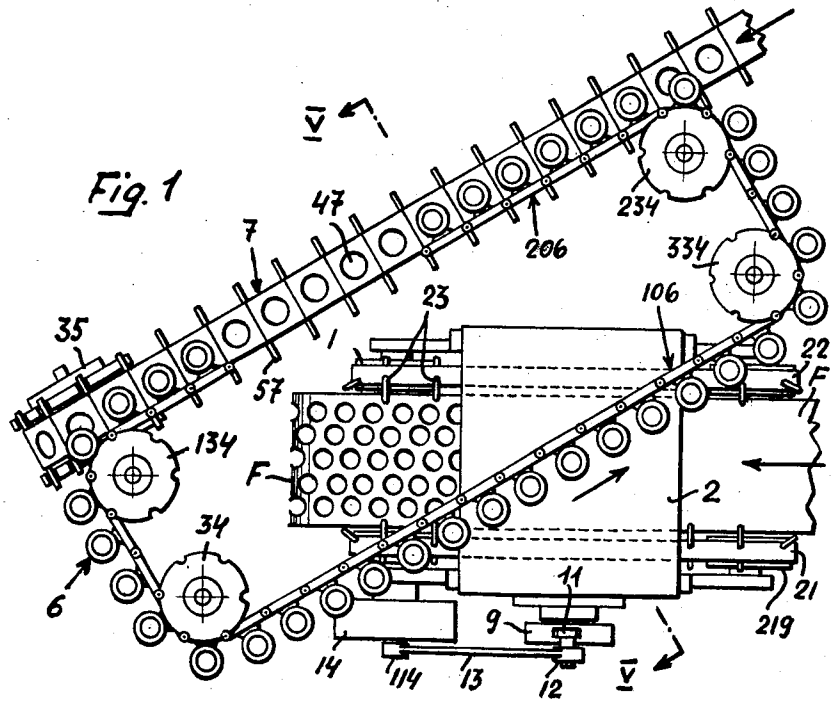
Dec. 13, 1960 E. BUSI 2,964,091

SHEET MATERIAL DISC-PUNCHING AND CORKLINING MACHINE

Filed May 6, 1958 3 Sheets-Sheet 1

Fig. 1



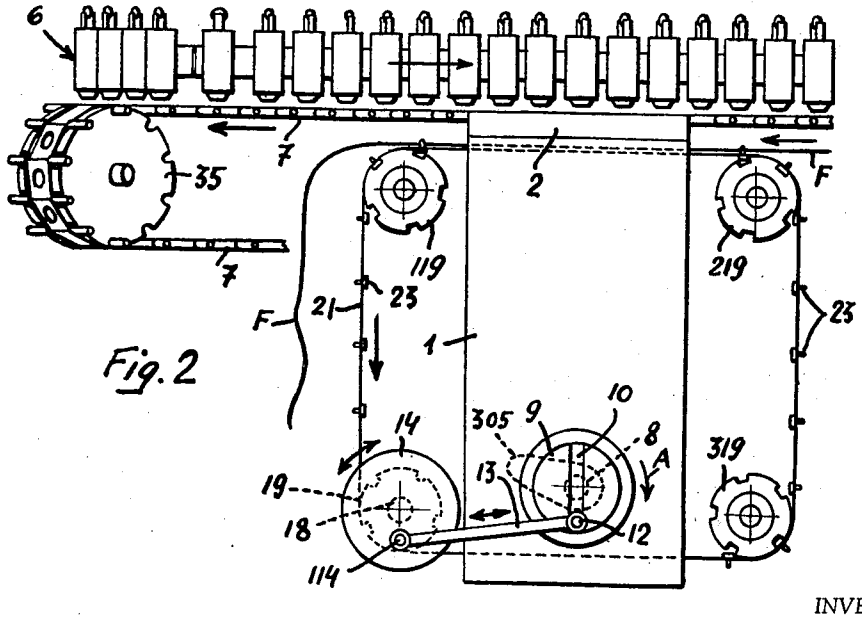


Fig. 2

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SHEET MATERIAL DISC-PUNCHING AND CORKLINING MACHINE

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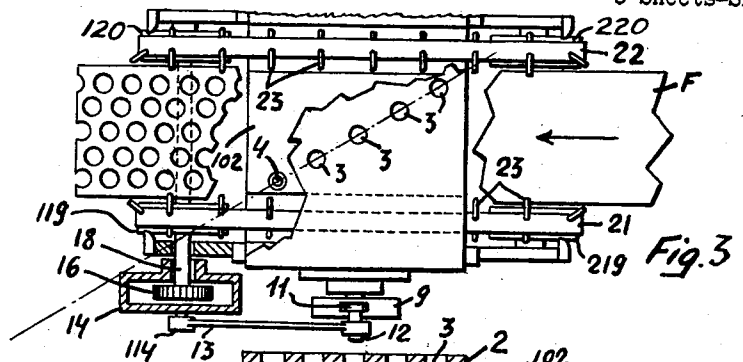


Fig. 3

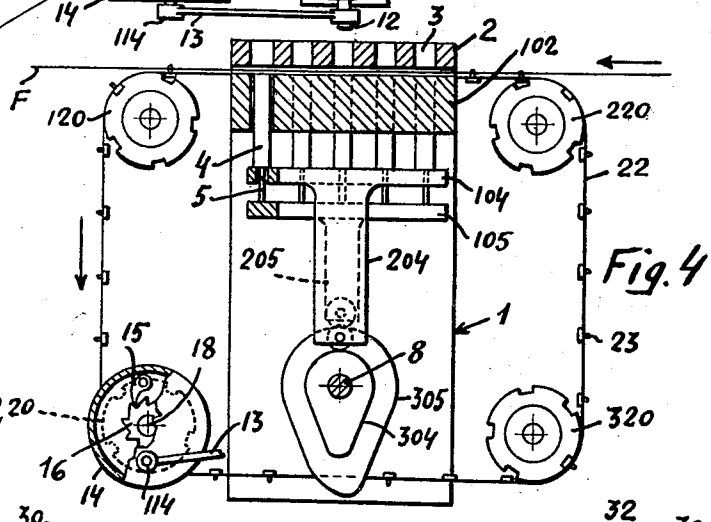


Fig. 4

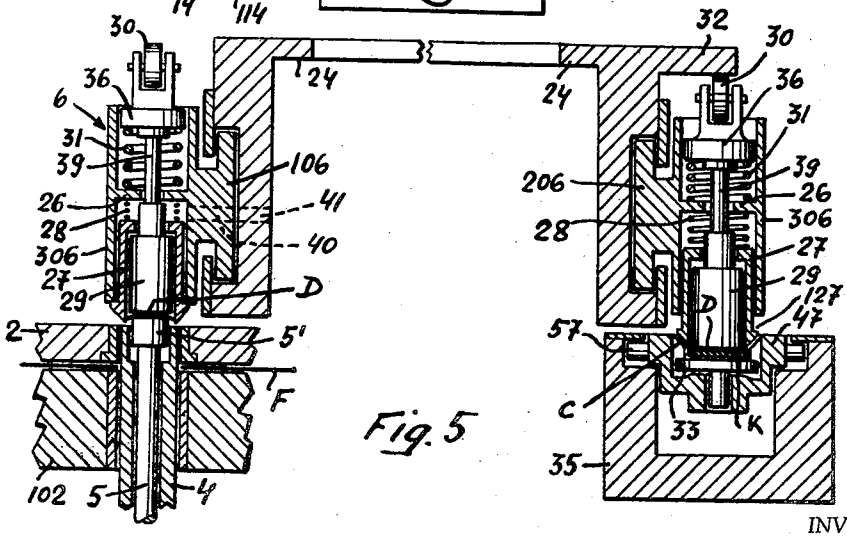


Fig. 5

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SHEET MATERIAL DISC-PUNCHING AND CORKLINING MACHINE

Filed May 6, 1958 3 Sheets-Sheet 3

Fig. 6

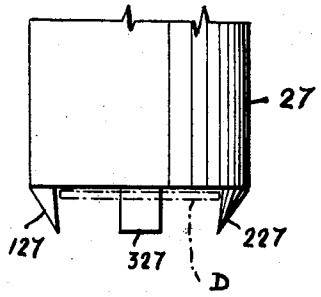


Fig. 7

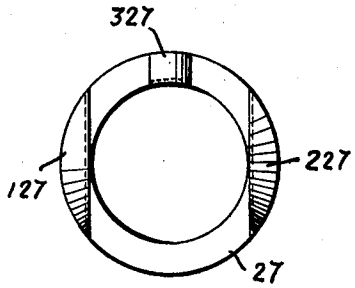


Fig. 8

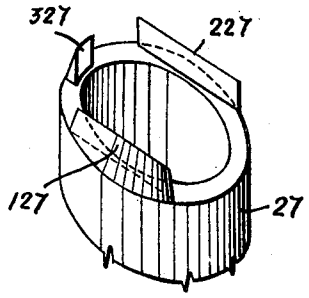
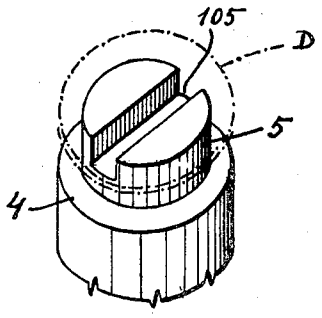


Fig. 9



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United States Patent Office 2,964,091 Patented Dec. 13, 1960

2,964,091

SHEET MATERIAL DISC-PUNCHING AND CORKLINING MACHINE

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Filed May 6, 1958, Ser. No. 733,336

7 Claims. (Cl. 154—1.5)

This invention, which is a continuation-in-part of application Serial No. 660,974, now abandoned, relates to an automatic high production machine for the punching or blanking of discs out of a continuous sheet of cork lining material, such as paper, aluminum leaf, tin leaf and the like and for automatically affixing said discs onto the cork or like packing of closure caps, such as crown corks or the like, which shall be briefly referred to as "corks."

The invention aims to provide an improved high production machine of the kind above referred to, in which the following operations are successively performed in a fully automatic manner:

(1) Simultaneous punching or blanking of a number of preferably five or even more discs from a sheet of lining material such as paper, tin leaf, aluminum leaf and the like, which is fed stepwise, by such a length and in such a manner as to leave a minimum of waste material between the holes left in the sheet after the blanking of the discs.

(2) Automatic insertion in vertical direction of the lining discs, immediately after their punching out of the sheet material, each into a disc-receiving and affixing unit fastened to the links of an endless chain carrier.

(3) Affixing of said lining discs on the corks, that is on packing discs inserted in container closure caps such as crown corks, the rate of affixing of the disks (which is notoriously a slow operation) being so timed as to keep apace with the rate of punching of the same disks (which is notoriously a very swift operation).

The known machines which perform automatically these functions, in addition to being very complicated, present usually the following drawbacks:

(1) In many of these machines the disks are blanked, taken out and affixed while they are in a position other than horizontal, thus necessitating the use of vacuum holding and centering means.

(2) In another machine the punches are carried by a wheel, the arrangement permitting to punch only two rows of disks out of a narrow strip of lining material.

(3) In all the known machines the disk-affixing operation onto the stepwise advancing corks is very slow with respect to the possibility of punching at high speed a row of disks at a time.

In order to overcome in part this drawback, in a machine in which two rows of disks are cut out of the strip of lining material, two disk-affixing devices are provided for each cutting wheel, but the rate of production is low, both due to the fact that no more than two rows of holes can be punched at a time and the disk-punching operation may be many times swifter than the disk-affixing operation.

Other known machines for lining crown caps, such as that described in the U.S. Patent 2,171,258 (Pearson) besides being very complicated, comprise a step-by-step rotatable table or rotor in which at each successive station the following operations are executed: In a first station the pad equipped crown caps are introduced into

corresponding receiving pockets; in a subsequent station the lining disks or "spots" are punched from a strip of adhesive-coated material after which the said "spots" are affixed to carrying plungers at succeeding stations of which said carried "spots" are heated, at successive stations of which said plungers apply the heated spots to the cap pads and exert a pressure thereagainst, and at another station said pads are discharged.

Also these machines are relatively slow in operation, due to the fact that the time during which the rotor must stop at each station is the time which is necessary for effecting the longest of the steps, viz. the introduction of the caps into the pockets and during this step the punches function for a small fraction of the time between two subsequent steps of the rotor.

The object of the invention is to provide a machine for punching lining disks out of a suitably broad sheet of lining material and for affixing said disks into crown caps or the like practically at the same rate of speed at which the disks are punched out of the sheet of lining material.

According to the invention, this end is attained by providing above a set of vertical punches, which punch a plurality of lining disks out of a sheet of lining material, an endless chain running above said punches and carrying a plurality of disk-receivers adapted to receive at the same time all the lining disks punched in each punching operation and to subsequently carry said disks onto another endless chain carrier carrying the caps to be lined and running for a certain time in parallel relation and at the same speed as the endless chain carrying the disk receivers and during this parallel running the said disks are expelled from said receivers and affixed into said caps.

According to a preferred embodiment of the invention all operations may be effected continuously, the rate of speed of the slowest or disk-affixing part of the machine being set apace with the swiftest or punching operation by suitably extending the length of the section of the chain carriers of the disk-receiving and affixing means and of the cap or cork carriers.

The above and other objects and advantages of the invention will be better understood from the following specification made with reference to the attached drawings, in which:

Figure 1 is a diagrammatical top plan of the machine with parts broken away.

Figure 2 is a side elevation of the machine shown in Figure 1.

Figure 3 is a top plan of the disc-punching and ejecting section of the machine, with some parts broken away or in section.

Figure 4 is a side elevation, with some parts broken away and some parts in section of the machine shown in Figure 3.

Figure 5 shows in section two of the disc-receiving and affixing units, one in disc-receiving position and the other in disc-affixing position.

Figure 6 is a side elevation, Figure 7 a bottom plan and Figure 8 a perspective view of another embodiment of the disc-seizing member of a disc-receiving and affixing unit and

Figure 9 is a perspective view of a modified disc ejector.

With reference to Figures 2 to 4 of the drawings, the machine comprises a section for punching and ejecting the lining discs to be affixed onto the packing discs of container closure caps or "corks." Said section comprises a substantially prysmatic rectangular frame **1** containing the punching and ejecting mechanisms and connected, as will be seen hereinafter, with feed means of the continuous sheet material or foil F from which the

discs are punched and carrying also a die plate provided with a set of preferably diagonally arranged punching holes **3** (see Figures 3 and 4) through which the punches **4** may pass with a snug fit.

The punches **4** (see Figure 4 and left-hand side of Figure 5) are substantially constituted by hollow cylindrical members **4** sliding into corresponding holes of a guide block **102** fastened at the top side of the machine frame **1** having its guide holes in line with the holes **3** of the die plate **2**, which slightly spaced from the top of said block **102** so as to allow the foil or sheet material F to pass therebetween, as clearly shown in Figures 2, 4 and **5**.

In the interior of said hollow punches **4** piston-like ejectors **5** are slidably mounted, the head portion of which (see Figure 5) may be pushed beyond the upper surface of the die plate **2** after the corresponding punches **4** have reached their upper position, with their ends substantially at level with the top surface of said plate **2**.

The said punches **4** and ejectors **5** may be simultaneously reciprocated by suitable conventional means, operating during the time in which the intermittent feed of the sheet material is stopped, such as, for example, those now to be described:

In the constructive form shown in Figures 4 and 5, the punches **4** are fastened to a cross bar **104** to which a vertical stem **204** is attached provided with a cam roller, rolling on a driving cam **304** keyed on the control shaft **8** of the machine. Likewise the ejectors **5** are connected to a cross bar **105** provided with a vertical stem **205** ending with a cam roller rolling on a cam **305** fastened on the same shaft **8** adjacent to the cam **304**. As clearly shown in Figure 4, both the cams are concentrical to their shaft for about one-half of their periphery while the cams proper lie both on the opposite half and are substantially parallel, but the lift of the cam **305** at its apex is somewhat greater than that of the adjacent cam **304** so that, when the punches **4** are lifted with their edge at level with the top of plate **2**, the corresponding top pistons of the ejectors **5** are lifted somewhat higher, as clearly shown in Figure 5, and thus lift the discs D beyond the upper surface of plate **2** into a row of disc-receiving units **6**, which are positioned just above the punching holes **3**. Said devices **6** are attached to the links of a carrier chain **106**, **206**, one run of which passes parallel to said punching holes **3** while the other run runs above a cork carrier chain **7** (Figure 1, 2 and 5) to be described later.

The sheet F of lining material is fed stepwise in the gap between the block **102** and the plate **2** by a pair of driving belts **21**, **22** provided at suitable intervals with pliers **23** of conventional type which, under the action of control means (not shown), when they reach the upper run of the said belts **21**, **22**, seize the sheet F and carry same along with them until they reach the opposite end of said upper belt run.

The belts **21** and **22** are driven stepwise at the unison after each operation of the punches **4** and ejectors **5** for example a swinging-crank mechanism, such as that now to be described.

At one end of a driving shaft **8** (see Figures 2 and 3) a disc **9** is keyed which is provided with a diametral slide groove **10** (Figure 2) having a restricted mouth and in which a slide member **11** (Figure 3) provided with a crank pin **12** is slidably mounted. The slide groove **10** is set substantially crosswise to the ridges of cams **304** and **305**. To the crank pin **12** (Figures 2 and 3) is hinged one end of a connecting rod **13** the other end of which is connected to a crank pin **114** projecting out of a drum **14** (Figures 3 and 4) rotatably mounted on a shaft **18** and carrying a driving pawl **15**.

At one end of the shaft **18**, inside the box **14** a ratchet wheel **16** is keyed which co-acts with said driving pawl **15**. As particularly shown in Figures 2 and 4, the belt **21** is tensioned on four pulleys **19**, **119**, **219** and **319** while the other belt **22** is mounted on an equal number of pulleys (only two of which, numbered **120** and **220**, being visible in Figure 3), the pulleys on said shaft **18** being the driving pulleys, while the other pulleys are idle.

The operation of the just described device is as follows:

The driving shaft **8** being rotated continuously by a suitable driving means (not shown) rotates the cams **304** and **305** which reciprocate the punches **4** and the ejectors **5** substantially at the unison, until the rollers rolling thereon arrive in proximity of the apices or ridges of the said cams at which point the ejectors **5** are shifted upwardly by an amount in excess of the shifting of the corresponding punches **4**, so that, as shown at the left-hand side of Figure 5, while the punches **4** come to be at level with the upper surface of die plate **2**, the corresponding piston-like heads of the ejectors **5** are pushed beyond said surface and thus detach the just blanked discs D from the die plate and insert same into the overlying disc-receiving units **6**, after which the ejectors **5** and punches **4** retract under the level of the block **102**, and then the stepwise feeding of the sheet material F takes place by the action of the swinging crank **12** and driving pawl and ratchet **15—16**, as follows: Starting from the position shown in Figure 2 and assuming the disc **9** to rotate in clockwise direction (see arrow A) cam **305** and cam **304** (not shown) rotate from a substantially horizontal position of their apices (Figure 2) to a vertical position, with the cam apices directed upwardly (that is in the position opposite to that shown in Figure 4). During this first quarter of revolution the punches **4** and ejectors **5** are gradually lifted to their uppermost position, shown at the left hand side of Figure 5. Then the groove **10** passes from its horizontal position to the vertical position opposite to that shown in Figure 2 so that the crank pin **12** comes to be at the top of the groove **10** and at the same time the apices of the cams **305** and **304** pass from their upward position to a substantially horizontal position, opposite to that shown in Figure 2.

In this position, as stated, the punches **4** and the ejectors **5** have gradually assumed their lowermost position. At the same time the drum **14** has been rotated, by action of connecting rod **13**, also in clockwise direction and the pawl **15** carried thereby has snapped over the teeth of the ratchet wheel **16** (see Figure 4). During the subsequent half revolution, the slide **11**, which carries the crank pin **12**, slides downwardly along the groove **10** until it reaches again the lower position, as in Figure 2, while the crank pin **114** comes to be in its upper position (that is in a position diametrically opposite to that shown in Figure 2). During the subsequent half revolution, under the cam rollers comes to rotate the concentrical part of the cam, so that the punches **4** and ejectors **5** remain in their lowermost position. At the same time the connecting rod **13** is again pushed in its left-hand direction and as the slide **11** and crank pin **12** have dropped along the groove **10** into their lower position, the drum **14** is rotated in anticlockwise direction and the pawl **15** carried thereby acts as driving pawl and drives the ratchet wheel **16**, the shaft **18** the pulleys **19** and **20** carried thereby and the belts **21** and **22** by one step in anticlockwise direction. The belts **21** and **22**, in their turn, by means of the pliers **23** advance by one step in the direction of the arrow shown in Figure 3 the sheet F. Thus at each half revolution of the shaft are operated the punches and ejectors, while in the subsequent half revolution the feed of the sheet F and annexed parts take place.

With particular reference to Figures 1 and 2, as said, under the chain run **206** which carries the disc-affixing device **6** a cork carrier chain **7** is mounted at the unison

with the chain run 206 and at such a speed that at each feed of the foil F by one row of holes, the chain runs 206 and 7 are shifted by a length corresponding to a complete row of die holes 3.

In slow-acting machines of this kind this feed movement is intermittent and the devices 6 which have received a disc from the underlying holes 3 are shifted beyond the upper hole 3 shown in Figure 3 and in correspondence of said row of holes 3 comes a number of empty disc receiving devices 6.

In high speed machines, on the contrary, the chain runs 206 and 7 may be driven continuously always at the unison and at such a speed that they move by a length corresponding to one row of holes at each feed movement of the sheet F.

Each of the disc-receiving and affixing devices 6, the construction of which is shown in detail in Figure 5, comprises a cylindrical body 306 fastened to a carrier chain link. The links are hinged together as shown in Figure 1, and form an endless carrier chain tensioned between a number of drums or pulleys 34, 134, 234 and 334, one of which is the driving drum and the others are idle. The links of said chain are suitably guided in rigid frame members 24 as shown in Figure 5. Also the cork carrier chain is composed of a plurality of horizontally arranged cork carrying links 47 (Figure 5) hinged together by means of hinge pins 57 and mounted between a pair of drums, only one of which indicated by the reference numeral 35 is shown in Figures 1 and 2. The chain links have a cavity (Fig. 5) provided with a central bore in which a cork supporting plate 33 provided with a retaining stem is fitted with some clearance. Each plate 33 receives from a suitable cork-feeding device (not shown) a cork C with its bottom in contact with the corresponding plate 33. The links 47 of the cork carrier chain are guided at least in their upper run by a rigid U-shaped frame member 35, so that the carrier chain links cannot yield under a substantial downward pressure.

The disc-receiving and affixing units 6 proper comprise each an outer cylinder 306 divided into two superposed chambers by a transversal wall 26 having a central bore. In the lower chamber of said cylinder a cylindrical shell or slidable cylinder 27 provided with a perforated bottom is slidably mounted. The slidable cylinder 27 has a conical centering lip 127 projecting out of the lower edge of said fixed cylinder 306, as shown in the left hand side of Figure 5. Between the wall 26 and the bottom of the slidable cylinder 27 a weak spring 28 is inserted and in said slidable cylinder 27 a piston 29 is slidably mounted which is provided with a stem 39 which passes through the hole of the transversal wall 26 and carries at its upper end a disc plate 36 slidably mounted in the upper chamber of said fixed cylinder 306 and carrying on a supporting stirrup a cam roller 30. Between the transversal wall 26 and the disc plate 36 is inserted a spring 31 which is much stronger than the spring 28 at the opposite side of the wall 26.

The intermittent operation of the just described device, at the disc-receiving run 106 of the carrier chain (left hand side of Figure 5) is as follows: when a number of disc-receiving devices 6 equal to the number of die holes 3 of plate 2 is stopped in a position in which each empty device 6 corresponds to a hole 3, the edges of the shell 27 are maintained spaced from the upper surface of the die plate 2 by the strong spring 31 acting through the disc 36 and stem 39 on the piston 29 which lifts the shell 27 against the action of the weak spring 28. At the end of its upward stroke the ejector 5 lifts the punched disc D above the surface of the die plate, either into the mouth of said shell 27, as shown, where it is retained by friction and/or by suction. The said suction may be effected, for example, by providing through each link 106, a conduit 40 opening at one end into the chamber containing the weak spring 28 and at the other end in front of a groove 40 extending in the frame 24 from slightly before the position shown at the left-hand side of Figure 5 to slightly beyond the position shown at the right-hand side of the same figure. In this groove, preferably in proximity of the disc-receiving positions of the device 6, a conduit 41 opens, which is connected with a source of suction (not shown). The packings in the hole of the wall 26 and, if necessary, between the guided part of the links 106—206 and the corresponding guide groove in frame 24 are not shown.

The suction of the disc D takes place through the gap between the slidable cylinder 27 and the piston 29.

When the discs are taken up by suction, the carrier 106—206 may be driven continuously, whereby its speed is so timed that a row of empty devices 6 comes to be slightly in advance of the die holes when the ejecting cut disc takes place.

It is also possible to seize the discs as soon as they are ejected by the continuously running punching units in a fully mechanical manner, for example by adopting the device as shown in Figures 1 to 9 of the attached drawings.

According to this embodiment, the slidable cylinders 27 instead of having a centering lips are provided with a pair of oppositely lying parallel seizing claws 127 and 227 and a central abutment claw 327 arranged in a position of the shell intermediate the said seizing claws, in a rear position with respect to the direction of movement of the units 6.

On the other hand, the ejectors 5 of the punches 4 are provided at their top ends with a diametral slot 105 through which the central claw 327 may pass.

The operation is apparent:

When each of the slidable shells 27 passes in correspondence of an ejector 5 in its raised position, in which it raises a disk D above the level of the corresponding punch 4, the claws 127, 227 and 327 seize the said disc from above the ejector 5 and carry same along as will be described hereinafter.

When the disc-receiving devices 6 carrying each a disc D are driven to the opposite chain run 206 where each of the disc-receiving devices 6 comes to be just above one of the corks C on a plate 35, the rollers 30 pass successively under a cam abutment member 32, projecting out of the frame 24, and the disc 36 is forced downwardly, thus compressing the strong spring 31 and allowing the weak spring 28 to expand. This spring by expanding, pushes downwardly the slidable cylinder 27 together with the cap C, so that its centering lip 127 is pushed into the flaring skirt of the cap C and thus exactly centers the disc D on the cork C and immediately thereafter the piston 29 by the action of the cam 32 on the roller 30 is pressed upon the disc D which is affixed to the packing contained in said cap or cork C and is firmly attached thereto by an adhesive with which either of the parts is coated.

When the roller 30 has passed beyond the abutment member 32, the parts assume again the position shown at the left hand side of Figure 5.

From the foregoing it is apparent that a machine has been provided which automatically cuts a set of cork lining. An important feature of the just described machine (which in its non-intermittent form, in which the two chain carriers 206 and 7 run continuously, may effect up to 40,000 disc-affixing operations per hour, and even more) is the arrangement of a row of punches at an angle to the feed direction of the sheet material or foil F so as to cause each hole to be punched in the sheet between two adjacent holes, thus reducing to the minimum the waste material, especially when the row of die holes form with the direction of feed of the sheet F an angle of about 30°, as shown, so that each three adjacent holes on two adjacent rows form equilateral triangles. Although, for the purpose of illustration, the holes punched in the sheet material in Figures 1 and 3 of the

drawings have been shown well spaced from one another, in practice they lie close together so as to be almost tangent to one another, thus reducing to a negligible amount the waste material.

What is claimed is:

1. An automatic machine for the punching of center discs out of a continuous sheet of sheet lining material and for the automatic affixing of said discs onto liners contained in crown caps, and comprising a straight row of vertical disc-punching and ejecting units, a row of die holes above said punching and ejecting units, means for operating at intervals first said punching unit and then immediately after the punching unit for operating said ejecting unit so as to eject said discs above said die holes, means for the stepwise feeding of said sheet material above said row of disc punching and ejecting units and below said die holes after each punching operation, a first endless chain carrier carrying a number of vertical disc seizing and affixing units, one run of said first chain carrier running above said row of die holes parallel thereto, a second endless chain carrier having a run thereof running below and parallel to and in timed relation to another run of said first chain carrier which carries said disc seizing and affixing units, said second chain carrier being provided with cap receiving means each of which carries a cap, and means for operating said affixing units each time one of said affixing units is positioned just above and in vertical alignment with one of the caps carried by said cap receiving means.

2. A machine according to claim 1 and further comprising a pair of endless belts mounted on pulleys carried by a shaft and arranged at both sides of said sheet material, a plurality of clamps on said belts, one of said pulleys being driven intermittently by means comprising a swinging crank, a pivotally mounted pawl-supporting means, a connecting rod connecting said crank and pawl-supporting means, and a ratchet wheel fastened to said pulley-carrying shaft with the teeth of said ratchet wheel being engageable with said pawl.

3. A machine according to claim 1 wherein each of said disc affixing units comprises a fixed cylinder having a piston slidably mounted therein, a spring for maintaining the end of said piston retracted within said fixed cylinder, said piston being provided with a stem having a cam roller on the end thereof, and a cam abutment means arranged on a fixed portion of said machine in the path of said cam roller, said cam abutment means acting on said cam roller so as to push said piston outwardly of said fixed cylinder against the packing of a cork carried by the underlying endless chain cork carrier by overcoming the force of said spring.

4. A machine according to claim 1 in which the means for taking up the said discs, for holding the said discs when they are ejected by said ejecting units and for transferring said discs into the corks and affixing same to the cork packing, comprises a fixed cylinder, a second cylinder slidable within said fixed cylinder and provided with a perforated bottom and having a lip projecting outside of said fixed cylinder for acting as disc-holding means when said discs are ejected by said ejector means towards said disc-affixing devices; a piston provided with a stem and slidably mounted within said slidable second cylinder; first spring means for maintaining the end of said piston inside said slidable second cylinder; mechanical control means for selectively neutralizing said first spring means; and second spring means weaker than said first spring means for urging the said slidable second cylinder with its lip away from said fixed cylinder when and in the measure in which the said first spring means are neutralized by said mechanical control means; said mechanical control means comprising a cam roller fitted on said piston stem and said fixed abutment means arranged in the path of said cam roller and depressing the same by compressing the first spring acting on the said piston so as to compress said disc by means of said piston against an underlying cork packing.

5. A machine as claimed in claim 4 with said disc-affixing chain carrier and said cork chain carrier being driven continuously at such a speed that said carriers move a distance corresponding to the entire set of punching holes during the feed of said sheet material.

6. A machine according to claim 4 and further comprising pneumatic means for establishing a suction in said cylinders so as to draw and hold the said discs as soon as they are ejected by said ejector means against the lips of said slidable cylinder of said disc affixing devices when the same pass in proximity to said die holes and until said disc affixing devices carried by said affixing devices carrier chain transfer said discs into corresponding corks carried by the adjacent run of the cork carrier.

7. A machine as claimed in claim 1 wherein each of said disc seizing and affixing units carried by the second-named chain carrier comprises a fixed cylinder, a bottomless cylinder slidable within said fixed cylinder and having at its bottom end a pair of diametrically opposite claws arranged parallel to the direction of movement of said chain carrier, a third claw arranged intermediate of said claw pair and transversally and rearwardly with respect to the direction of movement of said chain carrier; all of said claws acting as disc seizing and holding means when said discs are ejected by the said ejector unit towards said disc seizing and affixing units and one of said units comes to pass over one of said ejectors in ejecting position; a groove formed in the upper end of said ejectors, said groove being formed in the direction of movement of the chain carrier and in such a position as to enable the said third claw of the said seizing unit to pass therethrough while carrying the disc along with it; a piston provided with a stem and slidably mounted within said slidable cylinder; strong spring means for maintaining the end of said piston inside said slidable cylinder; and weak spring means for urging the said slidable cylinder with its lip away from said fixed cylinder when and in the measure in which the said strong spring means are neutralized by mechanical control means; said mechanical control means comprising a cam roller fitted on said piston stem; and fixed abutment means arranged in the path of said cam roller and depressing the same by compressing the strong spring acting on the said piston so as to compress said disc by means of said piston against an underlying cork packing.

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