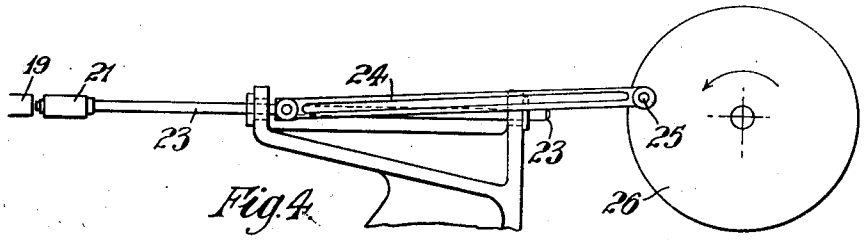


Fig. 4.

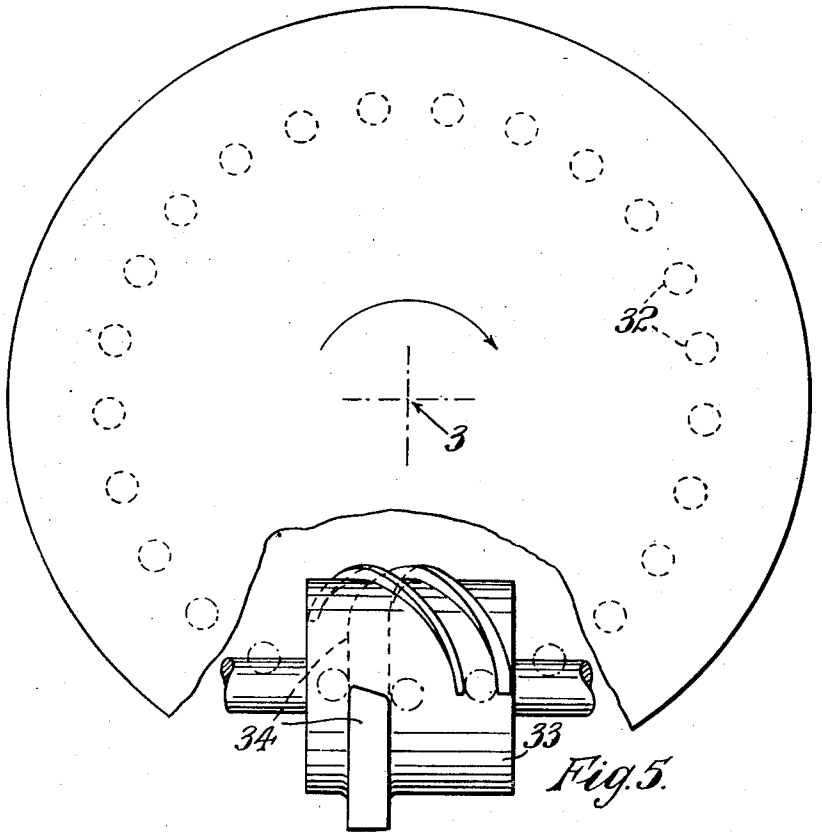


Fig. 5.

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UNITED STATES PATENT OFFICE

2,512,922

PACKET MAKING OR OTHER MACHINES COMPRISING INTERMITTENTLY ROTATABLE DISKS OR TURRETS

George Dearsley, Scarsdale, N. Y., assignor to Molins Machine Company Limited, London, England, a British company

Application October 29, 1947, Serial No. 782,882
In Great Britain November 4, 1946

1 Claim. (Cl. 93—6)

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This invention concerns improvements in or relating to packet making or other machines, comprising intermittently rotatable discs or turrets arranged to convey workpieces to positions or stations where operations are performed on said workpieces. Examples of such machines are packet making machines of the type in which blanks are folded around mandrels and secured to form open-ended cups or pockets (hereafter termed packets), a number of such mandrels being mounted concentrically about a support (such as a disc or turret) and said support being intermittently rotated on its axis to bring the mandrels in turn to positions or "stations" which stations may comprise blank feeding, blank folding and other devices for converting a blank into a packet. Usually the support rotates in a vertical plane and generally speaking the machine comprises devices for filling the packets with the articles to be packed, in which case the machine becomes a packing machine.

The intermittent disc or turret is a widely used device, particularly in automatic machines, and while the invention is primarily directed to packet making machines it is equally applicable to other kinds of machines, since as will appear it enables operations on workpieces to occupy a longer time interval than is available in one revolution of the disc which is the normal period of a cycle in machines as hitherto constructed.

An object of the invention is to provide a packet making machine of the type described, which without diminution of output, enables the packets to remain on the mandrels for a longer time than in existing machines so as to allow increased time for sealing the folds of the packets. Moreover the arrangement is such that there is much more space available between the stations for tucking and other mechanism and the packets may be inspected during rotation of the disc much more exhaustively than in existing machines.

According to the invention there is provided a machine comprising an intermittently rotatable disc or turret having an odd number of workpiece holders mounted concentrically thereon and means for intermittently rotating the disc so that at each movement it moves through an angle equal to twice the angular pitch of the workpiece holders whereby the support rotates two revolutions before a given holder stops again at a given position.

According to another aspect of the invention there is provided a machine of the kind referred to for making packets comprising an odd number

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of mandrels and means for intermittently rotating the support so that at each movement it moves through an angle equal to twice the angular mandrel pitch, whereby the support rotates two revolutions before a given mandrel stops again at a given position. Thus more than a revolution is taken for the making up of a packet from a blank.

Further according to the invention there is provided a machine comprising an intermittently rotatable disc or turret having a number of workpiece holders different from (e. g. in excess of) the number of stations and means for intermittently rotating the disc by imparting thereto a number of indexing movements or equal angular displacements each different from (e. g. greater than) the angular pitch of the holders, the arrangement of the holders being such that the disc moves through a plurality of revolutions before it returns to a particular angular position between two said equal angular displacements and said stations being so disposed around the axis of the disc that a given holder stops at the first station only during the first revolution of the disc and at the last station only during the last revolution of the disc.

Further according to the invention there is provided a machine of the kind referred to for making packets having a number of mandrels different from (e. g. in excess of) the number of stations, means for intermittently rotating the support by imparting thereto a number of indexing movements or equal angular displacements each different from (e. g. greater than) the angular pitch of the mandrels, the arrangement of the mandrels being such that the support moves through a plurality of revolutions before it returns to a particular angular position between two said equal angular displacements, and said stations being so disposed around the axis of the support that a given mandrel stops at the first station (e. g. a blank-feeding station) only during the first revolution of the support and at the last station (e. g. a packet ejecting station) only during the last revolution of the support.

For general guidance in designing a machine:

if M=number of mandrels
N=number of revolutions per cycle
P=number of mandrel pitches per displacement whether expressed as a whole number or a fraction or an improper fraction
D=number of displacements

Then M. N=P. D. since M. N.=total of mandrel pitches passed per cycle.

And if the angular distance in mandrel pitches between the first and last station measured in the direction of rotation=S (a whole number)

Then

$$\frac{S+(N-1)M}{P}$$

must give a whole number as quotient. In this way the time elapsing between the feeding of a blank and the subsequent ejection of the packet made therefrom is prolonged although the cycle time of the machine is not increased. In other words the turret acts as a kind of magazine and carries a blank for a time equal to the total of all the indexing movements between the stop at the first station in one revolution and the stop at the last station in a subsequent revolution whereas in existing machines the time available is only that given by a number of indexing movements equal to the angular distance in mandrel pitches between the two stations.

In designing a machine, M will depend on considerations of size, weight, cost and like factors and the complexity of folding and other operations. Assuming that a fixed time is required for an indexing operation in any machine according to the invention irrespective of the value of the angular displacement, then the longest time a blank can be retained in the machine is given by the design requiring the largest number of displacements and not the largest number of revolutions, e. g. 25 mandrels and 2 revolutions means 25 indexes per cycle but 16 mandrels and 5 revolutions only give 16 indexes per cycle.

One way of carrying the invention into effect will be described with reference to the accompanying drawings, in which:

Figure 1 is a front elevation of a disc or turret, for use in a cigarette packing machine, and constructed according to the invention.

Figures 1A and 1B are views which together show Figure 1 on a larger scale.

Figure 2 is a sectional side elevation of a part of Figure 1, looking in the direction of the arrow II.

Figure 3 is a section through a mandrel showing a device for pressing seams of the packet.

Figure 4 is a view to a smaller scale than Figure 3 showing the mechanism for operating the device.

Figure 5 shows an intermittent motion device suitable for driving the disc or turret of Figure 1.

As the invention relates only to the general arrangement of and driving arrangement for the discs or turrets of machines of the kind referred to above, the drawings are of a diagrammatic nature to show by way of example the utility of the invention in a packing machine and only a few parts of such machine are shown and described since machines of this kind are very well known in the art.

Referring to Figure 1 of the drawings, a disc 1 has twenty-five mandrels 2 equally spaced around its centre 3 and projecting at right angles to a plane of the disc which is mounted for rotation in the direction of the arrow on a horizontal axis. The disc is intermittently rotated by any suitable kind of intermittent motion such as a Geneva movement so that it stops each time a given mandrel has moved twice the angular pitch of the mandrels. A preferred device for imparting the intermittent movement will be described later.

In Figure 1 bare mandrels are shown in full lines while those having packets on them are indicated by the outline of the packets in chain line.

The mandrels, which are rectangular in cross-section, are so disposed that the broad sides thereof are parallel to radii of the disc drawn through the central planes of the mandrels. At the left-hand side of the disc finished packets are ejected from a mandrel which comes to rest symmetrically disposed about a horizontal line A—B drawn through the disc axis. This position is the ejecting station and marked E. S. As there are twenty-five mandrels it will be seen that at the opposite side of the disc two neighbouring mandrels are symmetrically disposed about the line A—B, that is, the line bisects the angle between the two mandrels. The upper mandrel of these two is located at a blank feeding position or station B. F. S.

The blank 4 which receives lines of adhesive during the feeding process is fed in the direction of the arrow I by any suitable blank feeding apparatus so that it passes beneath the leading broad face of the mandrel and a gripper 5 which is spring-urged so that normally it is in contact with the leading face of the mandrel and is moved away from the face to permit the blank to be fed and for other operations, by cams which will be referred to later. When the blank has reached its proper position in front of the mandrel the gripper moves up and presses the blank against the mandrel. The disc 1 is then moved by the intermittent motion so that the mandrel carrying the blank 4 is moved an angular distance of twice the mandrel pitch to bring said mandrel to a position marked F. F. S. (the first folding station) where the blank is folded into a tube about the mandrel by movable folders of any suitable kind. During the mandrel movement the parts of the blank extending laterally beyond the mandrel face are folded by guides 20 so that the blank is formed into a U about the mandrel. The movable folders shown are of well-known type and merely consist of a pair of pivoted arms 6 and 7 which are operated by any suitable mechanism to cause folding blades 8 and 9 to move to and fro across the upper face of the mandrel. Another gripper 10 which is normally held in contact with the trailing face of a mandrel by a spring is raised at this time by a cam described later to permit the lateral extensions of the blank to be folded down on the trailing face of the mandrel after which the gripper moves down on to the tube seam 11, which is formed on the upper side of the mandrel, and holds the seam while the adhesive of said seam dries. This gripper may be heated, e. g. by electricity, to assist in drying the seam.

At the next stop, two angular pitches beyond the first folding station, the end of the tube projecting beyond the free end of the mandrel is folded down on to the mandrel end. The operations at this second folding station S. F. S. consist of tucking the narrow sides of the tube over the mandrel end and then folding down the two broad flaps on to the same. Referring also to Figure 2, the narrow sides are tucked by tuckers 12 fixed to the ends of pivoted arms 13 which are operated at the required times by suitable mechanism. The trailing broad side of the tube end is then folded over the tucks by a moving folder 14 and the leading broad flap is folded on to the upper flap by a fixed folding plate 15 as the disc commences to move again. Thereafter the folds are held in position by a plate 16 (omitted

from Figure 1) and extending concentrically around the centre 3 so as to cover the ends of the mandrels as they move in their circular path. If need be the plate may extend nearly up to the position where finished packets are filled as will be described more fully later.

In machines which merely make packets as distinct from those in which the packets are also filled, the mandrels may be more or less solid though they usually comprise an ejector movable inside the mandrel to strip the packet therefrom, but in the example illustrated a mandrel is constructed as a thin tube or sleeve so that cigarettes may be thrust through it into the packet. The end of such a tube is not particularly suitable for the folding operations just described, so a removable mandrel end 17 is provided. This is moved in and out of the mandrel when the latter stops to provide a temporary end for the folding operation, the mechanism for moving the end 17 being the same as that shown in Figure 4 and described later.

At the next stop, after a further movement of two angular pitches, a movable pressing device engages the folded end of the tube and presses it hard against a fixed cooperating device to cause the folds to adhere to one another. This position of the mandrel is the first pressing station, F. P. S.

The pressing device is fully illustrated and described in the copending United States application Serial No. 777,036, filed September 30, 1947, now Patent No. 2,476,051 and will only be briefly described here with reference to Figures 3 and 4.

The movable presser consists of a plunger 18 movable in a tubular member 21 against the action of a strong compression spring 22. The member 21 is fixed to a rod 23 slidable in guides and reciprocated by a connecting rod 24 pivoted thereto. The other end of the connecting rod is attached to a crank pin 25 on a crank disc 26. The crank disc is rotated at such speed and the throw of the crank is such that in the brief interval of time that a mandrel 2 is stopped at a pressing station the rod and plunger pass into the hollow mandrel, press the seam and move out again. Opposite to the free end of the mandrel there is a rigid abutment 19 which is just touched by the folded ends of the packet tube and forms the co-operating surface for the presser. The part 19 may be fixed to or form part of the cover plate 16 or project through it as desired.

The operative end of the presser plunger comprises, for example, two studs, such as the stud 27 shown in Figure 3, of small diameter (e. g. ¼") and with the mechanism described an enormous unit pressure is developed over these small areas and results in the seams becoming very securely and rapidly joined at these places so that the remainder of the adhesive in the seams can dry naturally without risk of any displacement of the folds of the packet.

The pressure is repeated by a similar device at the next stop or second pressing station, S. P. S. and thereafter the disc continues to move intermittently without further operations on the packet until the disc has rotated slightly more than one complete revolution from the last pressing station as will now be more exactly explained.

Three mandrel pitches beyond the second pressing station there is located a filling station F. S. where articles are inserted into the packet as described below, but as the disc is operated in angular movements equal to two angular pitches it will be seen that on the first passage of the mandrel in question it will pass by the filling station and stop one mandrel pitch beyond it. After the disc has rotated a complete revolution plus three pitches from the second pressing station the mandrel under discussion will stop at the filling station. During all the time taken for the disc to rotate this amount the packet has been drying so that the seams are quite set before filling takes place. Moreover, the packet has been exposed while moving over the upper part of the mandrel path for prolonged visual inspection if need be.

Often it is desired to furnish the packets with an inner liner of tin-foil or the like, and where this is required a feeding and cutting device for the foil is arranged at the top of the machine. This device may be of any known construction arranged to feed and cut suitable lengths of foil from a reel. A piece of foil 28 is fed into the path of a mandrel which is an even number of pitches away from the blank feeding station. As shown, the tin-foil feeding station T. F. S. is six pitches in front of the blank feeding station. A pair of curved guides 29 extend from the foil feeding station to the blank feeding station, and these cause the strips of foil to be bent into a U about the mandrel and maintain it in position on the mandrel by their friction. While the foil is being fed in front of the mandrel the gripper 5 is moved away from the mandrel as previously described and moves back again under the action of its spring. When said mandrel arrives at the blank feeding station, a blank is fed out as previously described and gripped by the mandrel gripper 5. This gripper also serves to grip the foil when the blank has been fed and gripped.

The remaining folding operations are similar to those previously mentioned for the packet blank as the two pieces of material are folded at once, except that the leading broad flap of the foil strip is folded at the blank feeding station. This folding is effected by a fixed folder 30 similar to the folder 15 already described, and the purpose of the operation is to obtain a foil covering at the bottom of the interior of the packet. Thereafter the foil is folded simultaneously with the packet blank and thus the order of the folds from the interior outwards is leading broad foil flap, foil side tucks overlaid by paper side tucks, trailing broad foil flap overlaid by trailing broad paper flap, leading broad paper flap.

Any suitable mechanism may be provided for operating the grippers 5 and 10, but in a convenient form rotatable cams 35 and 36 are disposed at suitable positions around the disc axis. The cams rotate on fixed axes and are so timed that as the disc moves intermittently rollers 37 and 38 on the gripper arms come into contact with the cams and permit or prevent the grippers from moving into contact with the blank under spring influence according to the disposition of a cam when a roller engages it.

Machines of the type described are principally used for packing cigarettes and for this purpose a mandrel is often made as a thin sleeve or tube as illustrated into which the cigarettes (which may be compressed) are fed at the filling station. A chamber 31 is shown at the filling station. This is part of the compressing device described and illustrated in United States application Serial No. 765,391 (now abandoned), and a batch of ciga-

rettes in a compressed state in said chamber is thrust from the chamber through the hollow mandrel until the leading ends of the cigarettes touch the bottom of the packet.

The ejecting station E. S. is located two pitches beyond the filling station so that at the end of the next intermittent movement after the cigarettes are fed into the mandrel an ejector pushes them out of the mandrel during which operation the packet is stripped from the mandrel.

It will be obvious that the mechanism shown in Figure 4 can be adapted for thrusting the cigarettes into the mandrel and for ejecting the cigarettes therefrom at the next station.

A convenient intermittent motion for the disc is shown in Figure 5 and consists of twenty-five studs or rollers **32** equally spaced on a circle concentric with the disc axis **3** and engaged by a single thread worm **33** which engages with every second stud and moves the disc an angle equal to twice the pitch angle of the studs at each movement. The worm has a part **34** of zero lead and thus while this part is passing between the rollers the disc is stationary. This mechanism is well known and is only described here because it is very suitable for driving a large disc such as the disc **1**.

What I claim as my invention and desire to secure by Letters Patent is:

A packet making machine comprising a rotatable support, an odd number of formers about which packet blanks are folded and stuck to form open ended packets, said formers being mounted on said support and equally spaced around a circle concentric wtih the axis of rotation of the support, and means for intermittently rotating the support to bring the formers in turn to positions of rest, folding means located at certain of said positions of rest to effect folding operations on successive blanks, each intermittent movement being such that the support moves through an angle equal to twice the angular pitch of the formers, whereby the support rotates two revolutions before a given former stops again at a given position.

GEORGE DEARSLEY.

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