United States Patent [19]

[11] 3,775,000

Krob et al.

[45] Nov. 27, 1973

[54] CLAW DEVICE

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[30] **Foreign Application Priority Data**

Jan. 22, 1971 Austria.................................. A 555

[52] **U.S. Cl.** **352/79,** 352/191

[51] **Int. Cl.** **G03b 41/00**

[58] **Field of Search** 352/79, 191, 192, 352/193, 194, 195, 196

[56] **References Cited**

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[57] **ABSTRACT**

In a strip handling apparatus of the type in which a plurality of strip types may be moved in a first transporting direction from a supply station to a take up station. Each of the strip types have equidistant perforation holes. The perforations of different strip types have different perforation pitches, each of the perforation holes having a forward and a rearward edge seen in the transporting direction, whereby with aligned forward edges of a first perforation hole of each of the different strip types, second respective perforation holes, which follow when seen in transporting direction only partly overlap each other. The apparatus comprises a shuttle mechanism located between the supply station and the take up station. A drive device is adapted to impart a first movement to the shuttle mechanism cyclically in and out of engagement with the perforation holes of the strips. The drive device is further adapted to impart a second movement to the shuttle mechanism cyclically and in synchronism with the first movement up and down parallelly with the path of movement of one of the strips to move the same in transporting direction. First and second teeth on the shuttle mechanism are numbered, as when seen in the transporting direction. The teeth have forward and rearward surfaces opposite to each other, the surfaces of each of the teeth having a distance from each other. At least the second tooth is adapted to engage the forward edges of the perforation holes of the strips, when transported in the transporting direction, the distance between the forward and rearward surface of the second tooth corresponding to the space between the forward and rearward edges of the smallest perforation holes of one of the strip types to be used less a tolerance; the distance between the forward surface of the second tooth and the rearward surface of the first tooth increased by a further tolerance corresponds to the smallest existing distance on the strip types between the forward edge of the first perforation hole and the rearward edge of the second perforation hole; the distance of the rearward surface of the second tooth to the forward surface of the first tooth reduced by another tolerance corresponding to the largest existing distance on the strip types between the rearward edge of the first perforation hole and the forward edge of the second perforation hole.

1 Claim, 3 Drawing Figures

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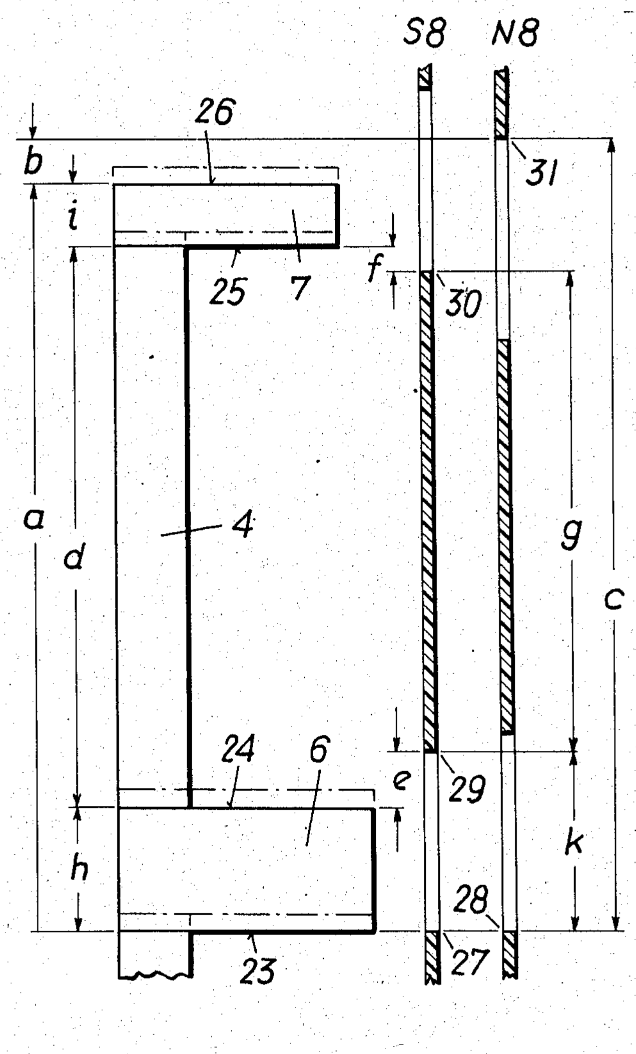

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FIG. 1

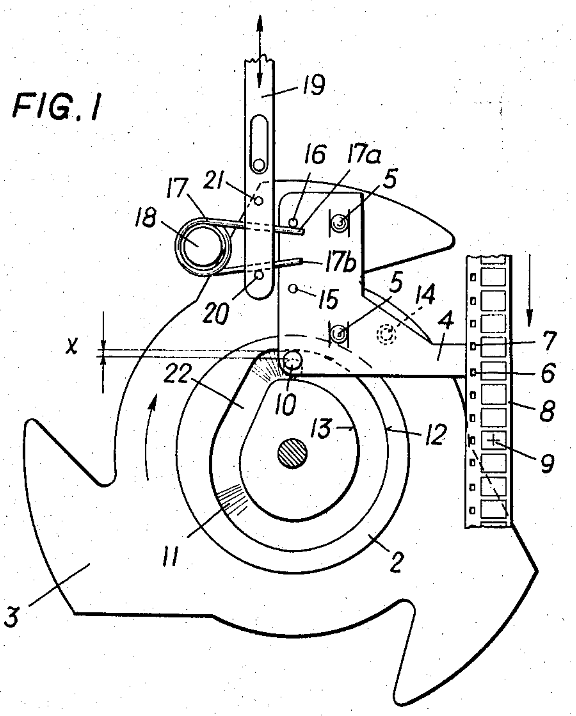


FIG. 2

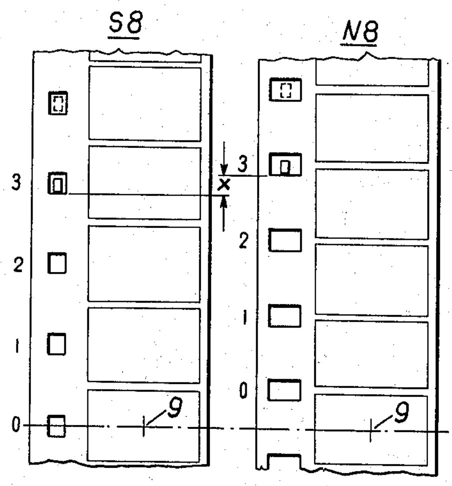
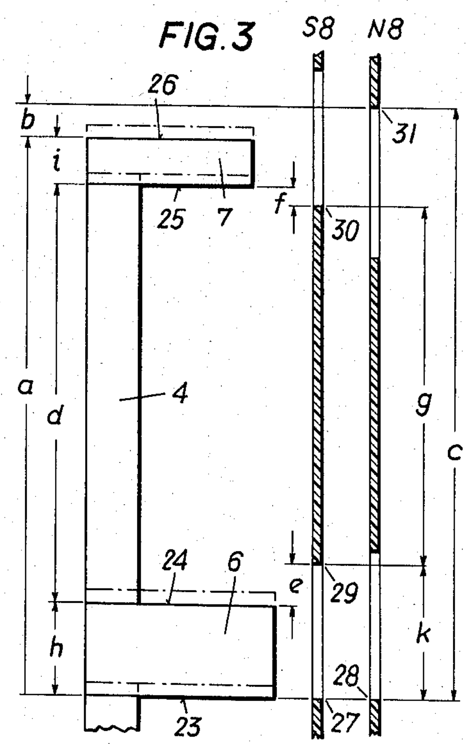


FIG. 3



CLAW DEVICE

The invention is concerned with a claw device in recording or playback apparatus, particularly substandard format film projectors for perforated information carriers with different perforation pitch whereby two perforation holes of said carriers perfectly coincide, while the following holes seen in running direction of the strip partly overlap, this preferably with super 8 and normal 8 films respectively, said claw device being provided with a claw with two teeth in particular of different thickness of which at least the second tooth, related to the running direction of the strip, shows a front surface with which upon forward run of the strip it meshes with the front edges of the strip perforation, said tooth having a rear surface opposite the control surface and the first tooth correspondingly showing a front surface facing the rear surface of the second tooth and a rear surface opposite said front surface.

Efforts have always been made to create claw devices for the transport of striplike perforated information carriers, which enable the transport of strips of different sizes. During the last time the efforts made in cinematography concentrated on the problem to use the same apparatus for both super 8 and normal 8 films due to the fact that their dimensions differ only slightly. Besides, intermittent transport means have been developed in which a so-called double-tooth claw performed the transport of the striplike perforated information carrier. As it is known, multiple tooth claws have the advantage that the film is transported even then, when one of the perforation holes is torn. Beyond that, the mechanical strain of the film may be assigned to several perforation holes, provided that the distance between the two teeth corresponds exactly to the perforation pitch. Since, however, already in the distances of the perforation holes there may occur some tolerances, it is expedient to choose the tooth distance also in a double tooth claw so that it corresponds with the perforation pitch including a certain tolerance. In this case it may be that not always both of the claw teeth abut the perforation edge of the film, but it will be useful to choose the tolerances so, that this will in general be still the case. Since with different film formats also the perforation pitch shows some differences, the distance of the two teeth was fixed in a known construction by the least common multiple. In this way, the length of the claw extended over several perforation holes, whereby the construction of the claw and its mass became relatively large.

The scope of the invention was to develop a double tooth claw as small as possible for striplike perforated in formation carriers of different perforation pitch and different format. According to the invention this is solved in that the distance of the front surface of the second tooth to the rear surface of the first tooth, a certain tolerance included, corresponds to the distance of the front edge of the related first perforation hole to the rear edge of the in running direction following perforation hole of strips of one format, as for instance normal 8 films, and that the distance of the teeth surfaces, facing each other, less a certain tolerance, corresponds to the distance of the rear edge of the first perforation hole to the front edge of the in running direction following perforation hole of strips of the other format, as for instance super 8 films. In order to let particularly one of the two teeth operate upon forward run of the film, it is preferred to dispose the distance of the front surface to the rear surface of the second tooth larger than the corresponding distance of the first tooth. In order to develop this main tooth as large as possible, it is expedient, as already known, that the distance of the front surface to the rear surface of the second tooth corresponds to the distance of the front edge to the rear edge of the smallest perforation hole less a tolerance.

In order to accommodate in addition the transport lift of the claw to the different formats, it is suggested that the control arrangement shows two coaxial control curves for optionally scanning of a cam follower, whereby each control curve is assigned to the lift movement of the claw for one format. From the Austrian Patent Specification No. 282 350 a claw control by means of cams has already become known, but this invention relates to the possibility to secure a reverse run of the strip-like perforated information carrier without changing over the control arrangement. Moreover it is necessary to equalize in the window the frame position of one format with the frame position of the other format. Thereof results a special advantage, under the condition that the lift of the cam follower upon changing over from one control curve to the other corresponds to the framing correction, when changing the format. As the super 8 film is the format most in use in the trade, the control curve assigned to this format will be scanned more frequently. However with outer curves there is the danger that the control curve is not always scanned faithfully upon abrupt changing from the large radius of curvature to the small one. Hence it follows a particularly advantageous embodiment of the invention, if the control curve for super 8 format films is designed as inner curve.

Further features and advantages will become apparent from the specification of an embodiment with reference to the drawing.

FIG. 1 shows an example for the arrangement of a claw control according to the invention,

FIG. 2 illustrates a comparison of the two different formats and

FIG. 3 displays the inventive construction of the claw.

A cam disk 2 with a groove 11 is arranged on a shaft 1. This cam disk 2 is connected with a shutter 3, which rotates upon forward run of the film in the direction of the arrow. Further a claw frame 4 is arranged in front of the cam disk 2, which is shiftable in vertical direction and tiltably rests in the ball guides 5. The frame 4 engages with its both teeth 6,7 the perforation of the film 8 and transports the same upon forward run in the direction of the arrow. The optical axis of the illuminating and reproducing arrangement is marked by 9. A cam follower 10, fixed to the frame 4, engages a groove, which is formed by the two curves 12,13. Of course the two curves could also be the boundary surfaces of a cam erected on the disk 2.

A spring 14 presses the cam follower 10 against the cam disk 2. The frame 4 further bears two pins 15 and 16, which cooperate with a thigh spring 17 mounted on a bolt 18. A vertical slider 19 bears stops 20 and 21, by means of which the thigh spring 17 may be joined to one of the pins 15 or 16. Depending on the acting direction of the thigh spring 14 the cam follower 10 is pressed either to the curve 12 or 13. The groove 11 is designed with a recess 22, which upon scanning the cam follower 10 causes a tilting of the frame 4 round the ball guide **5**, whereby the claw teeth **6,7** engage the perforation holes of the strip-like perforation carrier.

When the apparatus is switched on, the cam follower **10** transmits the movement predetermined by a control curve **12** or **13** to the claw teeth **6** or **7** respectively, whereby the control curve **12** is assigned to the lift movement of the claw for films of super **8** format, the control curve **13** for films of normal **8** format. If now for instance a normal **8** film should be transported instead of the set super **8** film, the slider **19** is pressed downwards. The spring arm **17***a* of the thigh spring **17** is then removed from the pin **16** by the stop **21**, likewise is the spring arm **17***b* removed from the stop **20** by the pin **15**. The spring **17** is now put under stress between the stop **21** and the pin **15**, whereby the cam follower **10** is pressed against the control curve **13**. Upon changing over of the cam follower **10** from one control curve to the other a determined path *x* is covered. According to DIN 15 830 sheet 1 and sheet 2 it has been standardized, that the engagement of the intermittent transport means for the transport should occur in front of the window between the third and the second perforation hole. As however this perforation hole has a different distance from the optical axis of the illuminating or reproducing arrangement **9** respectively with the formats to be transported (FIG. **2**), and therewith the framing line in the window would have a different position accordingly, this difference *x* has to be compensated. As known per se, the perforation holes of different formats also show a difference in size. Accordingly, the construction of the teeth of the double tooth claw are illustrated as in FIG. **3**.

With the transport movement of the claw **4** in forward run, the front surface **23** of the tooth **6** engages with both formats in the third perforation hole after the optical axis **9** and transports the strip over the front edge **27, 28** by one perforation pitch. Thereby the distance *a* from the front surface **23** of the tooth **6** to the rear surface **26** of the tooth **7** is so dimensioned, that the distance *c* from the front edge **28** of the first perforation hole to the rear edge **31** of the following perforation hole of the normal **8** format is larger by a tolerance *b* in the range of approximately 0.1 – 0.3. At the same time also the distance *d* of the surfaces **24,25** facing each other of the two teeth **6,7** is as large as the distance *g* from the rear edge **29** of the first perforation hole to the front edge **30** of the following perforation hole of super **8** format plus a tolerance $e + f$ in the range of approximately 0.5.

In FIG. **3** it is further made clear, that the distance *h* from the front surface **23** to the rear surface **24** of the tooth **6** is larger than the distance *i* from the surface **25** to the surface **26** of the tooth **7**. However, in order to enable the engagement of the tooth **6** into the smallest perforation hole of both strips to be transported, the distance *h* of the front surface **23** to the surfae **24** of the tooth **6** is smaller by a tolerance in the range of approximately 0.3 – 0.4 than the distance *k* of the front edge **27** to the rear edge **29** of the smallest perforation hole.

Finally it should be mentioned that it is not necessary to let the teeth of the claw engage perforation holes adjacent each other, as it is advantageous with super 8 and normal 8 films. The distance of the surfaces facing each other of the two teeth could cover also several perforation holes for the transport of two striplike perforated information carriers with a perforation spacing of little difference.

Besides it is particularly expedient to arrange the cam follower on the deepest point of the control curve, contrary to the illustration in FIG. **1**. Therewith it is achieved that the mass of the cam follower does not counteract to the spring force as a result of the occurring inertial forces upon scanning the control curves.

What is claimed is:

1. In a strip handling apparatus of the type in which a plurality of strip types may be moved in a first transporting direction from a supply station to a take up station, each of said strip types having equidistant perforation holes, the perforations of different strip types having different perforation pitches, each of said perforation holes having a forward and a rearward edge seen in said transporting direction, whereby with aligned forward edges of a first perforation hole of each of said different strip types second respective perforation holes which follow when seen in transporting direction only partly overlap each other, the apparatus comprising:

a shuttle mechanism located between said supply station and said take up station;

drive means adapted to impart a first movement to said shuttle mechanism cyclically in and out of engagement with said perforation holes of said strips, said drive means being further adapted to impart a second movement to said shuttle mechanism cyclically and in synchronism with said first movement up and down parallelly with the path of movement of one of said strips to move the same in transporting direction;

first and second teeth on said shuttle mechanism numbered as when seen in said transporting direction, said teeth having forward and rearward surfaces opposite to each other, said surfaces of each of said teeth having a distance from each other;

at least said second tooth being adapted to engage said forward edges of the perforation holes of said strips when transported in said transporting direction, the distance between the forward and rearward surface of said second tooth corresponding to the space between said forward and rearward edges of the smallest perforation holes of one of said strip types to be used less a tolerance;

the distance between the forward surface of said second tooth and the rearward surface of said first tooth increased by a further tolerance corresponding to the smallest existing distance on said strip types between the forward edge of said first perforation hole and the rearward edge of said second perforation hole;

the distance of said rearward surface of said second tooth to said forward surface of said first tooth reduced by another tolerance corresponding to the largest existing distance on said strip types between said rearward edge of said first perforation hole and said forward edge of said second perforation hole, and

the distance between said forward surface and said rearward surface of said second tooth is larger than the corresponding distance of said first tooth.

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