United States Patent [19]

Gronberg

[11] **3,738,584**

[45] **June 12, 1973**

[54] **DEVICE IN STRIKING CUTTERS**

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[22] Filed: **Oct. 16, 1970**

[21] Appl. No.: **81,414**

[30] **Foreign Application Priority Data**

Oct. 17, 1969 Sweden 14248/69

[52] **U.S. Cl.** **241/190,** 241/300.1, 241/239

[51] **Int. Cl.** **B02c 13/06**

[58] **Field of Search** ..... 146/102 A, 102 K, 146/117, 121, 138; 241/190, 300.1, 239, 240, 241

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[57] **ABSTRACT**

A striking cutter for disintegrating crops or the like in which a rotor having radially projecting knifearms which, during rotation, pass between a plurality of counterknives detachably arranged in a row on a holder, with the holder being pivotably suspended in the rotor housing and the counterknives being pivotably journalled and supported by a rest thereby enabling the counterknives to be partly or totally disengaged from the knifearms of the rotor.

5 Claims, 5 Drawing Figures

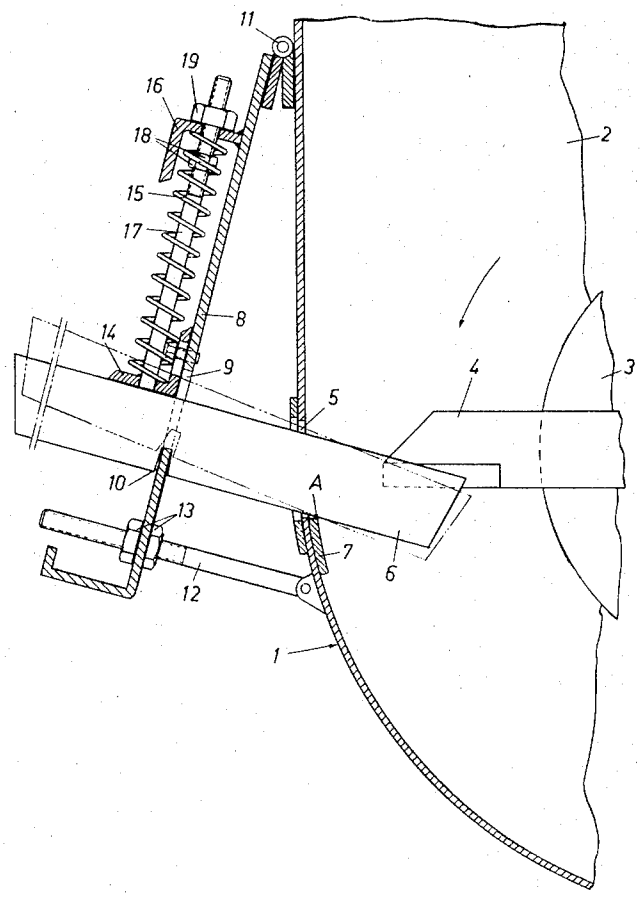


FIG. 1

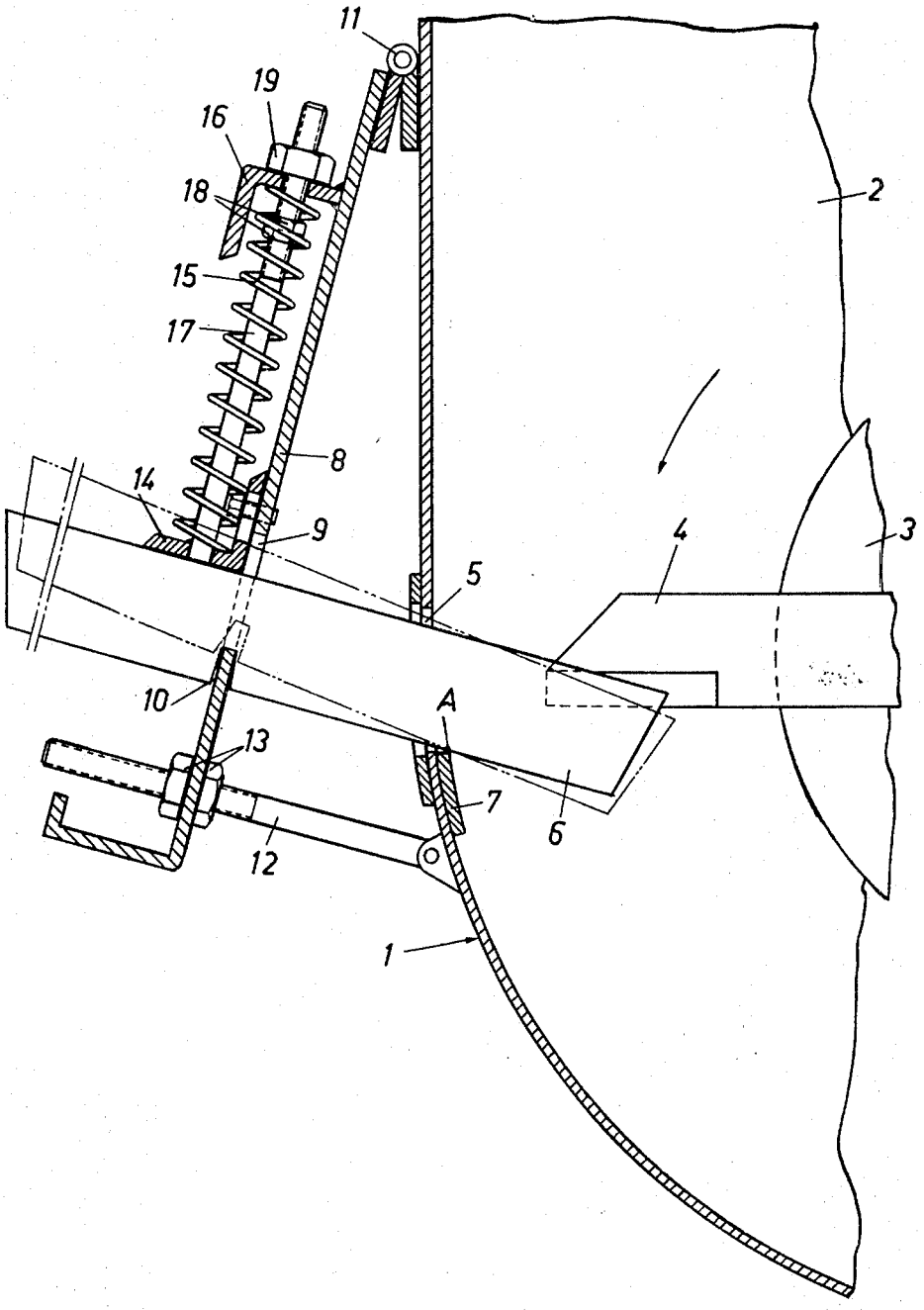


FIG. 2

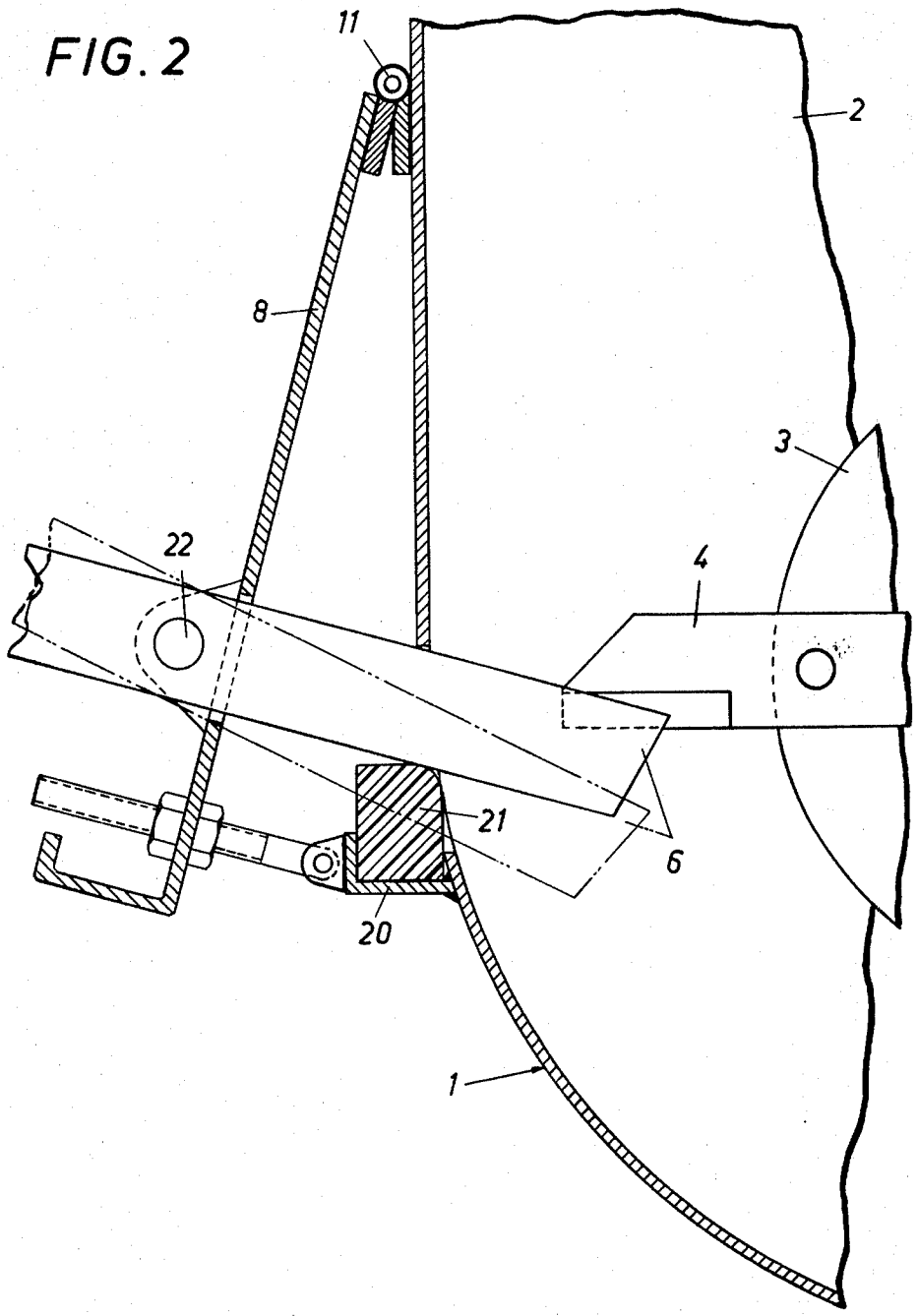


FIG. 3

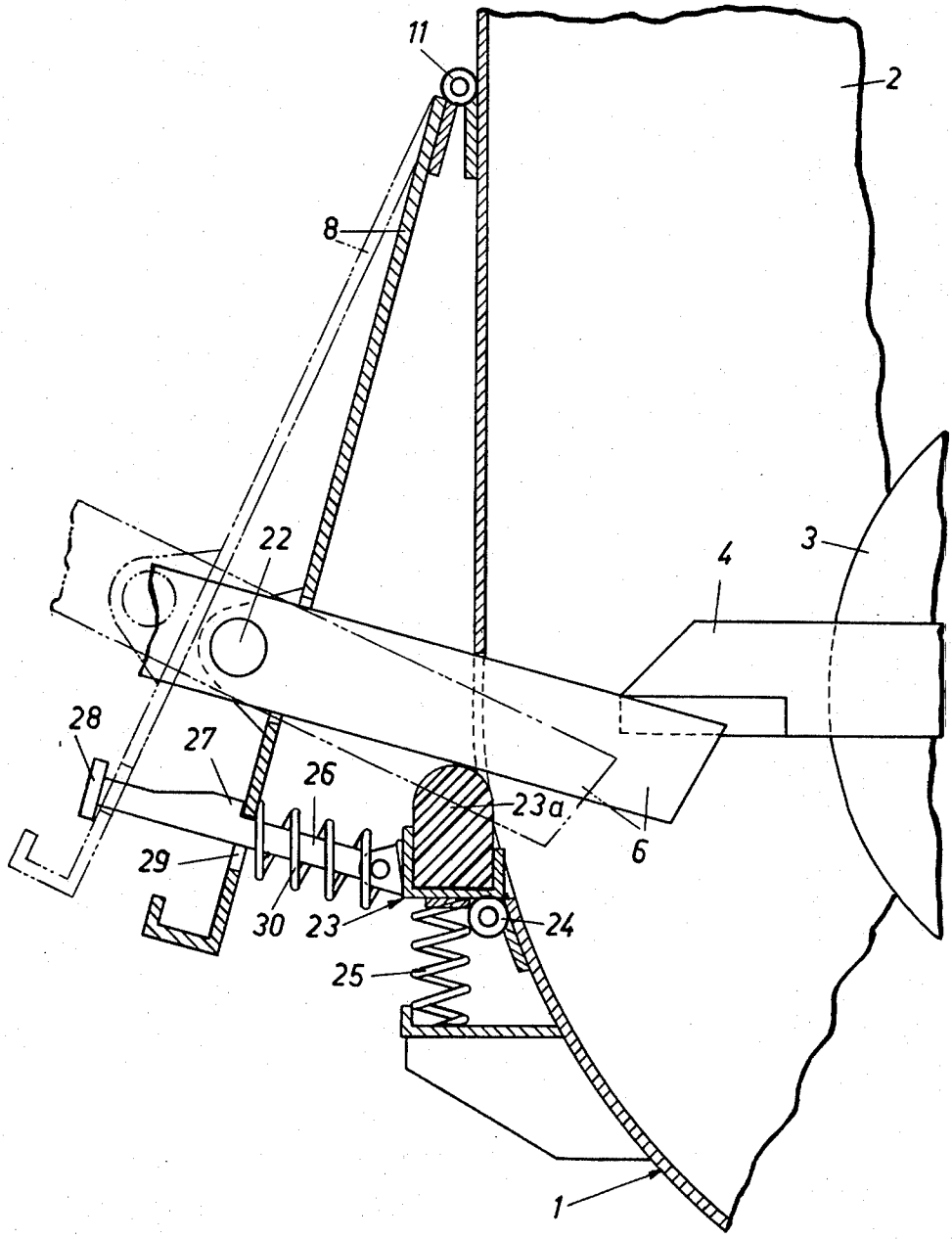


FIG. 4

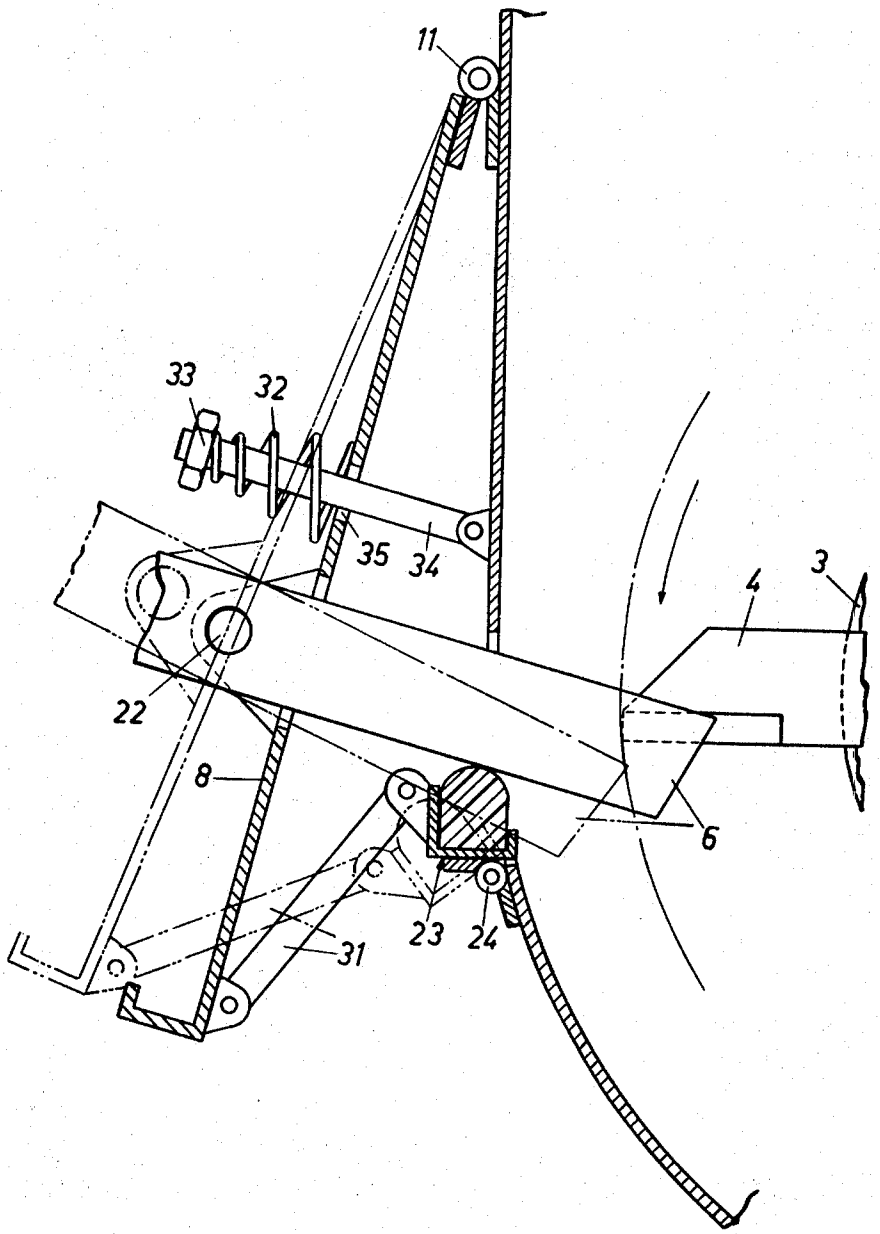
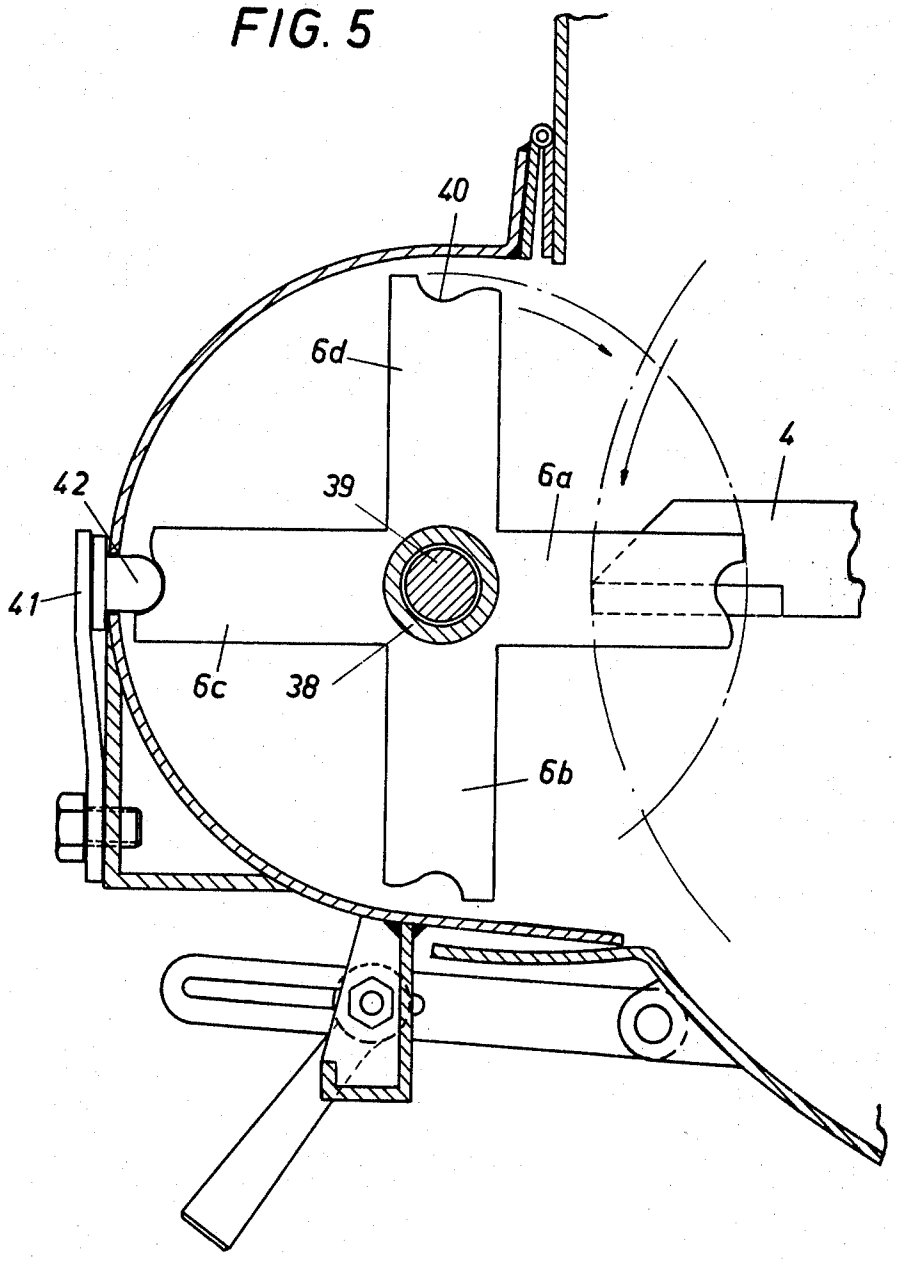


FIG. 5



DEVICE IN STRIKING CUTTERS

BACKGROUND OF THE INVENTION

The present invention relates to a device in striking cutters of the type comprising a rotor having radially projecting knifearms which, during rotation, pass between a plurality of counterknives which are detachably arranged in a row on a holder.

Striking cutters of the above mentioned kind are used for cutting straw, green fodder, garbage, etc., which material i.e., may occur in the form of succulent, soft stalks and stems or dry, tough straws. Due to the last mentioned, it is necessary that the counterknives project as far as possible in between the knifearms of the rotor whereas the same setting at disintegration of i.e., green fodder, would result in the fodder being reduced to pulp. In order to adapt the striking cutter to different crops and fodders it therefore is important that the length of the end portions of the counterknives projecting between the rotorknives be variable.

As the material, which is to be disintegrated is picked up from the ground, it is inevitable that larger hard objects such as stones, metallic objects or the like, which may damage the cutter may be picked up together with the material. In order to obtain an effective disintegration, it is necessary that the rotorknives be given a high rotational speed, and thereby the rotational energy acting upon the counterknives will be considerable. If during such circumstances a hard object has entered the cutter and the object is of such a size that it cannot pass freely between the counterknives, these will be exposed to such a great striking power that the concerned counterknives as well as the rotorknives may break.

PRIOR ART

There has earlier been proposed devices in order to solve these problems. By tilting the counterknives more or less it has been endeavored to adjust the length of the knives, however, only less successfully.

The counterknives further have been arranged rigidly connected to a shaft, which, by means of a pulling spring, is held against a stop. If a foreign object should give an exceptional large resistance when passing through the space between the counterknives, the same will turn away against the action of the pulling spring. A drawback in this construction, however, is that the spring must take all the force which is excerted by the rotating knives.

It is also a desire that the knives be manufactured in a thinner steel-material in order to eliminate the hitherto usual sharpening of one side of the knife to an edge. If the thickness of the counterknives is reduced, the risk that they break at an overload will, however, at the same time be increased. As the rate of disintegration is dependent on the counterknives being intact, it is necessary to exchange the defective counterknives, which hitherto has been a relatively complex operation which caused remarkable stoppages.

SUMMARY OF THE INVENTION

The purpose of the present invention is to provide a device in a striking cutter of the above mentioned type in which the above mentioned drawbacks are eliminated. The essential characteristics of the invention are that the holder, by means of a hinge, is pivotably connected to a machinery housing enclosing the rotor in such a manner that the length of the end portions of the

counterknives projecting between the arms of the kniferotor is variable, and that the counterknives are pivotably journalled around a journalling point or around a shaft which is common for all knives and are supported by a support at some distance from the journalling point or the shaft respectively, the rest being yieldably or pivotably formed against the action of resilient members so that the end portions of the counterknives may be totally or partly disengaged from the knifearms of the rotor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a section through the part of a striking cutter in which a number of counterknives are arranged,

FIG. 2 is a similar section through a modified embodiment,

FIGS. 3 and 4 show sections through further embodiments of the device illustrated in FIGS. 1 and 2, and

FIG. 5 shows a section through a part of a striking cutter having counterknives turnable 360°.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The striking cutter shown in the drawings comprises a machinery housing 1 in ends 2 of which a kniferotor 3 is journalled, the rotor being provided with knifearms 4 projecting gradually therefrom. In the housing 2 at a level with the rotor axis, which is not shown, there are provided a number of slots 5 for counterknives 6 between which the knives 4 pass as the rotor rotates. The counterknives 6 rest against a fixed stop 7 on the housing 1 and at some distance from the stop are carried by a holder 8. This holder is, at the housing 1, provided with a number of slots 9 positioned just in front of the slots 5, through which the rear end of the counterknives 6 project. The slots 5 and 9 are slightly broader than the thickness of the counterknives so that this sidewise will be effectively guided. The counterknives are, at their lower longside, provided with a recess or notch 10 which is designed to be attached to the holder 8.

The holder 8 is turnably connected to the housing 1 via a hinge 11 in such a way that the length of the part of the counterknives projecting between the arms 4 of the kniferotor are variable. By the aid of a screw 12 and nuts 13 the length of the counterknives may be adjusted. On the other side of the row of counterknives, there is arranged a section bar 14 which is pressed to engagement against the counterknives by a pressure spring 15, the spring having its opposite end resting against a holder 16. In order to limit the movement of the section bar 14, a rod 17 is connected thereto, and the rod is provided with limiting stops 18 and 19 in the form of nuts.

If a hard object which cannot pass between the counterknives 6 enters the striking cutter, the counterknives will be subjected to a very strong impact by the knifearms 4 of the rotor and thus the counterknives 6 will tilt around a point A, i.e., the engagement point against the stop 7. Hence, the ends of the counterknives 6 which are positioned outside the striking cutter will swing in a clockwise direction against the action of the spring 15. The swinging movement is limited by the nuts 18 which are so located that the counterknives not will detach from the recess 10 of the holder 8. This relatively restricted movement of the counterknives is, in most

cases, entirely sufficient to allow the object, the hindrance to pass by the counterknives **6.**

The recess **10** is preferably located at midway of the length of the counterknife, whereby the knife may be turned around. The section bar **14** may by the aid of a not shown lever e.g., and eccentric be raisable against the action of the spring **15** to such an extent that the counterknives may be detached from their respective slots **9.** By this arrangement an exchange of counterknives may be made in a very short time.

In the embodiment according to FIG. **2,** the counterknives **6** rest against a rubber block **21** which is located on a bracket **20** and which is compressed when the load on one or more counterknives exceeds a predetermined value, whereupon the counterknife effects a swinging movement so that it is partly disengaged from the rotorknife **4.** The counterknives **6** are turnable around a common shaft **22,** which is journalled in lugs on the holder **8.**

The advantage in this type of resilient member i.e., the rubber block **21** is that the counterknives are turnable separately independent of the movement of the adjacent knife.

In some cases, it is desirous that the counterknives may be entirely disengaged from the knifearms **4** of the rotor. Such an embodiment is shown in FIG. **3,** wherein a supporting device **23** for the counterknives is turnable around a hinge **24.** The supporting device **23** may comprise a shock-absorber **23***a* of a hard rubber material having low flexibility, which is pressed to engagement against the counterknives by a pressure spring **25.** To the supporting device **23** is pivotably attached a trunnion **26** which is formed with a step **27** and an end plate **28.** The trunnion **26** extends through a hole **29** in the holder **8,** with the hole being somewhat larger than the largest cross-section of the trunnion in level with the step **27.** Between the holder **8** and supporting device **23** a pressure spring **30** is positioned. When the counterknives are subjected to an overload, the supporting device **23** will turn in a counter-clock-wise direction against the action of spring **25,** whereby the trunnion **26** is moved downwards in the hole **29** thereby causing the stop **27** to loose its grip against the portion around the hole whereby the freed holder, due to the action exerted by the spring **30,** may turn around the hinge **11.** The counterknives also will be moved in a direction from the knifearms **4** of the rotor, whereby the knifearms are entirely freed from the counterknives. As soon as the thrust on the counterknives ceases, the supporting device **23** may turn back to its original position to contact against the counterknives **6.** These knives, however, will maintain their inactive position and may be brought to active position only by manually turning the holder **8** in a direction against the casing during compression of the spring **30** in order that the trunnion **26** at the stop **27** again may operate i.e., contact the holder **8.**

At the embodiment shown in FIG. **4** a link **31** is articulated between support device **23** and holder **8** in such a way that a movement of the supporting device **23** around the hinge **24** in a counter-clock-wise direction will result in a movement of the holder **8** in a direction from the striking cutter. The force at which the supporting device has to be moved is determined by pressure spring **32** which, with one of its ends, rests against the side of the holder which is turned from the housing, while the other end rests against a stop nut **33** screwed on a threaded trunnion **34,** which is pivotably attached to the housing **1** and which is guided through a hole **35** in the holder **8.**

By this arrangement, a device is obtained having an automatic return movement of the counterknives from an inactive to active position when the load on the knives ceases.

Due to the great speed of the rotor **3,** breakage of the counterknives may not always be avoided, also if the counterknives very fast may be tilted away from the operation area of the knifearms **4.** As it is not possible during many circumstances to exchange a number of counterknives at once, the arrangement according to FIG. **5** has been developed. In this embodiment, each counterknife **6** consists of several mutually connected knifearms **6***a*, **6***b*, **6***c* and **6***d*. In the embodiment shown, the arms are arranged in the form of a cross but it is, of course, also possible to arrange the arms in another number and another pattern.

The counterknives are arranged freely rotatable on a shaft **39** which is common for all knives. At the free ends of each counterknife is arranged a recess **40** intended to cooperate with a trunnion **42** acted upon by a spring **41.** At an overload on one or more counterknives, the trunnion or the trunnions **42** respectively will be pressed from engagement with their respective counterknives which, due to the heavy impact, will be turned so much that the recess **40** of the next knifearm will be just in front of the trunnion **42.**

The invention is not limited to the embodiments shown but a plurality of modifications are possible within the scope of the patent claims. Thus, it is possible that certain characteristics in one embodiment are applicable in other embodiments. It is also possible that in cases where a very extensive disintegration is desired, to arrange several rows of counterknives after each other.

What I claim is:

1. A disintegrator for straw and similar material comprising a housing, a rotor within said housing, said rotor being provided with a plurality of knives in spaced relationship along the length of the rotor, said knives extending radially from the rotor and each knife having a tip, and a plurality of spaced counterknives projecting into the housing and extending inwardly beyond the tips of the radially projecting knives and being cooperable therewith for disintegrating the material, and a holder for the counterknives, the counterknives being rotatably mounted on the holder about a pivot axis common to all counterknives and generally parallel to the axis of the rotor, the improvement comprising hinge means attached to the housing and the holder, means to adjust the distance between the pivot axis and the axis of the rotor, and support means at each counterknife for resiliently restraining rotation of the counterknife with respect to the pivot axis.

2. The disintegrator as claimed in claim **1** in which the support means for each counterknife includes a block of rubber secured to the housing so that a portion of the counterknife between the pivot axis and the axis of the rotor will rest thereon.

3. The disintegrator as claimed in claim **2** including a second holder in which said rubber block is mounted, a means hingedly connecting the holder to the housing about an axis generally parallel to the pivot axis of the rotor, a means biasing the holder to a position in which the portion of the counterknife between the pivot axis

and the rotor axis rests thereon, the holder being pivotable away from said latter position, upon an excess load being imposed upon the counterknife resting thereon.

4. The disintegrator as claimed in claim **3** including a link interconnecting the holder and the pivot axis for swinging the pivot axis away from the rotor axis upon tilting of the holder.

5. The disintegrator as claimed in claim **1** in which each counterknife includes a plurality of knife blades firmly secured to each other and extending radially outward from the pivot axis, each knife blade having a tip provided with a recess and said support means including means to engage said recesses in turn to resiliently restrain rotation of the knife blades.

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