A method and apparatus for successively punching lancets from a strip of lancets and then packaging the lancets. In a precisely timed manner the strip is fed by an intermittent feed to a punch press where each of the successive lancets is precisely positioned to be punched from the strip. The punched lancets are successively received on a timing transfer belt which is intermittently driven in synchronism with the strip from which the lancets are punched. From the timing transfer belt the lancets are successively dropped onto a strip of adhesive paper which is to form part of a packaging for the lancets and which moves transversely with respect to the timing belt. A second strip of packaging paper is adhesively joined to the first strip to form with the latter sealed pockets in which the lancets are respectively situated, and these paper strips are cut between the pockets to form separate packages for the separate lancets.
1

METHOD AND APPARATUS FOR MANUFACTURING AND PACKAGING LANCETS

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for manufacturing and packaging lancets.

In particular, the invention relates to that type of lancet which is used to puncture the skin in connection with obtaining a small amount of blood from a patient.

For purposes of hygiene it is essential that lancets of this type be used once and discarded. It is therefore of importance that the cost of the lancets be maintained low enough to make it practical to use each lancet once and discard it. Furthermore, it is essential that each lancet be hygienically packaged so that it will be free of germs when removed from a package and used.

At the present time the costs involved in the manufacture of lancets of this type are undesirably high. It is not possible at the present time to manufacture the lancets with the required precision. Once the lancets are manufactured they must be maintained under strict hygienic conditions until they are sealed in a package in a fully hygienic manner, and these requirements also contribute undesirably to the cost.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a method and apparatus which will avoid the above drawbacks.

In particular, it is an object of the invention to provide a method and apparatus which are capable of achieving very accurately manufactured lancets in an extremely inexpensive manner.

In particular, it is an object of the invention to provide a method and apparatus capable of providing highly satisfactory lancets at a high rate of output which contributes to the low cost.

Furthermore, it is an object of the invention to provide a method and apparatus where the packaging operations take place as an integrated part of the operations involved in the final stages of lancet manufacture, so that the packaging of the lancets will follow very inexpensively as an integrated part of the manufacturing of the lancets.

Yet another object of the invention is to provide a construction and method which require only a small amount of space and relatively simple rugged equipment of relatively low cost operating for the most part in a fully automatic manner to achieve low-cost lancets each of which is individually packaged under the strictest hygienic conditions.

According to the invention the lancets are initially integrally formed in strips from which the lancets are to be successively punched. These strips are intermittently fed by a feed means of the invention in an extremely precise manner which locates the successive lancets at a punch press in a precisely determined position ready to be punched by a descending punch of the punch press. Situated directly beneath the strip of lancets is a timing transfer belt means which receives each punch lancet as it is punched from the strip. The timing belt means and the strip of lancets are synchronously moved intermittently by increments which locates a lancet-receiving recess of the timing belt in a position to receive a lancet as it is punched from the strip. As the timing transfer belt turns around a pulley the lancets will successively drop from the belt, and a transversely extending adhesive paper strip forming the lower strip of the package is advanced to receive the successively dropping lancets which thus form a row of lancets along this packaging strip. An upper adhesive paper strip is joined to the lower strip to form with the latter sealed pockets in which the lancets are respectively located, and the pair of strips which are thus joined to each other are cut between the pockets to form separate packages for the separate lancets, respectively.

2

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a schematic front elevation of an apparatus of the invention for practicing the method of the invention;

FIG. 2 is a fragmentary illustration of part of a sheet metal strip from which the successive lancets are to be punched;

FIG. 3 is a partly broken away perspective illustration of a single package with a lancet therein;

FIG. 4 is a fragmentary plan view taken along line 4—4 of FIG. 1 in the direction of the arrows and showing that part of the apparatus where the strips of lancets are fed to have the lancets punched therefrom with the lancets then transported by the timing belts;

FIG. 5 is a fragmentary front elevation of the structure illustrated in FIG. 4;

FIG. 6 is a fragmentary partly sectional transverse elevation of the structure shown in FIG. 4, taken along line 6—6 of FIG. 4 in the direction of the arrows;

FIG. 7 is a fragmentary partly sectional front elevation of the intermittent drive, FIG. 7 being taken along line 7—7 of FIG. 6 in the direction of the arrows;

FIG. 8 shows the details of the apparatus and operations at the region where each lancet is punched from a strip and deposited onto a belt, FIG. 8 being taken along line 8—8 of FIG. 4 in the direction of the arrows;

FIG. 9 is a fragmentary transverse sectional elevation of the structure of FIG. 8 taken along line 9—9 of FIG. 8 in the direction of the arrows;

FIG. 10 is a fragmentary illustration of that part of the stationary die plate through which the lancets are punched by the descending punches, FIG. 10 being taken along line 10—10 of FIG. 8 in the direction of the arrows;

FIG. 11 is a fragmentary sectional elevation showing at an enlarged scale, as compared to the other figures, the manner in which an elevator and punch coat;

FIG. 12 is a fragmentary partly schematic side elevation of the packaging part of the apparatus and method, FIG. 12 being taken along line 12—12 of FIG. 1 in the direction of the arrows;

FIG. 13 is a fragmentary top plan view, taken along line 13—13 of FIG. 12 in the direction of the arrows, and showing how the lancets are successively delivered from a timing transfer belt to an adhesive paper strip which will form part of the final package;

FIG. 14 is a sectional elevation taken along line 14—14 of FIG. 13 in order to illustrate further the details of the transfer of each lancet from a timing belt to a paper strip;

FIG. 15 is a partly sectional front elevation, taken along line 15—15 of FIG. 12 in the direction of the arrows, and showing at an enlarged scale as compared to FIG. 12 the manner in which the separate packages are received by a packing means which packs them compactly one next to the other; and

FIG. 16 is a fragmentary top plan view of the structure of FIG. 15 taken along line 16—16 of FIG. 15 in the direction of the arrows.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. 3 of the drawings, there is illustrated therein a package 20 containing a lancet 22. This package 20 is composed of a pair of paper strips 24 and 26 which are adhesive, at least at areas where these strips are directed toward each other, and the adhesive coatings, which may be a pressure-sensitive adhesive, enables the strips 24 and 26 to be hermetically and hygienically joined to each other in a manner forming a closed pocket in which the lancet 22 is located. Thus, the package 20 need only be torn open in order to expose the lancet 22 which may then be used and discarded.

The method and apparatus of the invention form the packages 20 one of which is illustrated in FIG. 3.
The several lancets 22, made of sheet metal, are derived from a sheet metal strip 28 shown fragmentarily in FIG. 2. This sheet metal strip 28 has been initially worked in such a way that it is formed with the several parallel transverse slots 30 uniformly spaced from each other in the manner indicated in FIG. 2. Adjacent an edge 32, the strip 28 is formed with substantially V-shaped openings 34, so that at these openings there will be the sharp points 36 each of which will form the piercing point of a lancet. Thus, if the strip 28 is successively punched along the lines 38 and 40, indicated in dot-dash lines in FIG. 2, successive lancets will be punched from the strip with each of the lancets having the configuration of the lancet 22 shown in FIG. 3.

The strips 28 are initially in the form of supply rolls 42 one of which is shown in FIG. 1. Each roll 42 is supported for rotary movement in any suitable way and each strip 28 is drawn from the supply roll 42 by a feed means of the invention.

As may be seen from FIG. 4, in the illustrated example a pair of strips 28 are simultaneously worked so as to simultaneously derive lancets 22 from a strip. The pair of strips 28, respectively taken from a pair of supply rolls 42 may be guided along a stationary slide plate 44 from where the strips extend over a freely rotatable idling guide roller 46. As may be seen from FIG. 5, the guide roller 46 is simply supported for free rotary movement on a shaft carried by any suitable stationary brackets which are supported by the stationary framework of the machine which is illustrated. From the guide roller 46 the pair of strips 28 pass beneath a rotary feed roller 48 of the feed means 50. The feed roller 48 is fixed to an elongated shaft 52 which fixedly carries at its rear end a sprocket wheel 54 meshing with an endless sprocket chain 56 from which a drive is transmitted to the shaft 52 and the roller 48 of the feed means 50. This roller 48 has a pair of annular portions 58 each of which is formed with a series of axially extending ribs 60 uniformly distributed about the circumference of the roller 48 and the shaft 52, to which the roller 48 is fixed, so that in effect the portions 58 form a pair of gears having an elongated axially extending teeth which rotate with the shaft 52 in response to the drive delivered from the chain 56 and the sprocket wheel 54. The angular distance between the successive teeth 60 of each portion 58 of the roller 48 is such that these teeth are successively received in the transverse slots 30 formed in the pair of strips 28 and shown most clearly in FIG. 2. As a result the teeth 60 form a positive, non-slip drive for the pair of strips 28 advancing them very precisely in accordance with the angular movement of the feed roller 48.

The drive through the chain 56 and sprocket 54 is delivered in a stepwise intermittent manner as described in greater detail below. However, the structure includes a stop means 62 (FIG. 4) which very precisely stops the angular movement of the feed gears 58 after each increment of movement, so that each lancet which is to be punched from the strip 28 will be very precisely located at a proper punching position. This stop means 62 includes a disc 64 fixed also to the shaft 52 for rotary movement therewith. The periphery of the disc 64 has a series of cutouts in the form of openings 66 uniformly distributed circumferentially along the periphery of the disc 64. A pneumatic cylinder 68 is supported by the framework adjacent the disc 64, and within the cylinder 68 is a piston which is fixed to a plunger 70 in the form of a finger which is capable of entering into each of the openings 66. Through a suitable pneumatic circuit which is not illustrated, compressed air is delivered into the cylinder 68 for advancing the finger 70 into an opening 66 so as to very precisely stop the angular movement with this stop means 62 for precisely positioning the next lancet at the punching position. After the punching operations are completed, and this only involves a fraction of a second, the compressing air is released from the unillustrated valve and a spring quickly returns the finger 70 so that it moves out of the opening 66 which it had just occupied, and now the chain 56 will be actuated to bring about the next increment of movement of the feed means so as to bring the next lancet in position to be punched, and the finger 70 will again be driven by the force of the compressed air into the next opening 66, so that in this way the feed means 50 operates intermittently to successively position the row of lancets of each strip 28 precisely at a position to have punching dies accurately punch each lancet from the strip 28.

As is shown in FIG. 5, the pair of strips 28 slide along the upper surface of a die 72 which is fixed in a well known manner on the bed of the punch press 74. This punch press 74, schematically shown in FIG. 1, will in a well known manner actuate an upper die assembly so as to move it up and down as indicated by the arrow 76, and at each downward stroke the punches or dies will sever a lancet from each of the strips 28 and then the punch will return to its upper starting position in preparation for arrival of the next lancet at a punching position to be punched through the die 72 which has a shape conforming to that of the pair of lancets which are simultaneously punched from the pair of strips.

Referring now to FIGS. 8-11, the die 72 is shown in greater detail, FIG. 9 showing schematically the punches 78 which punch the several lancets from the strips 28 through the die openings 80 illustrated in FIG. 9. As is apparent from FIG. 9, the punches need only cut the strip 28 at the rear and front ends of the lancets which otherwise are already separated from the strip 28 by the slots 30.

Situated beneath each punch 78 is a timing transfer belt means 82 as is indicated most clearly in FIGS. 8 and 11, the upper run of the belt means 82 slides along the upper surface of a supporting bed 84 and has upwardly-directed recesses 85 in which successively become situated directly beneath the punch 78 to receive a lancet therefrom. Thus, referring to FIGS. 8 and 11 it will be seen that lancets 22 are already situated in upwardly directed recesses of the timing belt means 82 at the part of the latter which has moved to the left, as viewed in FIGS. 8 and 11, beyond the punching position, while the recesses on the right of this position are in the position beneath the punches 78 still are empty and will shortly receive a lancet 82. These timing transfer belt means 82 are also driven intermittently through increments which will properly situate the successive lancet-receiving recesses 85 precisely beneath the punches 78, and the manner in which this precise intermittent drive is transmitted to the belts 82 is described in greater detail below.

As is apparent particularly from FIG. 9, each timing transfer belt means 82 is made up of a pair of endless timing belts 82a and 82b. The endless belts 82a and 82b of each belt means 82 are parallel to and spaced from each other so that between each pair of belts 82a and 82b it is possible for an elevator 86 to engage the right hand edge of each pair of belts. The pair of belts 82a and 82b of each belt means respectively engage their transverse recesses between their teeth aligned with each other so that each pair of aligned transversely extending recesses of a pair of endless belts 82a and 82b forms a recess of the belt means 82. Thus, each lancet which is punched from the strip 28 will be supported at one end region by the belt 82a and at the opposite end region by the belt 82b of each belt means while an intermediate portion of each lancet will extend across the gap between the belt of each belt means.

In the position of the parts which is shown in FIG. 9, the punches 78 are about to descend along their working stroke to punch lancets from the strips 28, respectively, and lower them through the die 72 onto the pair of timing transfer belt means. At this time it will be noted that the elevators or plungers 86 are in their upper positions situated directly beneath the strips 28. These plungers or elevators are guided by way of piston portions 88 slidable in bores 90 of a block 92 fixed in any suitable way, as by screws 94 to the bed 84 of the machine. Positioning dowels 96 may be used for precisely positioning the second, the slidable portions 88 terminate in downwardly directed extensions 98 engaging the ends of compressed springs 100 housed within suitable tubes 102 closed at their bottom ends by threaded plugs 104, respectively. Thus, the springs 100 urge the elevators 86 up to the positions shown in FIG. 9. The junction between the top ends of
the pistons 88 and the plunger portions 86 define upwardly directed shoulders 106, illustrated in FIGS. 8 and 9.

As may be seen from FIG. 8, each plunger 86 is fixed by a cross pin 108 to the piston portion 88. The block 92 carries, for each piston 88, a pneumatic cylinder 110, the piston of which is fixed with a finger 112. As soon as the shoulder 106 moves below the finger 112, air under pressure is introduced automatically into each cylinder 110 to displacement the fingers 112 outwardly at the proper moment and for releasing the air under pressure so that springs can immediately retract the fingers 112. The arrangement is such that when the punches move down the plungers 86 are moved downwardly therewith. However, when the punches return up to their starting position, the elevators 86 are maintained in opposition to the springs 100, in their lower position not to follow the punches upwardly. These elevators 86 are maintained in their lower positions until the next lancet is moved into the punching position, whereupon the fingers 112 are automatically retracted to release the plungers for upward movement to the position as indicated in FIG. 9.

These elevators 86 perform an important function which contributes very greatly to the efficiency of the operation and freedom from faulty operation. It has been found that if the operation go forward without the elevators 86 then the lancets fall in an uncontrollable manner onto the timing transfer belt means. Thus, with certain lancets it may be that the front end will be inclined downwardly while with other lancets it may be that the rear end will be inclined downwardly, and a horizontal depositing of the lancets reliably in the recesses of the belt means is not assured. However, with the pair of elevators 86, this uncontrollable operation is avoided. The top ends of the elevators 86 coat with the punches to pinch or press against the lancets at the intermediate part thereof between the pair of belts of each belt means, and while thus held at the central portions the punch lancets are lowered onto the belts. This construction compels each lancet to be maintained in a desirable horizontal attitude while it is lowered onto the timing transfer belt, and to allow the lancet becomes situated in the best possible position on the belt means, so that the greatest precision is achieved with this arrangement.

The pair of timing transfer belt means 82 slide along the upper surface of the supporting bed or plate 84 of machine and are advanced in a stepwise, intermittent manner, by a structure described in greater detail below. At their right ends, as viewed in FIG. 5, the endless timing belts extend around a freely rotatable idler roller 114. From the latter the upper runs of the belts slide along the upper surface of the bed 84 in a horizontal plane until the opposite ends of the belts reach the end rollers 116 shown in FIGS. 12-14. These guide rollers for the endless timing transfer belts are referred to in more detail below. From these end rollers 116, which also are supported for free rotary movement, the timing belt transfer means moves horizontally to a guide roller which is not illustrated and which is also supported for free rotary movement, and from this guide roller the pair of timing belts move downwardly to extend around the pair of guide rollers 118 indicated at the lower left of FIG. 5. From the roller 118 the timing belt transfer means extends up to the driving rollers 120 which in fact are in the form of gears shown most clearly at the lower right portion of FIG. 6. These gears 120 mesh with the teeth of the timing belts so as to precisely advance the latter in accordance with a drive which is intermittently transmitted to the gears 120 in a manner described below. From the drive gears 120 the belts continue to the right end rollers 114 around which they extend in the manner described above and shown at the right portion of FIG. 5.

As may be seen from the lower portion of FIG. 6, the gears 120 are keyed to a rotary shaft 122 supported at its right end in a bearing carried by a plate 124 which is removably fixed to the frame work of the machine in the manner illustrated at the lower right portion of FIG. 6. The rear end of the shaft 122 is also supported for rotary movement in a stationary bearing 126 fixed to and extending downwardly from the bed 84. The rear end of the shaft 122 which extends rearwardly beyond the bearing 126 carries a stop disc 128 formed at its periphery with a series of circumferentially distributed openings 130 for successively receiving a pneumatically actuated stop finger 132 shown diagrammatically in FIG. 5. This finger 132 was fixed to a piston within a pneumatic cylinder 134 which is actuated in the same way as the cylinder 68.

Thus, at the end of each increment of movement air under pressure will be automatically introduced into the cylinder 134 to drive the finger 132 into the next recess 130 so as to precisely determine the angular position of the gears 120 and thus precisely determine the increment of feed of the timing belts. During the next cycle the air is vented while springs quickly retracted the fingers 132 so that the next increment of turning can be provided with the finger 132 and then entering the next recess or opening 130 so as again to precisely determine the increment of movement of the timing belts during the operating cycle. Thus, with this construction not only will the several lancets be precisely positioned beneath the punches but in addition several timing belts will be precisely positioned to receive the lancets in the manner described above.

The punch press 74 is schematically indicated in FIG. 1. It is driven by its own motor 136. Through a suitable transmission the motor 136 rotates the fly wheel 138, as is conventional. The punch press includes an unillustrated clutch which when engaged will transmit the movement of the fly wheel 138 to a rotary crank which will cause the punch to move down along its working stroke and then back to its rest position, with the clutch then becoming disengaged until the next actuation, as is well known. The control for the clutch of the punch press is taken from a rotary shaft 140. For example this shaft carries an unillustrated cam which engages and then disengages the clutch depending upon the angular position of the shaft 140. The shaft 140 drives a sprocket 142 (FIG. 6) which drives an endless chain 144 which in turn drives a sprocket 146.

The sprocket 146 is fixed to end drives a shaft 148 which in turn drives a gear box and driving unit 150. Because unit 150 is driven from the punch press drive it is in synchronization therewith. The end of the shaft 148 distant from the sprocket 146 fixedly carries a pair of cams 152 which respectively control valves 154 of the unillustrated pneumatic circuit so as to bring about the pneumatic controls of the stop fingers in the manner referred to above. The configuration of the eccentric cams 152 is most clearly apparent from the left portion of FIGS. 5 and 6.

The drive from unit 150 is also taken to a rotary shaft which carries an eccentric cam 156. This cam 156 has at its front face an eccentrically arranged circular camming groove 158 which receives a follower roller carried by the rear surface of a swing plate 160 which is swingable about a shaft 162 supported for rotary movement in suitable bearings as illustrated in FIG. 6. Thus, the plate 160 is freely swingable about the shaft 162. This shaft 162 fixedly carries a ratchet 164 (FIG. 7), and the swing plate 160 pivotally supports a pawl 166. Thus, during each revolution of the cam 156 the plate 160 will be swung first in one direction and then in an opposite direction about the shaft 162, causing the pawl 166 to move first in a counterclockwise direction as viewed in FIG. 7, until it falls ahead of the next tooth, and then in a clockwise direction, as viewed in FIG. 7, so as to turn the shaft 162 through an angular increment equal to the angular displacement of one of the teeth of the ratchet 164. In this way the shaft 162 is angularly turned through predetermined angular increments at each revolution of the cam 156, and this intermittent drive is of course correlated and synchronized with the drive to the punch press through the chain 144 as well as with the pneumatic controls through the cams 152.
As is apparent from FIG. 6, just in front of the ratchet 164 is a bearing 168 for the shaft 162. Just in front of this bearing 168 is a disc 170 which is fixed to the shaft 162 for rotation therewith. This disc 170 is formed with axially extending bores 172 uniformly distributed circumferentially about the disc 170. Part of the pneumatic system includes a cylinder 174 shown in FIG. 4 and actuating a locating finger 176 which will enter into one of the openings 172 in order to precisely determine the successive angular positions of the disc 170. Thus, the pneumatic circuit will deliver to the cylinder 174 air under pressure which will advance the finger 176 into an opening of the disc 170 in order to precisely stop the shaft 162 at a given angular position, and then in preparation for the next cycle the air is vented while a spring quickly retracts the finger 176 so that the disc 170 can again turn through the required angular increment.

Just in front of the disc 170 is a sprocket 178, and it is this sprocket which drives the endless chain 56 which transmits the drive to the feed means 50 in the manner described above.

In front of the sprocket 178 is a second sprocket 180 from which an endless chain extends to a sprocket 182 (FIG. 6). This sprocket 182 is fixed to the shaft 122 so that in this way the shaft 122 is driven from the unit 150 in a precisely controlled manner, and of course it is from this shaft 122 that the gears 120 are driven in order to advance the timing belts.

At the right portion of FIG. 6 is shown an additional drive carried by the top part of the plate 124 so that further drives may be taken off from the shaft 162 as desired.

As was indicated above, the timing transfer belts are guided around end rollers 116 which are shown in FIG. 12. At this location the rollers are delivered to a packaging means which is illustrated in FIGS. 12-16. As is apparent from FIGS. 12-14, the frame of machine carries guides 186 which extend around the ends of the timing belts which are guided around the rollers 116, so that, in the manner shown most clearly in FIG. 14, the several lances 22 will be maintained in the several recesses of the timing belts 82 until the lances have been transported around the inner concave surface of each guide 186 up to the lower right end 188 thereof, as viewed in FIG. 14. This lower right end 188 of each guide 186 extends over a paper strip 190. This paper strip 190 has an upwardly directed coating of pressure sensitive adhesive, for example, and this strip 190 forms the lower layer of a package for each of the lances. The lower adhesive paper strip 190 is derived from any suitable supply roll and moves to the left, as viewed in FIG. 12. In order to advance the strip 190 to the left it is conveyed by an endless belt 192 supported on suitable pulleys 194 with the upper run of the belt supporting the strip 190. In this way the strip 190 extends beneath the guides 186 at the ends 188 thereof as clearly shown in FIGS. 13 and 14. The rate of movement of the strip 190 has with respect to the intermittent movement of the timing belts a relationship which will cause the lances 22 to be successively deposited on the strip 190 centrally between the side edges thereof and uniformly distributed therealong, as is apparent from FIGS. 12 and 13.

The packages are completed by an upper layer of adhesive paper derived from a supply roll 196. From the supply roll 196 the upper adhesive strip of paper 198 is guided around a roll 200 and then through a guide 202 onto the strip 190 over the lances 22 thereon. Just ahead of the guide 202 is situated an upper friction roller 204 which presses down on the upper strip 198 so as to adhesively fasten the latter, due to the pressure-sensitive adhesive, to the lower strip 190, and in this way the joined strips 190 and 198 will have the lances 22 hygienically and hermetically sealed therebetween as the joined strips move to the left beyond the pressure roller 204. Just beneath the pressure roller 204 is a counter-pressure roller 206 which presses against the upper surface of the endless belt 192 so that the packaging strips are compressed between the roller 204 and the belt 192 as a result of the pressure of the lower roller 206.

The drive for this part of the structure is taken from shaft 140 which through transmission 250, schematically indicated in FIG. 1, drives gear box unit 208 which in turn drives a sprocket which drives a chain 210. Since the drive is taken from shaft 140, the press counter shaft, all is in synchronization so that everything happens in synchronization with the press stroke. The advancement of the lances, the advancement of the timing belt, and the movement of the belt 190 are all synchronized. This chain 210 rotates the sprocket transmission 212 from which a chain 214 is driven. The chain 214 drives a gear train 216 from which the drive is transmitted in the manner shown in FIG. 12 on the one hand to the front roller 194 of the belt 192 and on the other hand to the counter pressure roller 206. The roller 204 simply rotates by a friction engagement with the strip 198.

The pair of thus-joined strips 198 and 190, with the lances 22 therebetweent, form successive sealed packages in which the lances are located. This assembly extends from the left end of the endless belt 192, as viewed in FIG. 12, to the upper surface of a stationary cutting member 218 carried by a supporting structure 220 which also carries a rotary cam assembly 222 driven by the gear 224 from the chain 214. This cam 222 serves to reciprocate a movable blade 226 vertically, the blade assembly 226 carrying rods 228, one of which is shown in FIG. 12. These guide rods 228 extend sidewardly through vertical bores of the support structure 220 so as to guide the blade 226 for vertical up-and-down movement. Because of the synchronization referred to above, midway between each pair of successive lances 22 the blade 226 will move down across the strips 198 and 190 so as to separate them into individual packages each of which has only one lance therein. One of these packages 20 is illustrated in FIG. 3 and has been referred to above. The forward end of each package 20 is deflected downwardly by a deflector plate 230 carried by the structure 220, and it is deflected in this way along a chute 232. The chute 232 is stationary and directs each package between the rotary screws 234 of a packaging means. These rotary screws 234 are respectively fixed to and driven by a pair of shafts 236 one of which is driven from the unit 208 by bevel gears 238. The pair of shafts 236 are respectively provided with gears 240 which mesh with each other, one of these gears being shown in FIG. 12. As a result the rotary movement of one shaft 236 is transmitted to the other shaft and they rotate it to advance the successive packages 220 in the manner indicated in FIGS. 12,15, and 16. The lower edges of the packages rest on an endless belt 242 driven in any suitable way, and through an unillustrated counting mechanism, after a given number of packages 20 have been tightly packed against each other by the screws 234 a separator member 244 is situated therebetween. This will divide the groups of packages so that each group of a given number of packages is made instantly accessible to be placed within a given container for shipment, for example.

It is thus apparent that with the method and apparatus described above an almost fully automatic manufacture and packaging of the lances is achieved in a fully hygienic manner from the strips 28. All that need be done, in the way of manual operations, is to replace the supply rolls for the strips 28 as well as to replace the supply rolls for the paper strips 198 and 190. Also, an operator will be required to place the groups of packages 20 into suitable containers. Otherwise all the operations are fully automatic.

Moreover, as a result of the fully synchronized intermittent drive and pneumatic step structures at the various locations throughout the apparatus as well as the fact that all drives are taken from a single source, namely shaft 140, an exceedingly precise movement of the components is achieved in a manner which assures precise proper operation throughout the entire apparatus.
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strip between the increments of movement thereof, situating in the path of movement of each punched lancet a timing transfer belt at the same intervals as the strip so that the belt is stationary between said intervals to receive a punched lancet and so that the lancets are arranged on said belt in side-by-side relation transversely of the belt, dropping the lancets from the belt to a packaging mechanism, and conveying the dropped lancets at the packaging mechanism away from the timing transfer belt in a direction perpendicular thereto for arranging the lancets at the packaging mechanism in spaced end-to-end relation distributed longitudinally along the packaging mechanism.

2. In a method for manufacturing lancets, the steps of intermittently feeding to a punch press a strip from which lancets are to be punched at increments corresponding to the distance from one lancet to the next along the strip, punching the lancets successively from the strip between the increments of movement thereof, situating in the path of movement of each punched lancet a timing transfer belt which receives each punctured lancet, advancing the timing transfer belt at the same intervals as the strip so that the belt is stationary between said intervals to receive a punched lancet, and delivering the lancets from the belt to a packaging mechanism, feeding a strip of adhesive paper in a direction perpendicular to the direction of movement of the timing transfer belt, and dropping the lancets transported by the latter belt successively onto the strip of adhesive paper.

3. In a method as recited in claim 2, covering said strip of adhesive paper with a second strip of adhesive paper adhesively joined to the first strip to form therewith pockets for respectively receiving the lancets, and cutting through the strips between the lancets to provide separate lancet packages.

4. In a method for manufacturing lancets, the steps of intermittently feeding to a punch press a strip from which lancets are to be punched at increments corresponding to the distance from one lancet to the next along the strip, punching the lancets successively from the strip between the increments of movement thereof, situating in the path of movement of each punched lancet a timing transfer belt at the same intervals as the strip so that the belt is stationary between said intervals to receive a punched lancet, transferring each lancet by a punch from the strip to said belt, dropping the lancets from the belt to a packaging mechanism and conveying the dropped lancets at the packaging mechanism away from the timing transfer belt in a direction perpendicular thereto, and yieldably supporting each lancet during its movement by a punch to the belt for maintaining each lancet in a substantially horizontal attitude while it is deposited onto the belt.

5. In an apparatus for manufacturing lancets, feed means for intermittently feeding to a punch press a strip having elongated lancets arranged in side-by-side relation transversely of the strip and from which lancets are to be punched at increments corresponding to the distance from one lancet to the next in the strip so that a row of lancets carried by the strip will be successively located at a punching position, stop means coaxing with said feed means for stopping the latter precisely at a position which accurately locates each lancet at a position to be accurately punched by a descending punch of the punch press, a timing transfer belt means extending beneath the punch of the punch press to receive each lancet punched from the strip, said timing transfer belt means having successive recesses extending transversely of said belt means in side-by-side relation for successively receiving the lancets and maintaining them in side-by-side relation, drive means operatively connected both with said belt means and with said feed means for driving the latter two means intermittently in synchronism to situate the recesses of the belt means successively beneath the punch as the lancets are successively punched from the strip, said belt means including a pair of endless timing belts parallel to but spaced from each other and respectively formed with transverse recesses which are respectively aligned to form the recesses of said belt means, and elevator means aligned with the space between the belts of said belt means and with the punch of the punch press for raising up through said space to hold an intermediate portion of each lancet pressed against the punch as the latter descends to situate the opposed ends of each lancet in a pair of aligned recesses of said belts, whereby said elevator coasts with said punch to maintain each lancet in a horizontal attitude as it is deposited in each pair of aligned recesses of the belts of said belt means.

8. The combination of claim 7 and wherein said elevator means includes an elongated plunger and a spring urging the plunger toward said punch, said plunger having an upwardly directed shoulder, and releasable holding means engaging said shoulder to prevent the spring from moving the plunger up once the plunger has descended when a lancet has been deposited on said belt means, said releasable holding means releasing said plunger for upward movement when the next lancet is punched from the strip.

9. In an apparatus for manufacturing lancets, feed means for intermittently feeding to a punch press a strip from which lancets are to be punched at increments corresponding to the distance from one lancet to the next in the strip so that a row of lancets carried by the strip will be successively located at said recesses, said timing transfer belt means conveying the punched lancets away from the punch press to drop successively from said timing transfer belt means, and a packaging mechanism having a conveyor means extending perpendicu-
receive each lancet punched from the strip, said timing transfer belt means having successive recesses for successively receiving the lancets, and drive means operatively connected both with said belt means and with said feed means for driving the latter two means intermittently in synchronism to situate the recesses of the belt means successively beneath the punch as the lancets are successively punched from the strip, a packaging means including a strip conveyor extending beneath the timing belt means perpendicularly thereto for moving an adhesive paper strip onto which the lancets successively drop from said timing belt means when the latter changes its direction of movement, and said packaging means including a guide for guiding onto the strip which receives the lancets a covering strip of adhesive paper to form with the other paper strip sealed pockets in which the lancets are respectively situated.

10. The combination of claim 9 and wherein a cutting means coacts with the strips for cutting across the latter between said pockets to form separate packages for the several lancets.

11. The combination of claim 10 and wherein a packing means receives the several packages and packs them one next to the other in a compact group.

12. The combination of claim 11 and wherein said packing means includes a pair of rotary screws respectively having convolutions situated beside each other and receiving the packages therebetween for packing them one next to the other in said groups.

13. The combination of claim 8 and wherein the strip of lancets is a sheet metal strip formed with transverse slots each located between each pair of successive lancets to be punched from the strip, and said feed means including a rotary gear the teeth of which enter into said slots to mesh with said strip, and said stop means including a rotary stop member fixed to said gear for rotation therewith and formed at its periphery with cutouts circumferentially distributed uniformly along said periphery, and a stop finger successively displaced into said cutouts for precisely positioning said gear of said feed means between the feeding intervals.