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[54] **FLYING SHEARS OR STAMP FOR TRAVELING MATERIAL**

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[52] **U.S. Cl.** **83/299**; 83/315; 83/328

[51] **Int. Cl.**[2] **B26D 1/56**

[58] **Field of Search** 83/298, 299, 315, 316, 83/317, 328, 600; 72/189, 191, 196

[56] **References Cited**

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[57] **ABSTRACT**

Two knife-carriers are maintained in oscillatory cutting motion through a drive means in direction of the traveling material and corresponding in height to the direction of travel.

7 Claims, 2 Drawing Figures

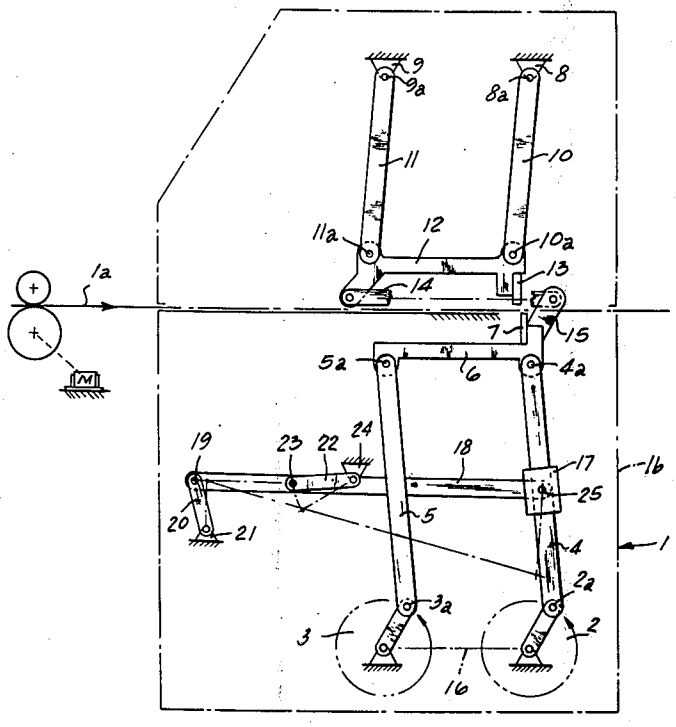


Fig. 1

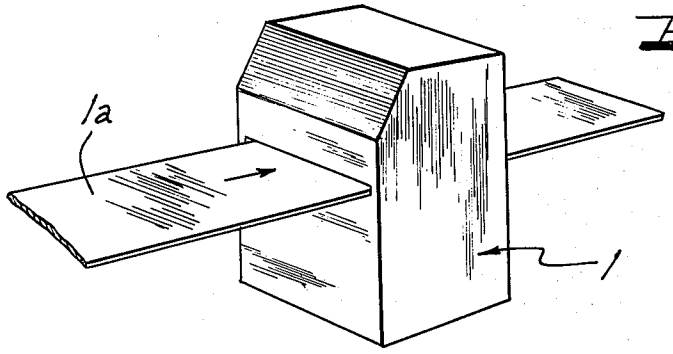
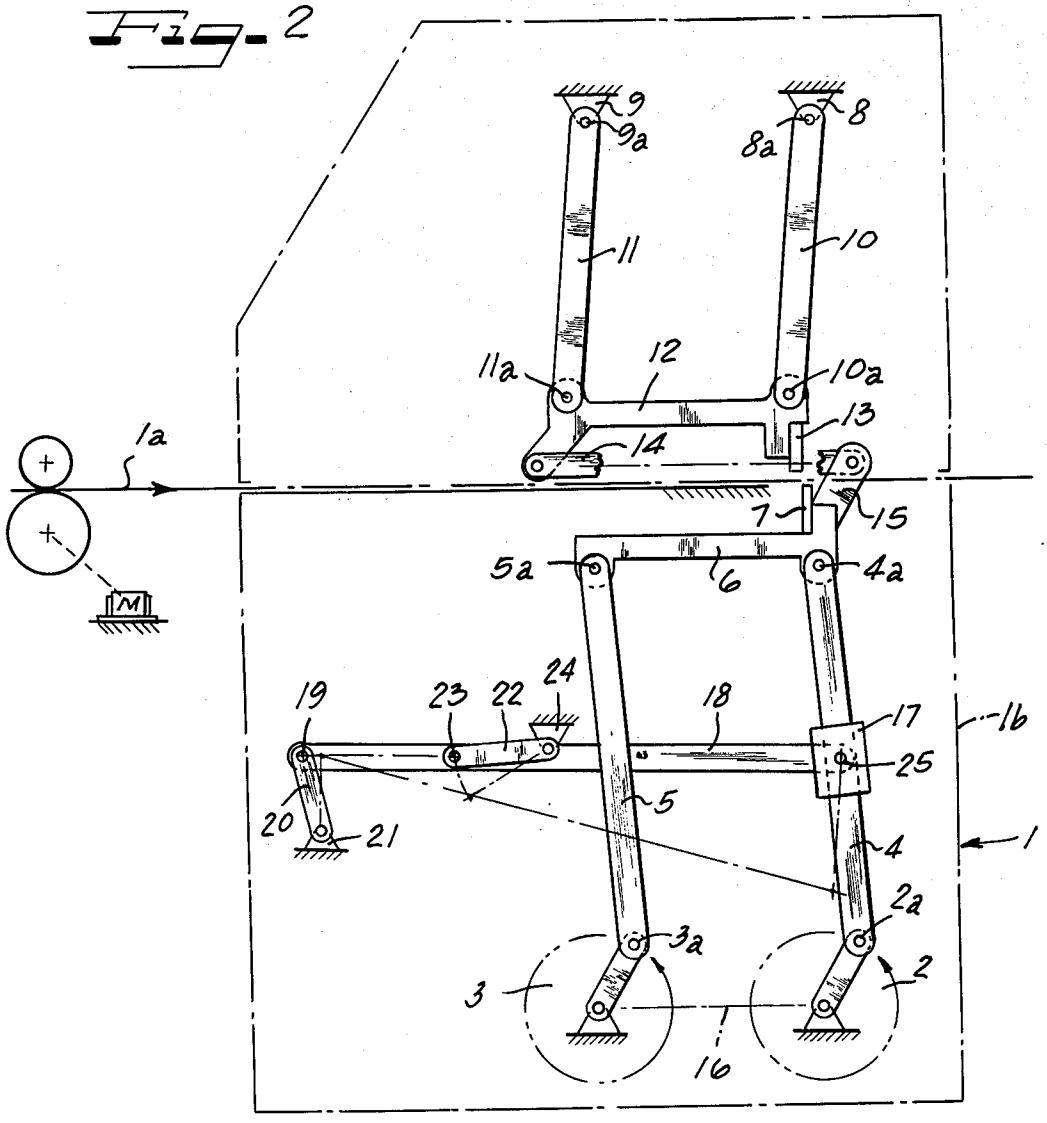

1a
1

Fig. 2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FLYING SHEARS OR STAMP FOR TRAVELING MATERIAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention provides for a high degree of accuracy in cutting materials traveling at high speeds, the attainment of clean cut surfaces cut at such speeds regardless of the thickness of material to be cut, and the facility of adjusting said invention to the requisite lengths.

2. Prior Art

Prior art is replete with shears for traveling material, comprising upper and lower knives which function in common to cut or stamp said material.

In German Pat. No. 1,141,857, upper and lower knives swing in common about the axis of a shaft. In operation, the traveling sheet to be cut is lifted slightly from the shears during the cutting. This effect is deleterious in nature to the efficiency of the operation. At high speeds, the metal sheet is inclined to vibrate or chatter, thereby resulting in and compounding discrepancies in the cross cutting with respect to the length.

German Pat. No. 1,502,678 is provided with an upper and lower rocker arm whereby both knives are positively held in vertically positioned grooves. In this known arrangement, the entire frame must be moved with the supports and grooves to and fro, such that the method of operation corresponds to that of a sliding shears. Due to high mass-acceleration forces, such construction does not favor higher speed operation.

German Pat. No. 1,627,288 features a lower knife fastened to a rocker arm which swings about a horizontal shaft. The upper knife is fixed to a crankshaft, and when operating maps out a circular trejectory. The lower knife is restricted to pendulum motion. The crankshaft for the upper knife is adjustable, depending on the lengths to be cut off. As this adjustment of the eccentric must not influence the immersion depth of the upper knife, this system requires a very expensive manner of construction.

A further disadvantage of these shears lies in the fact that the knives upon cutting undergo a rotary motion which leads to untidy cut surfaces of the separate roller material.

German Pat. No. 1,652,789 provides for the alteration of the cutting length by moving the pivotal point of the thrust crank arm wherein said displacement results in a change of the knife path. As in the previous design, the knives function rotationally with similar results.

The closest prior art comprises the Gebrauchsmuster Specification No. 1,926,561. Said embodiment relates to a flying shears or stamp for traveling material with two knife carriers, which through drive means are held in motion in the direction of the traveling material. The lower knife support is provided via the rocker-arms of the same length, with crank-gears of some eccentricity, arranged in parallel and positioned in the stationary frame.

The embodiment provides a means for adjustment to the requisite cutting length. Such alterations, however, require independent adjustments on the connecting rods on both the lower and upper knives.

In operation the movement of the rocker-arms is transferred through rods to the knife-carriers. Each knife carrier is driven in vertical direction by two cranks which are positioned adjacent one another in a

frame and connected through a rod system with the knife carrier. Such embodiment limits the unwanted rotational knife movement evident in prior embodiments. To its disadvantage, however, the transfer of forces occurring in operation may result in pressure and tensile forces commensurate with variants in the cutting gap between the upper and lower knives. Furthermore, the precise adjustment of the knife-cutting edges at the cutting point is difficult and requires a lengthy expenditure of time.

SUMMARY OF THE INVENTION

The invention allows high degree of accuracy in cutting materials traveling at high speeds, the attainment of clean cut cross sectional surfaces regardless of the thickness of material to be cut and the facility of adjustment to the requisite lengths. It is thus the object of the invention to produce a flying shear or stamp which allows both the high incident material speed and the maintenance of great accuracy of cut regardless of the lengths of the cut by providing for an efficient and substantially effortless adjustment of the requisite cutting lengths.

The invention comprises two knife carriers connected flexibly and tensionally with one another through a system of connecting rods. Adjustment of the horizontal movement of the two knife carriers is determined through a linking system to the guide or slide-bar and the setting of a carriage or slide which is slidably fastened, in the vertical, on one of the rocker arms.

The two crank-gears of same eccentricity located in the lower part of the frame referenced with one another are set in rotation by a common drive. The crank-gears are connected flexibly or hingedly with the lower knife carrier by means of rocker-arms of equal length arranged parallel to one another.

The construction of the invention makes possible the utility of single and distinct structural elements which is thus made possible a rigid manner of construction which negates the elasticity problems indigenous to the prior art and thus benefits the attainment of clean cutting surfaces and a high degree of accuracy. This holds true both for the rocker arms and knife carriers as well as for the connecting rods of the knife carriers. The cutting forces occurring upon cutting to length are transferred through the rocker-arms acting as press-rods directly to the crank-gears or supports of the rocker-arms and introduced into the stationary frames.

The invention permits the utilization of the points of rotation. By eliminating sliding bearings or sliding surfaces, roller bearings may be installed and adjusted free from play for greater accuracy. The construction of the invention is extraordinarily favorable to the repetitive accuracy of the cutting operations.

A further simplification, without prejudice to the aforesaid advantageous results, if, in a further construction of the invention, the upper knife carrier is movably mounted by parallel rocker arms of the same length to move in supports rigidly secured to the stationary frame wherein said supports comprise the point of rotation.

Rocker-arms and the knife carrier form in each case a parallelogram. The cutting edges of the cutting knives fixed to the knife carriers move during the operating or power stroke in each case in a straight line to one another and are always perpendicular to the axis of the material band. The prevention of rotary movements of the knives during the cutting operation insures the at-

tainment of clean cutting surfaces upon the separating section.

As both knife carriers are connected tensionally and flexibly with one another through connecting rods, the movement of the lower knife-carrier introduced by means of the crank-gear is positively transferred to the upper knife carrier. With this arrangement a synchronous movement of the upper and of the lower knife carrier is attained. Each rotation of the crank gear results in one cut. The requisite lengths of material are controlled by the interaction of the pre-determined band velocity and the harmonic period of the knives resulting from the pre-determined angular velocity of the crank gear.

To shorten the lengths of the material traveling at constant band velocity, the angular velocity of the crank gear is increased to pre-determined velocity.

Additionally, the actuating velocity of the knives, generating a determined arc, need be adjusted to correspond to the band speed by shifting the carriage on the guide rod system such that the guide continues to generate a straight line.

The carriage is adjustably secured on the rocker arm between the crank drive and the lower knife carrier. The application points of the linking system are selected pursuant to the band velocity and the angular velocity of the crank gear. If properly selected, the motion of said point generates a straight line.

The invention allows the adjustment to be made solely at one point thus minimizing the requisite expenditure of time and potential inaccuracies compounded in adjustment of several points.

The cutting edges of the cutting knives on revolution generate harmonic trajectories of weak curvatures. In this manner, a more favorable rotation of the masses is brought about; making possible high band speeds and unlike the prior art, to undergo no distortion or deformation at requisite short blank lengths.

Other objects, features and advantages of the present invention will be readily apparent from the following description of a preferred embodiment thereof taken in conjunction with the accompanying drawings although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a functional view of the material to be cut traveling in direction of the arrow through the invention.

FIG. 2 is a vertical section detailed view depicting the elements of the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 depicts the material, 1*a*, to be acted upon, traveling in the direction of the arrow through an apparatus **1.**

The apparatus **1** for cutting or stamping traveling materials comprises a rigid stationary frame 1*b* (FIG. 2) providing support for a pair of crank gears **2** and **3.** A pair of rocker arms **4, 5,** of equal lengths, arranged in parallel and rotatably secured to said crank gear **2, 3** at points **2***a*, **3***a* respectively, communicate said crank gears with a lower knife **7** via a pair of hinged connections **4***a*, **5***a* and a lower knife carrier **6** having said lower knife **7** securely fastened thereto.

A frame **1b** further provides a pair of permanent supports **8, 9** for a pair of rocker arms **10, 11** movably secured via points **8***a*, **9***a*. The rocker arms **10, 11** are of equal length and arranged in parallel. The supports **8, 9,** may comprise shafts fixed in the side supports of the frame **1b** or bearings mounted in said frame. A knife carrier **12** with an upper knife **13** fixed thereon is hingedly connected with the rocker arms **10, 11.** A knife carrier **6** is hingedly connected with the knife carrier **12** via an arm **15** and a connecting rod **14.**

The crank gears **2, 3,** have similar eccentricity and are connected fixed against rotation with one another. They are set in rotation by a drive shaft **16,** which may be connected with a drive means.

An adjustable carriage **17** is secured on the rocker arm **4.** In operation, the motion of a linkage point **25** approximates a straight line.

A connecting rod **18** movably communicates said carriage **17** with a linkage **19.** A guide rod **20** is rotatably attached to a stationary bearing **24** and movably connected with the connecting rod **18.**

In operation, the crank gears **2, 3** rotate in counterclockwise direction. Such rotation induces vertical and angular movement in the rocker arms **4, 5.** The movement of the rocker arms **4, 5** is transferred to the knife carrier **6** resulting in actuation of the lower knife **7** both in the vertical and the direction of the traveling material. A concomitant motion in the same direction and of equivalent velocity results in the knife carriage **12** and the upper knife **13** via said connecting arm **15** and said rod **14,** thus resulting in synchronous velocities between the knives **7, 13** and the traveling material **1a.**

Upon each revolution of said crank gears **2, 3,** one cut occurs. After the passage through the upper inflection point of the crank gears **2, 3** where the cut occurs, the movement of the knife carriers **6, 12** continues with the knives **7, 13** in the passage direction of the cutting material, until the movement is reversed with the further rotation of the crank gear **2, 3** in the opposite direction, when the cycle is repeated.

To change the blank length without changing the velocity of the traveling material, angular velocity of the crank gears **2, 3** is correspondingly decreased or increased. In addition, the actuating speed of the knives **7, 13** is commensurately adapted, by changing the position of the carriage **17** referenced on the rocker arm **4.** To shorten the blank length, the carriage **17** is adjusted in direction of the knife carrier **6.** To prolong the blank length the adjustment is made in direction of the crank gear **2.**

The invention may be used in other processes. If the material **1b** is to be stamped, suitable stamping or processing tools may be disposed on efficaciously constructed knife carriers **6, 12.**

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

We claim as our invention:

1. An apparatus for processing a continuously traveling web comprising, in combination,

a drive means to continuously feed said web, and

a means positioned downstream of said drive means for receiving said web from said drive means and processing said web into a plurality of pieces, said means comprising,

an upper tool carrier,

a lower tool carrier,

said tool carriers having tools held in parallel and acting in concert to operate on incident material,

rocker arms hingedly connected to said tool carrier,

adjustable means motively connected to a rocker arm for matching the horizontal velocity of the tools with the velocity of the material to be processed,

two crank gears of similar eccentricity arranged in parallel, acting in concert, rotatably connected to a pair of lower rocker arms communicating with the lower tool carrier, and

a connecting rod, tensionally and hingedly connecting and synchronizing the horizontal velocities of said tool carriers.

2. The apparatus of claim **1,** wherein said rocker arms comprise:

upper rocker arms having equal length and arranged in parallel and hingedly connected to said upper tool carrier, and

lower rocker arms having equal length and arranged in parallel and hingedly connected to said lower tool carrier.

3. The apparatus of claim **1,** wherein said adjustable means comprises a linkage system having a carriage means wherein said carriage means is adjusted by vertical displacement along a lower rocker arm and secured to said lower arm at a point, when motive, approximates a straight line.

4. A machine for cutting traveling material comprising:

an upper knife carrier,

a lower knife carrier,

said knife carriers having shearing knives, held in parallel and acting in concert to operate on incident material,

rocker arms hingedly connected to said knife carriers,

adjustable means for matching the horizontal velocity of the shearing knives with the velocity of the material to be processed,

two crank gears of similar eccentricity arranged in parallel, acting in concert, rotatably connected to rocker arms communicating with said lower knife carrier, and

a connecting rod tensionally and hingedly connecting and synchronizing the horizontal velocities of said knife carriers.

5. A machine of claim **4,** wherein said rocker arms comprise:

upper rocker arms having equal length and arranged in parallel and hingedly connected to said upper knife carrier, and

lower rocker arms having equal length and arranged in parallel and hingedly connected to said lower knife carrier.

6. The machine of claim **5,** wherein said adjustable means comprises a linkage system having a carriage means wherein said carriage means is adjusted by vertical displacement along said lower rocker arm and secured to said lower arm at a point when motive approximates a straight line.

7. A machine for cutting traveling material comprising:

a drive means,

an upper tool carrier,

a lower tool carrier,

said tool carriers held motive through said drive means in the direction of traveling material,

upper rocker arms hingedly connected to said upper tool carrier,

lower rocker arms hingedly connected to said lower tool carrier,

adjustable means for control of the horizontal swinging movement of the two tool carriers, and

means for processing said traveling material fixedly fastened to said tool carriers,

said adjustable means comprises a linkage system having a carriage adjustably secured on said lower rocker arm,

said carriage being adjustable by vertical displacement along said lower rocker arm and secured to said lower rocker arm at a point which when in motion approximates a straight line.

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