United States Patent [19]

Button

[11] **3,735,659**

[45] **May 29, 1973**

[54] PERFORATING APPARATUS

[76] Inventor: **Hollis E. Button,** 1025 W. Parr Avenue, Campbell, Calif. 95008

[22] Filed: **June 17, 1971**

[21] Appl. No.: **154,119**

[52] **U.S. Cl.** **83/524,** 83/205, 83/283, 83/573, 83/588, 83/628, 83/660

[51] **Int. Cl.**.....**B26d 3/08,** B26d 5/16

[58] **Field of Search**.....83/572, 573, 283, 83/588, 628, 624, 660, 620, 615, 203, 205, 524

[56] **References Cited**

UNITED STATES PATENTS

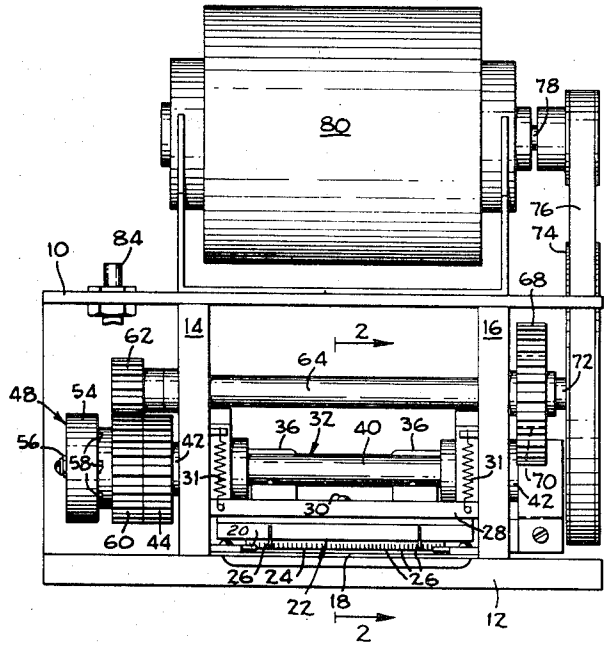
1,486,561	3/1924	Belisle	83/573 X
2,968,983	1/1961	Cousino	83/628 X
828,546	8/1906	Hart	83/283 X
3,520,220	7/1970	Acker	83/660 X
3,613,491	10/1971	Kahmann	83/572 X

Primary Examiner—Frank T. Yost
Attorney—Paul B. Fihe

[57] **ABSTRACT**

A perforating apparatus for photographic prints or other sheet material including a platen over which the material can be moved and against which a cam-actuated perforating die can be pressed through cyclical actuation to perform the perforating function.

5 Claims, 4 Drawing Figures



PATENTED MAY 29 1973

3,735,659

SHEET 1 OF 2

Fig-3

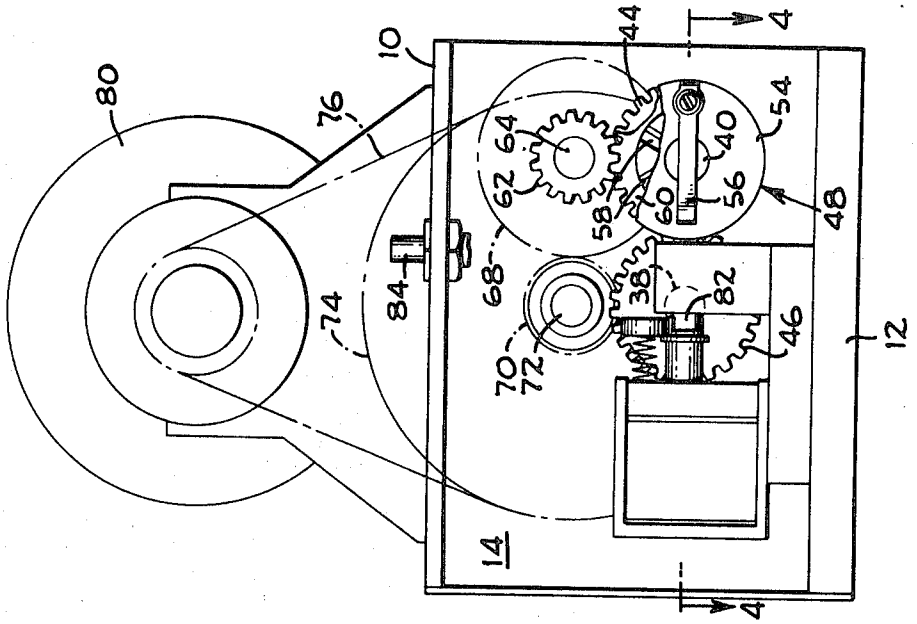
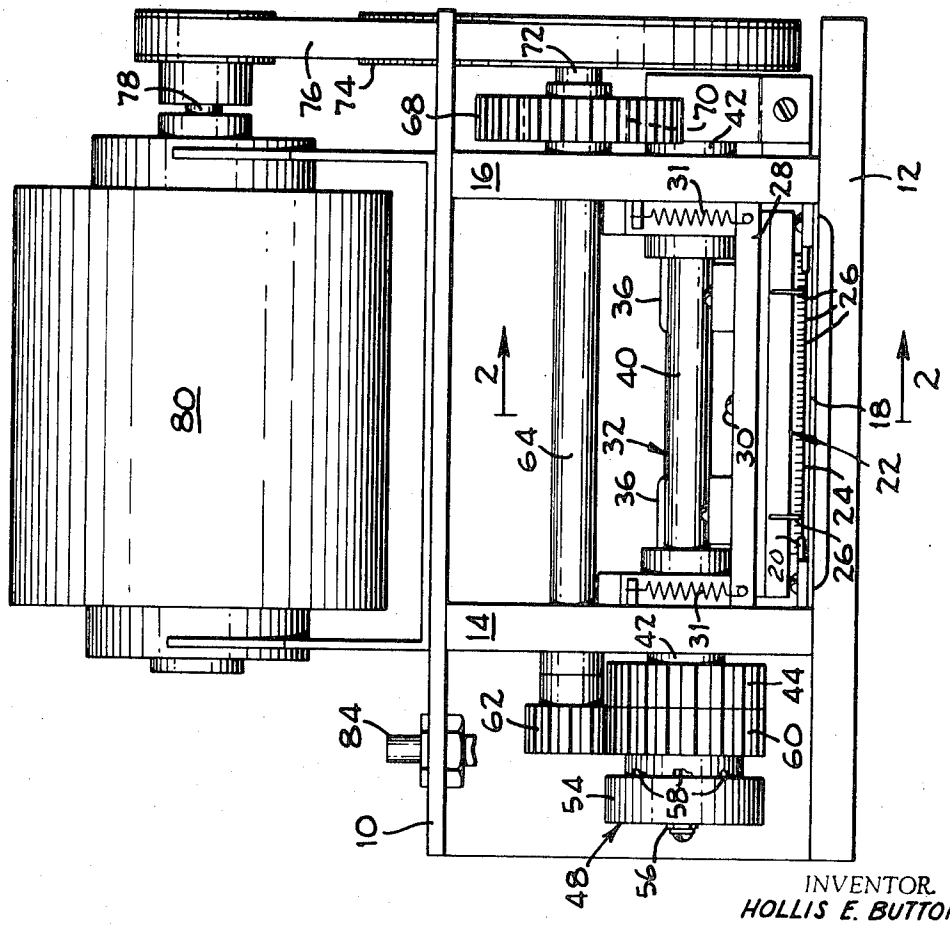


Fig-1



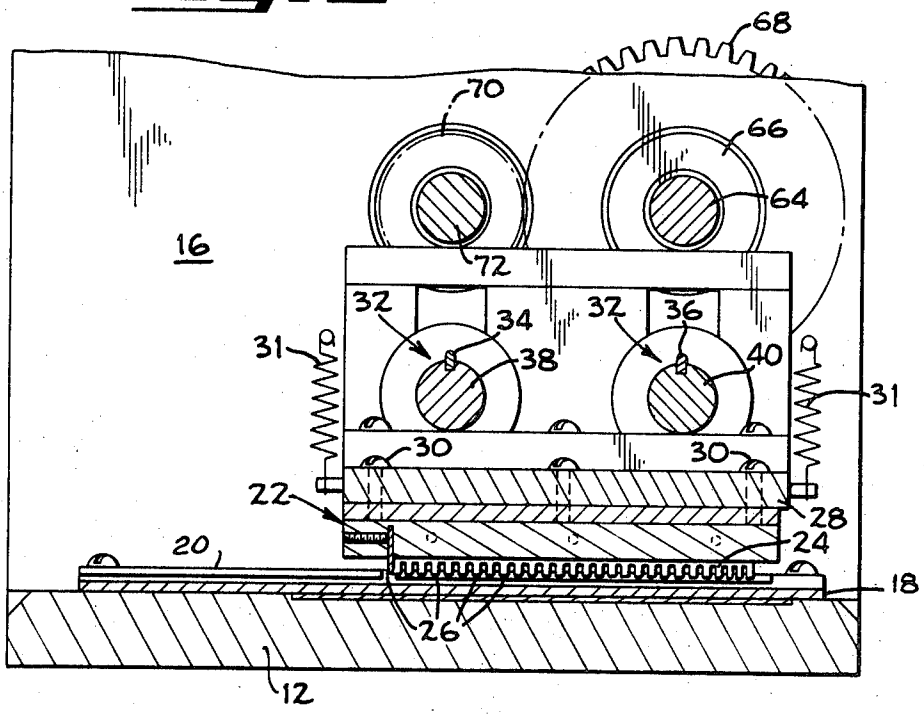
INVENTOR.
HOLLIS E. BUTTON

BY

Paul B. Eddie

PATENT AGENT

Fig. 2



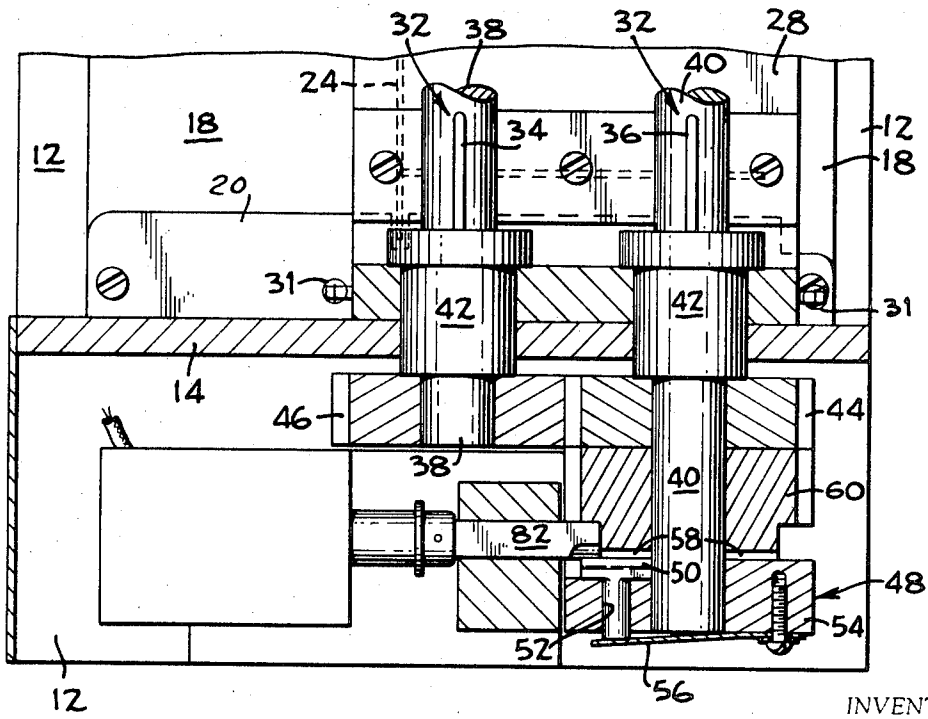


Fig. 4

INVENTOR.
HOLLIS E. BUTTON

BY

Paul E. Tilo

PATENT AGENT

PERFORATING APPARATUS

FIELD OF THE INVENTION

The present invention relates generally to perforating apparatus, and, more particularly, to apparatus for perforating photographic prints or other sheet material enabling easy separation of the material into sections by a simple manual tearing operation.

BACKGROUND OF THE INVENTION

Current commercial photographic processing techniques provide for the continuous processing in sequence of a large number of prints on a single elongated strip of positive photographic sheet material. These sequential prints on the strip must be separated in an expeditious manner in order to realize the full capabilities of the continuous processing techniques and cutting mechanisms preferably energized at appropriate times relative to the advancing print material, for example by a sensing mechanism such as a photoelectric cell, have been brought into use.

Recently, photographic processors have provided a so-called "Bonus" print which constitutes a smaller print immediately adjacent the larger main print on the positive strip of print material and to facilitate separation of such bonus prints from the main prints on the material, a perforated score line has been found to be desirable to avoid the necessity for the customer using a scissors or other cutting mechanism.

SUMMARY OF THE INVENTION

It is the general objective of the present invention to provide a perforating apparatus arranged to enable perforations to be made at intervals along a length of positive photographic print material or similar sheet material in a fashion which will not interfere with the expeditious processing of such material. Generally, to achieve this objective, the perforating apparatus includes a flat platen across which a strip of sheet material can be moved in any suitable fashion forming no part of the present invention itself. Preferably, in case of processing of positive film prints, the associated print cutter mechanism incorporates a print feeding mechanism and can be utilized to effect motion of the elongated strip of print material through the perforating apparatus.

Adjacent the sides of the platen, guide means are provided to laterally engage the strip of sheet material at its edges and also overlie the edges of the sheet material slightly so as to maintain the same appropriately positioned on the platen during the perforation operation which is performed in accordance with the present invention by a perforating die that is supported for movement toward and away from the platen. The perforating die includes a die member having a plurality of perforating teeth projecting therefrom in a particular configuration as required for the particular design of perforations required in each particular instance. If a different design of perforations is required, the die member can be removed from a support plate in a simple fashion, and can be immediately replaced with another die member having the desired configuration of perforating teeth.

The perforating die is normally urged away from the platen by springs but, upon suitable actuation, cam means are arranged to positively force the perforating die against the action of the springs towards the platen

and any sheet material supported thereon. Preferably, the cam means includes a plurality of cam members at spaced positions so that an equal pressure at all points is applied by the perforating die and regardless of the particular configuration of the teeth on the perforating die, a consistent, balanced scoring or perforating of the sheet material is achieved. Preferably, the cams which actuate the perforating die are mounted in spaced positions on two parallel shafts arranged to rotate at the same speed of rotation but in opposite directions thus to balance the forces applied to the perforating die accordingly to avoid any lateral shifting thereof. The cam shafts are arranged for simultaneous energization for a single perforating operation which consists of one revolution of each of the cam shafts through clutch means preferably in the form of a dog clutch which connects the cam shafts to a rotary drive mechanism for a single revolution of the cam shafts upon energization of a solenoid-actuated, clutch-releasing member which itself can be actuated by manual closure of a switch or through an automatic switch means actuated by a photocell of the type used in conjunction with the cutter mechanism, as mentioned hereinabove.

BRIEF DESCRIPTION OF THE DRAWINGS

The stated objective of the invention and the manner in which it is achieved, as summarized hereinabove, will be more readily understood by reference to the following detailed description of the exemplary structure shown in the accompanying drawings wherein:

FIG. 1 is a front elevational view of a perforating apparatus embodying the invention,

FIG. 2 is a fragmentary, transverse sectional view taken along line 2—2 of FIG. 1,

FIG. 3 is a side elevational view as viewed from the left of FIG. 1, and

FIG. 4 is an enlarged, fragmentary, detailed, sectional view taken along line 4—4 of FIG. 3.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT OF THE INVENTION

With initial reference to FIGS. 1 and 2, the illustrated perforating apparatus includes a relatively simple frame including top and bottom plates 10, 12 which are supported in spaced parallelism by upright side plates 14, 16 at positions spaced somewhat inwardly from the ends of the top and bottom plates.

A strip of positive photographic material which is to be perforated is arranged to pass across a stainless steel flat platen 18 which is secured to the bottom plate 12 intermediate the supporting side plates 14, 16 and is guided in its movement across the platen by suitable guide means which as here illustrated take the form of inturned guide flanges 20 secured suitably to the platen 18 at opposite edges thereof, so as to project upwardly and then inwardly to form slots thus to not only engage the edges of the strip of sheet material to maintain its lateral position but a portion of its top to maintain the same substantially flatly against the platen 18.

The perforating die, indicated generally at 22, is supported immediately above the platen 18 and includes a flat rectangular die member 24 having a plurality of perforating teeth 26 projecting downwardly therefrom in a desired pattern, which, in the present instance, constitutes a substantially U-shaped pattern including both longitudinal and transverse linear arrays of the perforating teeth. The die member 24 is secured by

screws 30 to a rectangular support plate 28 and simple loosening of such screws enables its replacement with another die member whose teeth configuration may be of any desired design. This quick changing of the die member 24 greatly enhances the utilitarian scope of the unit and, in fact, a cutting die member can be utilized in conjunction with the support plate 28 if desired so that the unit can alternatively perform perforating or cutting functions. Thus, in some instances, the use of a separate cutting mechanism can be avoided.

The perforating die 22 is supported adjacent its corners by a plurality of coil springs 31 which are carried by the side plates 14, 16 of the unit and normally urge the perforating die 22 upwardly to a position spaced perhaps one quarter of an inch from the platen 18. In order to urge the perforating die 22 against the platen 18 so as to effect perforation of any strip of sheet material thereon, it is preferred to use a positive acting cam means 32 which provides not only a positive pressure but a pressure equally distributed over the entire area of the perforating die 22 so that regardless of the configuration of the perforating teeth 26 or other cutting elements of the die, a consistent perforation and/or cutting is achieved. Consequently, the positive die-actuating cam means 32 preferably takes the form of four separate rotary cams 34, 36 arranged to engage the perforating die 22 at spaced positions adjacent its four corners, as illustrated, two of the cams 34 being mounted at like circumferential positions but in axially-spaced relation on a first cam shaft 38 and the other two cams 36 being similarly mounted on a second cam shaft 40. The two cam shafts 38, 40 are supported by suitable bearings 42 in the side plates 14, 16 and mount equal size intermeshing gears 44, 46 beyond the side plate 14 to the left as can be best visualized by reference to FIG. 4 so that as one cam shaft 40 rotates for example in a clockwise direction, the other shaft 38 will rotate at the same speed but in a counterclockwise direction. The cams 34, 36 normally rest in their uppermost positions as shown in FIG. 2 and upon actuation, the two shafts 38, 40 rotate in the opposite directions a single revolution to effect a single perforation. As a consequence, the cams 34 on the one shaft 38 move across their engaging position with the perforating die in a direction opposite to the engagement by the other cams 36, thus balancing any lateral forces and assuring direct positive downward pressure of the perforating die 22 against the platen 18.

In order to effect the described single revolution of the two cam shafts 38, 40 a controlled clutch means 48 is provided and, as best shown in FIGS. 3 and 4, includes a clutch dog 50 mounted for sliding movement in a lateral bore 52 in a clutch wheel 54 secured to one of the described cam shafts 40 at its outer extremity and normally urged by a leaf spring 56 mounted on the side of the clutch wheel 54 into one of a number of like mating recesses 58 in the side of a gear member 60 mounted for free rotation on the cam shaft 40 but in meshing engagement with a smaller gear 62 mounted on a power driven shaft 64 thereabove. This power driven shaft 64 is supported for rotation in simple bearings 66 in the side plates 14, 16 and at the opposite end of the unit mounts another gear 68 which engages a smaller gear 70 on another shaft 72 similarly rotatively supported, and that in turn mounts a large pulley 74 connected by a belt 76 to a small pulley on the drive shaft 78 of a small electric motor 80 mounted on the top of the top plate 10. The sequence of gears and pulley connections provide for a desired gear reduction. For example, in one operating unit, a one-tenth horsepower motor 80 was utilized and its speed of 1500 RPM was reduced by the intermediate belt and gear reduction units to a full perforating die speed of 120 cycles per minute. Such speed of the perforating die is more than sufficient to accommodate any film processing and yet because of the considerable reduction in speed, a small one-tenth horsepower motor was more than adequate to effect positive and accurate perforation of the positive print strip.

Reverting again to the mentioned clutch means 48, it will seen that the leaf spring 56 normally urges the dog 50 into one or another of the recesses 58 in the driving gear member 60 thus to effect rotation of the one cam shaft 40 and through the intermeshing gears 44, 46 rotation of the other cam shaft 38 an equivalent amount but in the opposite rotative direction.

A solenoid-actuated clutch releasing member 82 normally holds the dog 50 away from contact with the gear member 60 in opposition to the action of the leaf spring 56 through disposition at one side of the clutch wheel 54 to present an angular surface to the mating angular surface at the end of the dog 50, as best shown in FIG. 4, thus to cam the dog out of clutch-engaging position. However if the solenoid member 82 is actuated to withdraw to the left as viewed in FIG. 3, the leaf spring 56 will urge the clutch dog 50 immediately into the next encountered recess 58 in the driven gear 60 thus to instigate rotation of the cam shafts 38, 40. If the solenoid actuation is but momentary, the plunger will immediately return to the right and upon completion of one revolution of the cam shafts 38, 40, the clutch dog 50 will come into contact therewith and will accordingly be released from engagement with the driven gear 60 thus to stop cam rotation.

As shown, a push button 84 is arranged to enable manual energization of the solenoid member 82 but it will be understood that a photocell or other control mechanism can be electrically associated to actuate the solenoid to instigate one perferating or cutting operation. It will also be apparent that many other modifications and/or alterations can be made in the structure as specifically described and shown hereinabove without departing from the spirit of the invention, and the foregoing description is to be understood as exemplary and not in a limiting sense, and the actual scope of the invention is to be indicated only by the appended claims.

What is claimed is:

1. Apparatus for perforating sheet material which comprises

a platen adapted to support the sheet material,

a perforating die supported for movement toward and away from said platen,

cam means operable to engage said die to positively press the same against said platen to effect perforation of the sheet material thereon,

a plurality of springs resiliently urging said perforating die away from said platen,

said cam means including a pair of shafts supported in parallel relation adjacent said perforating die, each shaft having a spaced pair of cams at like circumferential positions thereon, and

means for simultaneously rotating said cam shafts in opposite rotative directions and at the same rotative speeds.

2. Perforating apparatus according to claim 1 which comprises

drive means for said shafts, and clutch means operable to connect said drive means to said cam shaft rotating means to effect a single revolution of each of said shafts.

3. Perforating apparatus according to claim 2 wherein

said clutch means includes a rotary dog clutch spring-urged into clutching engagement and a solenoid-actuated clutch releasing member disposed at a predetermined circumferential position relative to rotation of said dog clutch.

4. Perforating apparatus according to claim 3 which comprises

means operable to energize said solenoid-actuated clutch releasing member to effect a single perforating operation of said perforating die.

5. Apparatus for perforating sheet material which comprises

a platen adapted to support the sheet material,

a perforating die supported for movement toward and away from said platen,

cam means operable to engage said die to positively press the same against said platen to effect perforation of the sheet material thereon,

said cam means including a pair of shafts supported in spaced relation adjacent said perforating die, each shaft having at least one cam thereon, and

means for simultaneously rotating said cam shafts in opposite rotative directions and at the same rotative speeds.

* * * * *