May 9, 1967 H. PLIENINGER 3,318,501

ARRANGEMENT FOR STAGE-WISE ADVANCEMENT OF RECORDING CARRIERS

Filed June 28, 1965

Fig.1

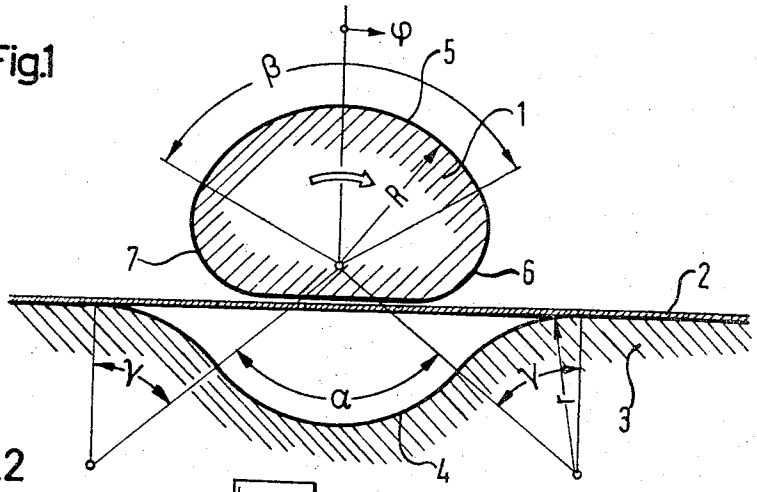


Fig.2

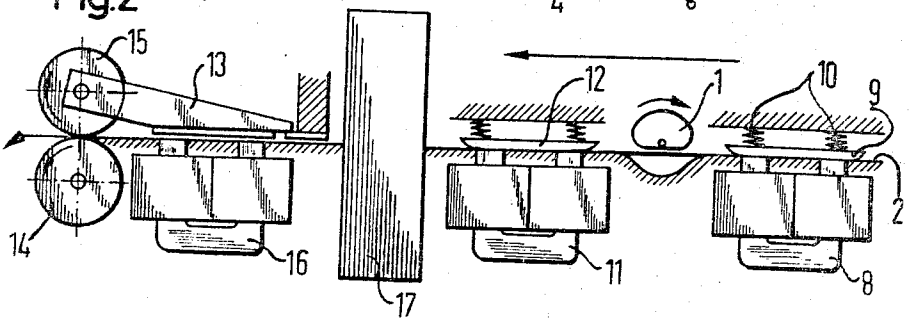
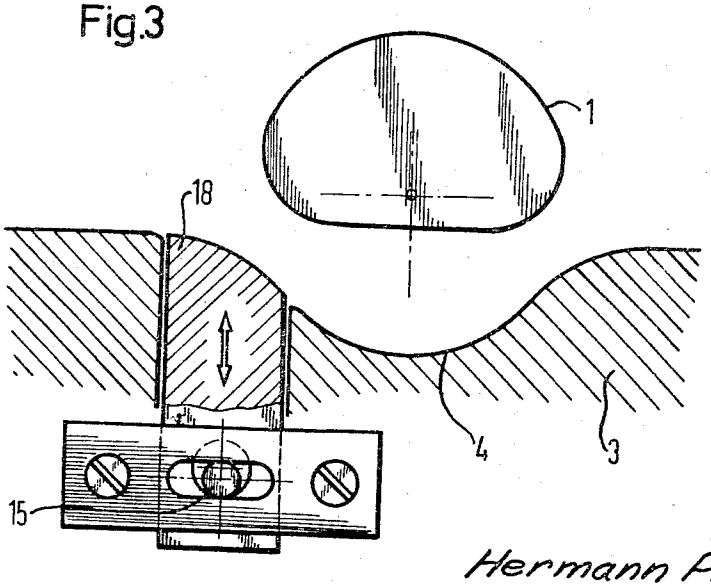


Fig.3



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ARRANGEMENT FOR STAGE-WISE ADVANCEMENT OF RECORDING CARRIERS

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6 Claims. (Cl. 226—139)

The invention relates to an apparatus for the stage-wise advancing of strip band, and similarly formed recording carriers by means of a loop former arranged between two clamping devices acting alternately on the recording carrier. A considerable need exists for rapidly actuated advancing devices which will produce uniform advance movements, particularly for strip punchers and the like.

One of the greatest problems in strip punches for high speed operation is the provision of a suitable paper advance mechanism. As the hole punch operations may take place at irregular intervals, it must be possible to rapidly accelerate the strip and also to rapidly brake the same. It is further required that the specified hole division be maintained as precisely as possible.

An apparatus has become known for effecting stage-wise movement of a strip-like recording carrier, in which there is arranged a loop forming striker arm or member which is disposed between two alternately energized brake magnets, in an effort to provide a uniform unit of advancement. This apparatus, however, is unsuitable for strip punches operating at high speed, since the abrupt movement of the loop forming member strains the apparatus severely and causes high wear on the impact points thereof.

For high speeds abruptly moved parts, such as the loop-forming members of the known devices, are to be avoided as far as possible, and it is the object of the present invention to provide an apparatus which satisfies this requirement.

According to the invention, this problem is solved by an apparatus for stagewise advancement of recording carriers which is characterized by the feature that in the zone of the strip advancement there is arranged a cam, driven by a shaft, which acts upon the strip to form loops perpendicularly to the direction of advancement, between two braking devices acting alternately on the strip. The utilization of a cam in a continuous stage-wise movement of a strip-like recording carrier has the advantage that the loop-forming element, that is, the cam, does not have to be accelerated and braked twice in each advance phase. Even in a single working revolution the cam may be accelerated and braked only once.

According to a preferred from of construction of the advance mechanism, in accordance with the invention, the loop-forming cam is constructed with a cam peak or high portion extending over a certain rotational angle with uniform spacing from the cam axis, which angle of generation is greater than the angle over which the recording carrier will normally contact the cam peak during the loop formation.

According to another preferred form of construction of the advance mechanism according to the invention, the cam valley, or low point of the cam, is disposed about the advance path of the recording carrier over a predetermined angular rotational range or is constructed with a uniform spacing from the cam axis.

As a result of this construction of the cam, over a certain angle of rotation thereof, and thereby during a certain period of time, the shape and length of the loop formed on the recording carrier remains unaltered. During this time, the brake magnets can be switched over for the desired securement of the recording carrier. Thus the switch-over operations may fluctuate within this deviation without thereby influencing the uniformity of the advancement steps produced.

According to a further preferred development of the invention a slide member is arranged in the loop-limiting member, and ahead of or behind the cam, which slide member selectively, through variation in its position, alters the loop length of the recording carrier brought about by the high portions of the cam. Through this measure, the unit of advancement per cam revolution is adjustable. The precision of manufacture of the cam may, therefore, be broadly dimensioned, whereby production costs are kept within low limits.

Details appear from the examples of construction described in the following with the aid of the drawing, in which:

FIG. 1 illustrates, in schematic form, the loop-forming cam and the guide means in the guide member;

FIG. 2 illustrates the loop-forming cam in conjunction with the two brake magnets; and

FIG. 3 illustrates the loop-forming cam in cooperation with a slide member for varying the loop length at will by adjustment of the slide portion.

In FIG. 1 a cam **1**, rotatable about its axis, in each revolution presses a recording strip **2** into a recess **4** formed in a guide member **3**. The length of the loop in strip **2**, formed by cam **1**, is determined by the angle α and the radius of the circumference of the cam peak **5** from the cam axis which is uniform over an angular range β which is greater than the angle α, as well as by the radii r on the member **3** and the angles γ over which they extend. The rounded-off parts **6**, **7** determine the accelerations at which the strip is pressed into the recess **4** by the cam **1** and which it can again be drawn out of the recess.

FIG. 2 illustrates schematically the loop-forming cam **1** in conjunction with a punching device, in which the strip is advanced in the direction of the arrow. At the moment in which the cam **1** happens to be in the position depicted, a magnet **8** preceding the cam **1**, in advance direction, is de-energized, so that a brake shoe **9**, illustrated as functioning as a magnet armature, no longer restricts the paper strip **2** in its advance movement. The brake shoe **9** contacts the strip **2**, only through the action of the springs **10**, with merely a slight force incapable of impeding the advance movement of the strip **2** thereat. Shortly before the magnet **8** is de-energized, a magnet **11** following the cam, in advance direction of the strip, is energized. Thereby a brake shoe **12**, functioning as an armature for the magnet **11**, is pressed with high force upon the strip **2**, so that an advance of strip **2** thereat is prevented. During this process, the cam **1** rotates in the direction of the arrow and engages the strip at its radius **6**. There now begins the formation of a loop which, after an angle of rotation of the cam approximately 180°, has reached its maximal size. The length of recording carrier needed for the formation of a loop is drawn unimpeded through the brake shoe **9** by a supply roller (not illustrated in the drawing). For the angle of rotation $\beta-\alpha$, the loop remains unaltered. During this time the paper strip **2** is held by the brake shoe **9**, whereas the brake shoe **12** no longer impedes an advance movement of the paper strip. Simultaneously with the de-energizing of magnet **11** a magnet **16** is excited, and over its armature **13**, acts on the contact pressure roller **15** cooperable with a continuously driven advance roller **14**, so that the loop formed by the cam **1**, on further movement of the cam **1** into its starting position is drawn out between the advance roller **14** and the cooperable driven pressure roller **15**, past the brake shoe **12** and a strip processing device **17**. The

advance movement is terminated when the radius **7** leaves the stretched recording carrier **2**. Thereupon, the magnet **12** is again energized and the magnets **8** and **16** de-energized, thereby initiating a new working cycle.

FIG. 3 varies from the disclosure of FIG. 1, in that there is arranged in the recess **4**, adjacent the cam **1**, a slide member **18** which can be adjusted by rotation of an eccentric **19**. By adjustment of the position of the slide **18**, loops of different length, in a paper strip disposed in the recess **4**, can be produced by the cam **1**. Thereby it is possible to exactly adjust the advance paths.

It is possible, within the scope of the invention, to make general, especially minor constructional, modifications in details of the apparatus. Thus, for example, in the control of electromagnets **8** and **11**, suitable provision may be made to effect the switch-over successively.

Changes may be made within the scope and spirit of the appended claims which define what is believed to be new and desired to have protected by Letters Patent.

I claim:

1. Apparatus for the stagewise moving of strip, band, and similarly formed recording carriers, comprising a pair of spaced clamping devices disposed for intermittent engagement with a recording carrier to alternately apply braking forces thereto, a rotatable cam disposed between said clamping devices, constructed to intermittently engage such a recording carrier, extending between said clamping devices, operative to form a loop in said carrier perpendicularly to the advancing movement of the latter, said cam being arranged to produce such a loop when said clamping devices are in one of their alternate operative positions, a guide member disposed adjacent said cam for guiding said recording carrier, said guide member having a recess therein disposed opposite said cam and of a size to receive a portion of the latter, said recess having a portion which is uniformly spaced from the axis of said cam and which extends over an angle of generation which is less than the angle of generation of the uniform high portion of said cam.

2. Apparatus according to claim **1**, wherein the loop-forming cam is constructed with a high portion having uniform spacing from the cam axis and extending over a predetermined angle of rotation, with the rotative angle of generation being greater than the angle over which the recording carrier will normally contact said high portion during the loop formation.

3. Apparatus according to claim **1**, wherein the low portion of the cam, over a certain angular rotational range, is disposed above the advance path of the recording carrier.

4. Apparatus according to claim **1**, wherein the low portion of the cam, over a certain angular rotational range, is constructed with a uniform spacing from the cam axis.

5. Apparatus according to claim **1**, comprising in further combination, a movable slide member arranged adjacent said cam, operative through alteration of its position with respect to the cam, to effect an adjustment of the length of the loop produced in said recording carrier by operation of said cam.

6. Apparatus according to claim **5**, wherein said slide member defines a portion of said recess in the guide member and is movable toward and away from the path of said recording carrier.

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