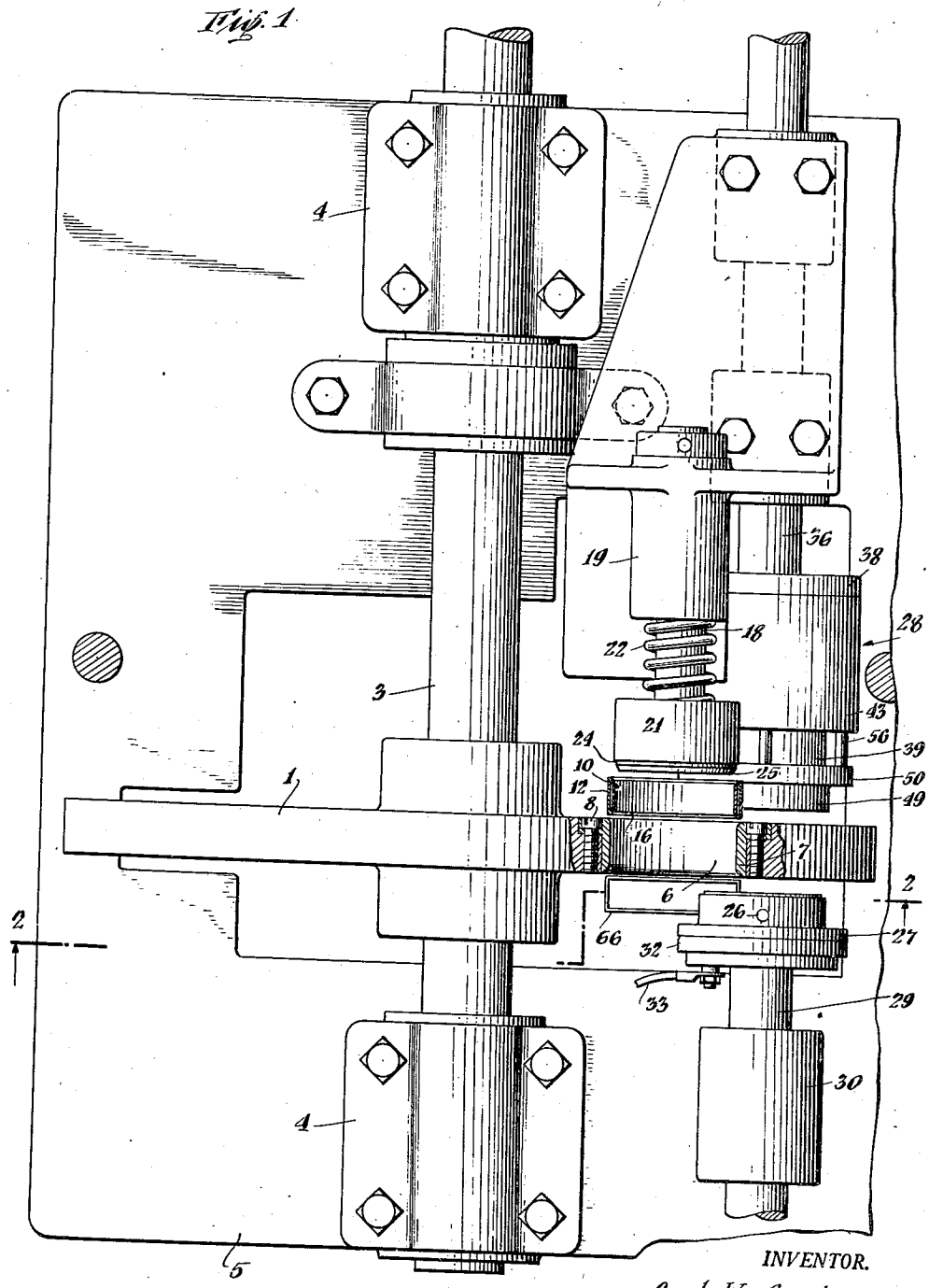
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Fig. 1.




INVENTOR.

Carl W. Goodwin

BY

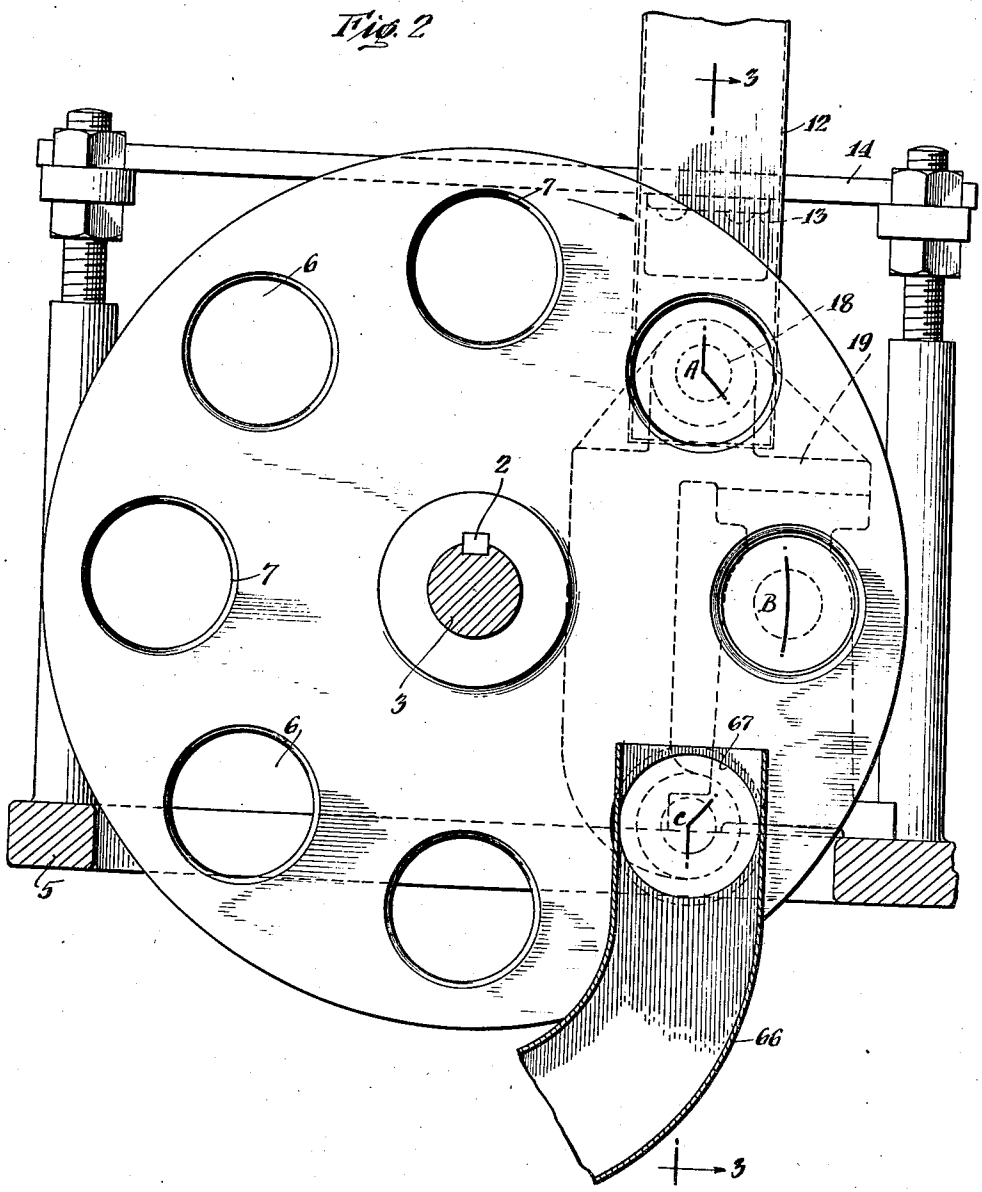
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Fig. 2



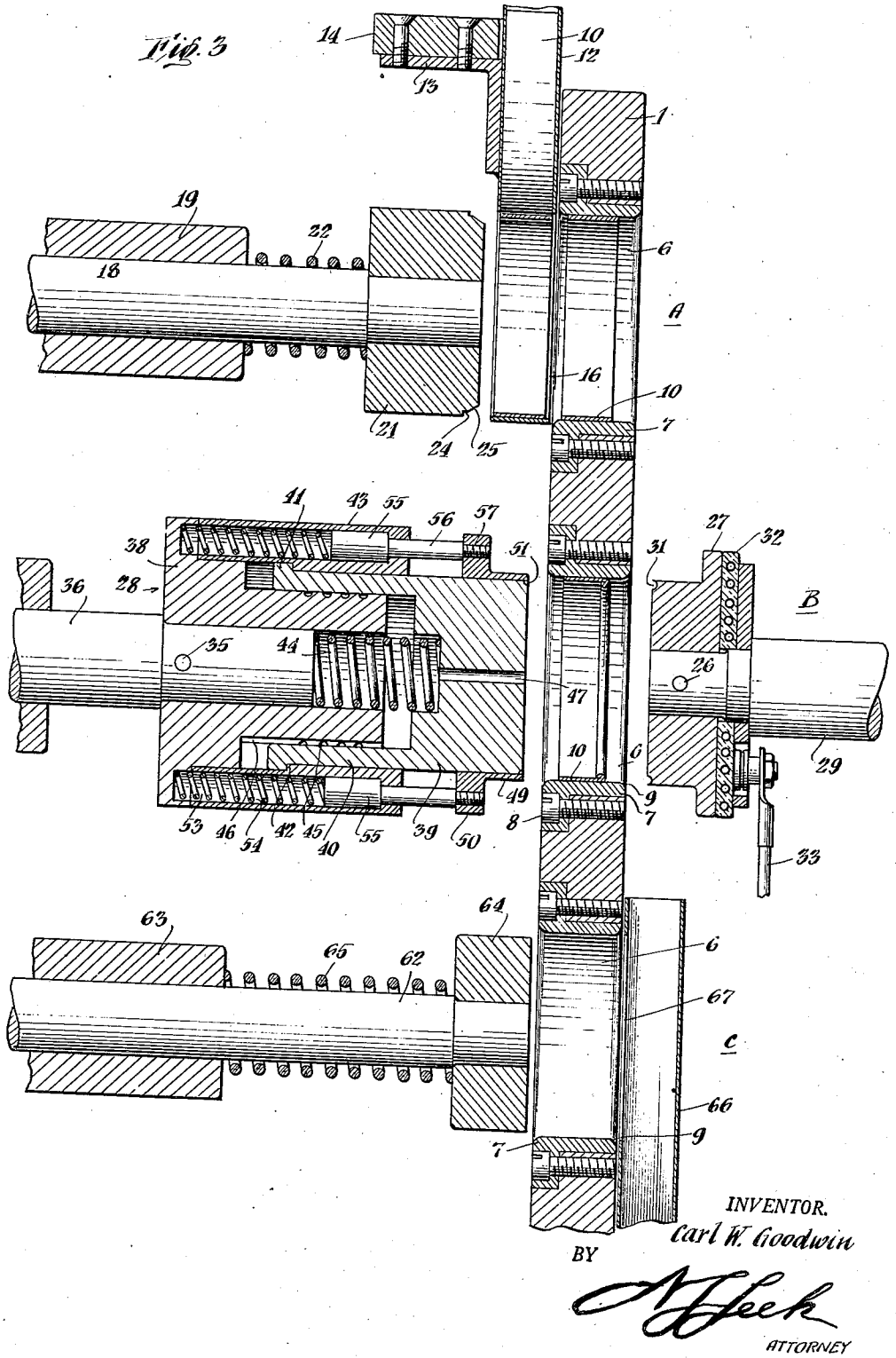

INVENTOR.
Carl W. Goodwin
BY
ATTORNEY

March 13, 1945. C. W. GOODWIN 2,371,580

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Fig. 3




INVENTOR.
Carl W. Goodwin

BY

ATTORNEY

March 13, 1945. C. W. GOODWIN 2,371,580

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Fig. 4

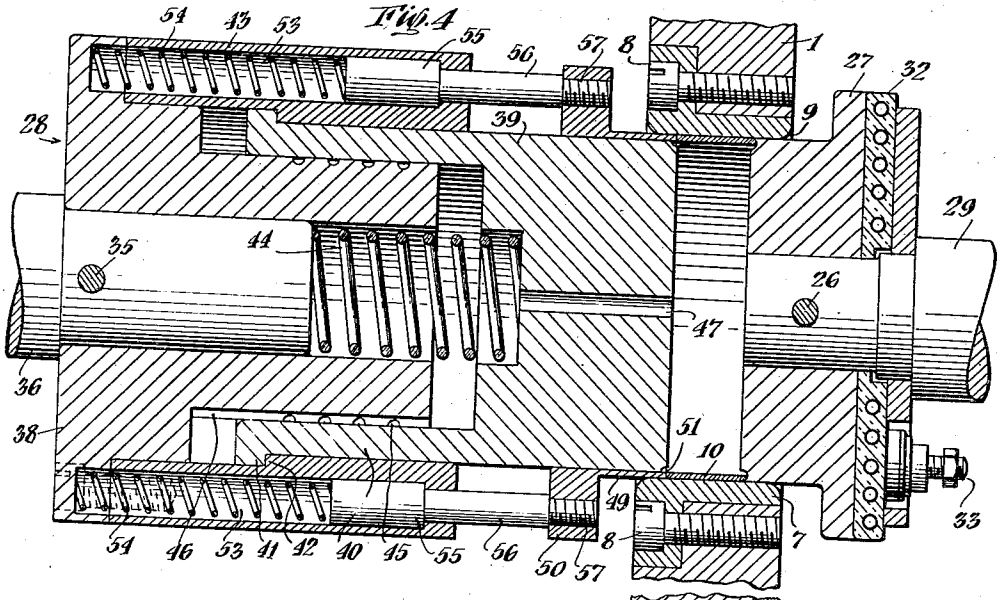



Fig. 5

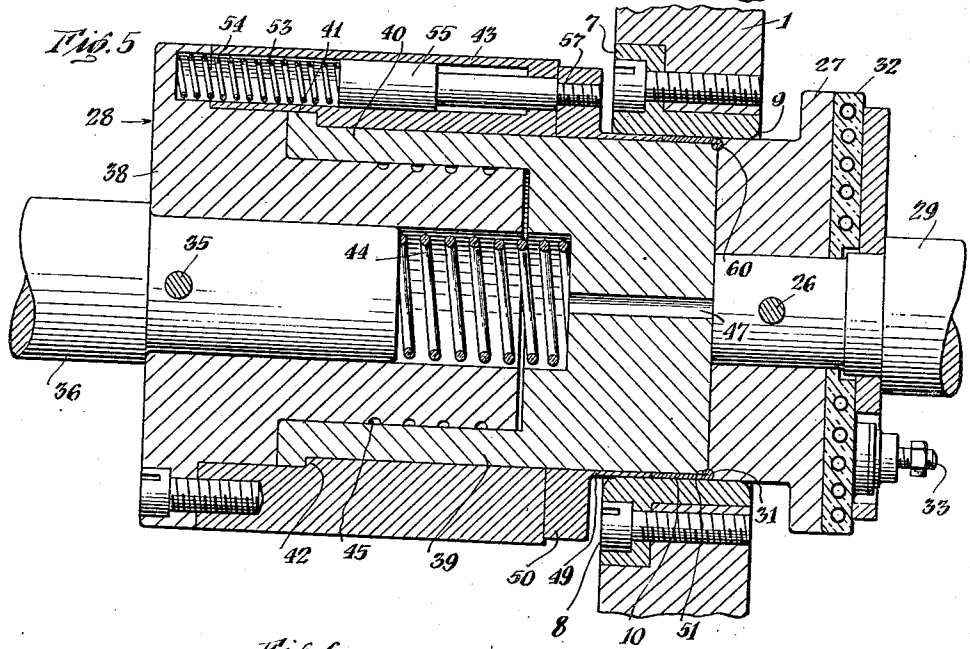
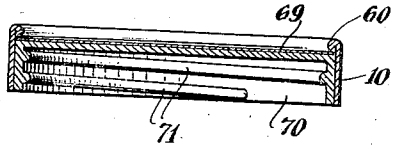



Fig. 6




INVENTOR.
Carl W. Goodwin
BY
ATTORNEY

Patented Mar. 13, 1945 2,371,580

# UNITED STATES PATENT OFFICE

2,371,580

## DIE PRESS

Carl W. Goodwin, North Plainfield, N. J., assignor to American Seal-Kap Corporation of Delaware, Wilmington, Del., a corporation of Delaware

Application October 15, 1943, Serial No. 506,308

1 Claim. (Cl. 93—36.5)

This invention relates to a machine for feeding and operating on deformable stock such as paper, metal or the like, and particularly to a machine for crimping or beading the edges of articles of this type which are used for a wide variety of purposes in the industrial arts.

The object of the invention is to provide a new and improved machine of the above type for rapidly and efficiently forming the articles and conveying them to the discharge point in a continuous stream or file without the intermediary of an operator.

Another object of the invention is to provide a high speed machine of the above type having novel and improved details of construction and features of operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although it will be evident from the ensuing description that my machine may be used for manufacturing a wide variety of articles, I shall describe it in connection with the manufacture of annular bands which are employed for reinforcing paper caps for jars, bottles and the like, as disclosed in my copending application, Serial No. 504,557, filed October 1, 1943. These paper caps comprise a diaphragm portion and an upstanding annular skirt formed in a single piece, and an annular paper band surrounding the outer surface of said skirt and having a beaded peripheral edge in contact with said diaphragm, for reinforcing purposes.

The annular paper band employed for reinforcing these caps may be formed in any desired manner. Usually, it is simply sliced or otherwise severed from an elongated spirally wrapped tube of paper or cardboard. That is, I first form an elongated spirally wound tube similar to a conventional "mailing tube" and then slice said tube into annular segments or bands of the desired width. The machine of the present invention is adapted to receive these bands from a hopper or other source of supply, position them properly for the forming operating, form the beaded edge and simultaneously compact the band to increase its strength and rigidity, and finally discharge the finished bands at the delivery point, in a minimum time and without the supervision of an operator.

Although the novel features which are characteristic of this invention are set forth more in detail in the claims appended hereto, the nature and scope of the invention may be better understood by referring to the following description, taken in connection with the accompanying drawings forming a part thereof, in which a specific embodiment has been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of a crimping machine embodying the invention;

Fig. 2 is a vertical cross-section taken on the line 2—2 of Fig. 1;

Fig. 3 is a cross-section taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view of the crimping die in the aligning position;

Fig. 5 is a sectional view of the crimping die in its final crimping position; and

Fig. 6 is a transverse section through a paper cap having an outer reinforcing band crimped by the machine.

In the following description and in the claim certain specific terms are used for convenience in referring to the various details of the invention. These terms, however, are to be interpreted as broadly as the state of the art will permit.

The machine shown in the drawings comprises a flat vertical wheel or carrier 1 keyed at 2 to a rotatable horizontal shaft 3 which is mounted in bearings 4 on the frame 5, as shown in Figs. 1 and 2.

The shaft 3 carrying wheel 1 is driven intermittently by any suitable driving means, not shown, rotation being in a clockwise direction as viewed in Fig. 2.

The flat surface of wheel 1 contains a circular series of identical, equally spaced circular holes 6. In the embodiment illustrated the wheel contains eight such holes, the diameter of which is only slightly greater than that of the paper bands to be frictionally carried therein as will hereinafter more fully appear. The precise size of the holes 6, which will depend upon the outer diameter of the paper bands to be handled, may be attained by fitting the holes with liners 7 secured to the wheel by set screws 8. The peripheral edges of liners 7 are preferably rounded at 9 to facilitate the entry and removal of the paper bands.

During its intermittent rotation the wheel 1 passes three operating stations, as follows: station "A," where the paper bands 10 are inserted individually into the holes 6 of the wheel; station "B," where the bands are properly aligned in the holes 6 and then crimped to provide the beaded edge; and station "C" where the formed bands are discharged from the wheel. These three operating stations are shown in Fig. 3 of the drawings.

*Charging*

The annular paper bands 10 are fed to the charging station "A," from a hopper or other suitable source of supply, through a vertical chute 12 which is secured by bracket 13 to the outer framework 14 of the machine. The chute 12 is of rectangular cross-section and is mounted parallel to and closely adjacent the flat face of the wheel 1; and the lower side walls of the

chute parallel to the wheel are provided with openings 16 in alignment with the openings 6 in the wheel so that the lowermost band 10 in the chute will coincide substantially with an opening 6 in the wheel and thus be presented in position to be moved into said opening during each intermittent pause in the rotation of the wheel.

The charging mechanism at station "A" comprises a plunger 18 slidably mounted in a bearing 19 and actuated by any suitable mechanism coordinated with the shaft 3 of wheel 1 as hereinafter more fully described. Plunger 18 has a cylindrical head 21 in axial alignment with the openings 16 in the feed chute 12 and therefore in axial alignment with any hole 6 in the wheel 1 which is presented in position for charging. A coil spring 22 compressed between the plunger head 21 and the stationary bearing 19 takes up any play in the plunger and insures the proper positioning of the head for the charging stroke.

The cylindrical plunger head 21 is slightly greater in diameter than the inner diameter of the annular paper bands 10 and the forward engaging face of the head is reduced in diameter to provide a continuous ledge 24 and a rounded peripheral edge 25 as shown in Figs. 1 and 3. Accordingly, when the plunger 18 advances toward the right in Fig. 3 the rounded peripheral edge 25 of head 21 will slip into the annulus of the lowermost band 10 in chute 12, even though such band may not be precisely aligned in the chute, and the ledge 24 of the head will thereupon engage the annular edge of the band and propel the band into the hole 6 in the wheel 1 which at that moment has paused in its intermittent rotation to receive said band. Entry of the band 10 into the hole 6 is facilitated by the rounded peripheral edge 9 of the liner 7 as previously described. With the parts in the position shown in Fig. 3, and band 10 has just been inserted in the uppermost hole 6 of the wheel, the plunger 18 has just completed its return stroke away from the chute 12, another band 10 has just dropped to the bottom of the chute under the weight of the superimposed file of bands, and the wheel 1 is just about to rotate another step to bring the next succeeding empty hole 6 into charging position at the station "A."

*Aligning and crimping*

The aligning and crimping mechanism at station "B" includes a cylindrical die 27 which I call the aligning die, and a complementary crimping die 28, which are mounted in axial alignment on opposite sides of the flat wheel 1 as shown in Fig. 3. The aligning die 27 is keyed at 26 to a plunger 29 slidably mounted in a bearing 30 and actuated by any suitable means coordinated with the shaft 3 of wheel 1. The forward engaging face of die 27 has a circular groove 31 about its peripheral edge, and it is into this groove that the material of the paper band 10 is forced to form the beaded edge as hereinafter more fully described. To facilitate this crimping action the die 27 may be heated by a suitable electric heating element 32 connected by a conductor 33 to any available source of heating current.

The crimping die 28 is keyed at 35 to a plunger 36 slidably mounted in bearings 37 and actuated by any suitable mechanism coordinated with the shaft 3 of wheel 1. The crimping die 28 has an internal cylindrical portion 38 of reduced diameter upon which is mounted a slidable die head 39, the rearward annular portion 40 of said die head having a flange 41 which is adapted to engage an internal ledge 42 on a cylindrical collar 43 which forms the outer cylindrical wall of the die 28, to limit the forward sliding movement of the die head. It will thus be evident that the die head 39 is capable of a limited sliding movement upon the die 28, toward and away from the aligning die 27. A coil spring 44 compressed between the end of plunger 36 and the inner wall of die head 39 normally forces said die head outwardly, or toward the right as viewed in Fig. 3, to the limit of its travel. The reduced cylindrical portion 38 of die 28 is provided with suitable annular grooves 45 for lubricating purposes, and with a longitudinal air vent 46. The die head 39 likewise has an axial air vent 47 extending therethrough as shown in Figs. 3 to 5.

An annular band or collar 49 having an upstanding flange 50 is slidably mounted on the outer cylindrical wall of die head 39, the outer annular edge of said collar 49 normally being flush with the flat front face of the head 39 as shown in Fig. 3. A circular groove 51 is formed in the said front face of head 39 at its juncture with the collar 49. This groove 51 cooperates with the circular groove 31 in the aligning die 27 in crimping the edges of the paper bands 10 during the forming operation, as hereinafter more fully described.

The cylindrical collar 43 forming the outer cylindrical wall of die 28 has a plurality of longitudinal holes 53 bored therein, these holes being spaced apart equally and being parallel to the axis of die 28. These holes 53 each contain coil springs 54 acting between the inner ends of the holes and the enlarged heads 55 of plungers 56 which extend outwardly through the forward edge of collar 43 and are threaded at 57 into the upstanding flange 50 of the slidable collar 49, as shown in Figs. 3 to 5. The springs 54 normally force the plungers 56 outwardly to the limit of their travel which is reached when the enlarged heads 55 of the plungers engage the outer ends of holes 53, and at such time the outer annular edge of the sliding collar 49 will lie flush with the flat front face of the die head 39 as shown in Figs. 3 and 4.

The operation of the aligning and crimping mechanism at station "B" is illustrated in Figs. 4 and 5. As previously explained, the aligning die 27 and the crimping die 28 are mounted in axial alignment on opposite sides of the flat wheel 1. Furthermore, these dies 27 and 28 are so positioned with respect to the wheel 1 that they are directly in the path of travel of the holes 6 in the wheel and in axial alignment with each hole 6 which is successively presented between said dies during each intermittent pause in the rotation of the wheel. Since the wheel advances in a clockwise direction as viewed in Fig. 2, with any given hole 6 presenting itself successively to the stations "A," "B" and "C" in the order named, it will be evident that each hole 6 arriving at the aligning and crimping station "B" will contain an annular paper band 10 which was deposited therein at the preceding station "A."

Accordingly, each time the wheel 1 stops momentarily, always with an annular paper band 10 occupying the hole 6 at station "B," the plungers 29 and 36 carrying dies 27 and 28 move toward each other and the dies engage the respective peripheral edge of the annular paper band 10,

as shown in Fig. 4. At this instant one peripheral edge of the band 10 is engaged in the circular groove 31 of die 27 while the opposite peripheral edge of said band is engaged by the outer annular edge of the band 49 on the outer cylindrical wall of die head 39. Up to this instant the dies have not yet deformed the paper band 10 but have merely clamped and properly aligned said band between them as shown in Fig. 4.

As the plunger 36 continues its advance toward the right in Fig. 4, the collar 49 slidably mounted on die head 39 maintains its engagement with the edge of paper band 10, and the resistance afforded by said paper band causes the plungers 56 to compress the coil springs 54 in the collar 43 of die 28, so that for an instant the slidable collar 49 and its plungers 56 are stationary while the remainder of the die continues its advance. The die head 39 thus enters the annulus of the paper band 10, resiliently at first since the spring 44 takes up any initial resistance to the passage of the head, until the flat face of die head 39 meets the cooperating face of die 27 which previously reached the limit of its movement. At this time the edge of collar 43 of die 28 has engaged the upstanding flange 50 on the slidable collar 49 which is already in clamping engagement with the edge of the paper band 10, so that the final forward movement of die 28 forces the collar 49 forward with considerable impact, thereby crimping the opposite edge of the paper band 10 over into the complementary circular grooves 31 and 51 of die 27 and die head 39 to form the beaded edge 60 as shown in Fig. 5.

The impact of the slidable collar 49 of die 28 upon the edge of paper band 10, while said paper band 10 is firmly clamped between the liner 7 of hole 6 and the outer cylindrical wall of die head 39, not only causes the formation of the beaded edge 60 but also results in compacting the entire material of the paper band and considerably increasing its strength and rigidity. The heating of the die 27 by heater 32 aids in effecting and consolidating the formation of the beaded edge 60.

With the parts in the position shown in Fig. 3, the paper band 10 at station "B" has been completely formed, the dies 27 and 28 have just returned to their retracted positions, and the wheel 1 is just about to rotate another step to bring the next succeeding paper band into position for forming.

*Discharging*

The mechanism for discharging the formed paper bands 10 at station "C" comprises a plunger 62 slidably mounted in a bearing 63 and actuated by any suitable mechanism coordinated with the shaft 3 of wheel 1. Plunger 62 has a cylindrical head 64 which is positioned to coincide exactly with each hole 6 in the wheel 1 which is presented thereto during each intermittent pause in the rotation of the wheel. A coil spring 65 compressed between the plunger head 64 and the stationary bearing 19 insures the proper positioning of the head for the stroke which is to discharge the paper bands 10 from the wheel. A vertical discharge chute 66 of rectangular cross-section is mounted parallel to and closely adjacent the flat face of wheel 1 on the side opposite to the plunger head 64, and the side wall of said chute adjacent the wheel is provided with an opening 67 in alignment with the plunger head 64.

Accordingly, when the plunger 62 advances toward the right in Fig. 3 the head 64 will enter the hole 6 of the wheel 1 which at that moment has paused in its intermittent rotation, and the paper band in that hole will be propelled by the head 64 through the discharge opening 67 into the chute 66 in which it drops by gravity to any suitable delivery point.

In the operation of the machine all of the plungers 18, 29, 36 and 62 move simultaneously; and the mechanisms actuating said plungers are coordinated with the intermittent drive of the wheel 1, so that each time the wheel pauses in its intermittent operation the plungers advance to perform the operations of charging, aligning and crimping, and discharging, as described above. Immediately thereafter the plungers are simultaneously retracted to the positions shown in Fig. 3, whereupon the wheel 1 advances another step and the same operations are repeated.

The annular paper band 10 with the beaded edge 60, formed in the above manner, is part of a paper cap for jars, bottles and the like, which is shown in Fig. 6 and comprises a diaphragm portion 69 and an upstanding marginal flange or skirt 70 having integral screw threads 71 formed on its inner surface. The cap is assembled by telescoping the reinforcing band 10 over the skirt 70 until the beaded edge 60 is seated on the diaphragm 69, the band usually being secured to the skirt by a suitable adhesive.

Although a specific embodiment of the invention has been shown for purposes of illustration it is to be understood that the invention is capable of various uses and that changes and modifications may be made therein as will be readily apparent to a person skilled in the art. The invention is only to be limited in accordance with the scope of the appended claim.

What is claimed is:

In a machine for crimping the edge of an annular paper band or the like, a support having a hole adapted to receive said band, an aligning die and a cooperating crimping die on opposite sides of said support, means for moving said dies toward each other in said hole in a forming stroke, said aligning die having a face provided with a peripheral crimping groove for engaging one edge of said band, said crimping die comprising a carrier, a die head provided with a peripheral surface adapted to enter and support the inner surface of said band and having a face provided with a crimping groove adapted to mate with the groove in said aligning die to receive and confine the edge of said band during the crimping operation, spring means mounting said head on said carrier for retraction on said carrier in response to pressure of said aligning die to permit continued forward movement of said carrier, a collar slidably mounted on said die head and having a flange to extend between said support and said die head to engage the edge of said band on the forward stroke of said carrier and to form with said head, support and aligning die a closed die pressure chamber, spring means mounting said collar for retraction by said band as the die head continues its movement to engage said aligning die, and stop means on said carrier to engage said collar after said head has been brought into engagement with said aligning die to force said flange into compacting engagement with the edge of said band to compact said band in said pressure chamber and crimp the opposite edge of said band into said crimping grooves to form a crimped peripheral bead on said edge.

CARL W. GOODWIN.