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Aasland et al.

[11] **3,726,488**

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[54] **SHREDDING AND BAGGING DEVICE FOR YARD USAGE**

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[52] **U.S. Cl.** **241/101.7,** 241/186, 241/258, 241/277

[51] **Int. Cl.**.....**B02c 18/10**

[58] **Field of Search**.....241/101 M, 186 R, 241/245, 248, 258, 261, 277

[56] **References Cited**

UNITED STATES PATENTS

3,412,770	11/1968	Johnson	241/101 M X
3,593,930	7/1971	Lautzenheiser	241/101 M X
3,674,220	7/1972	Tupper et al.	241/101 M X

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[57] **ABSTRACT**

A device for shredding and bagging leaves and other yard and garden waste which includes a horizontal base of shallow cup shape and a cover plate which mounts an engine and rotary blade. The base is fitted with removable breakers spaced about the inner periphery having horizontal notches which register with the tip portions of the blade. A shoulder provided on the engine shaft seats the blade in a precise axial position, and the cover plate is seated directly on the breakers to insure registry between the blade and the cooperating notches. Preferably, two blades are employed welded to a cylindrical hub at right angles to one another. Material is fed, via a hopper, through the cover plate and ejected through a peripheral opening into a discharge conduit. A bag-holding ring generally alined with the conduit supports the bag as material is blown into it.

15 Claims, 9 Drawing Figures

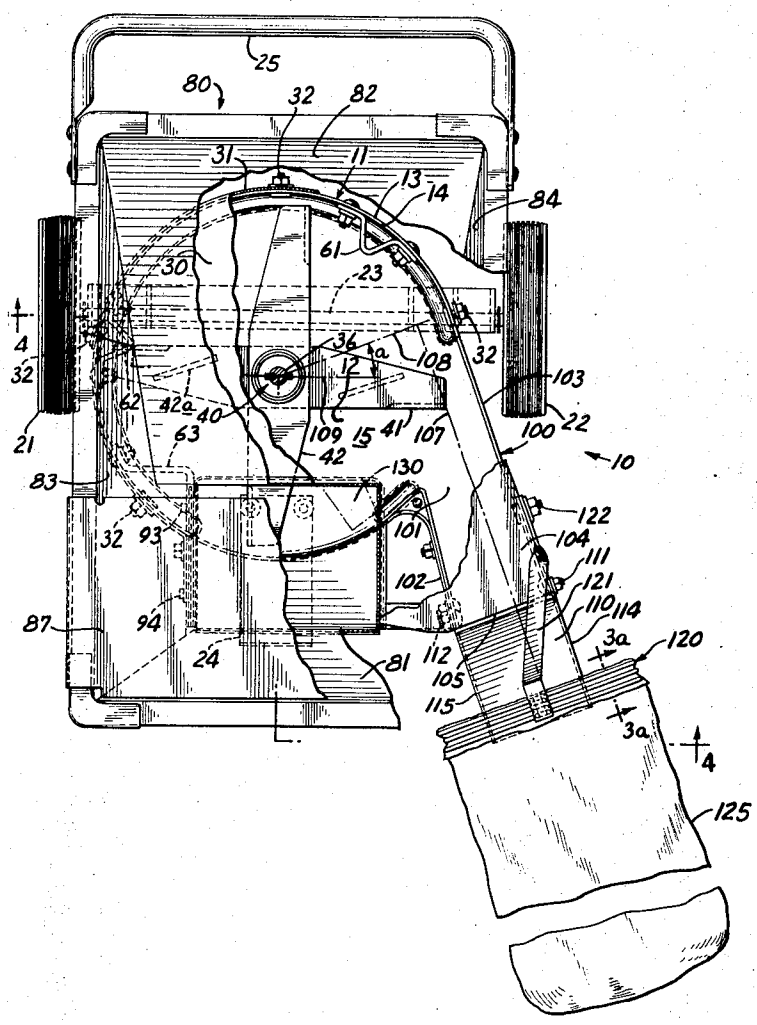


FIG. 1

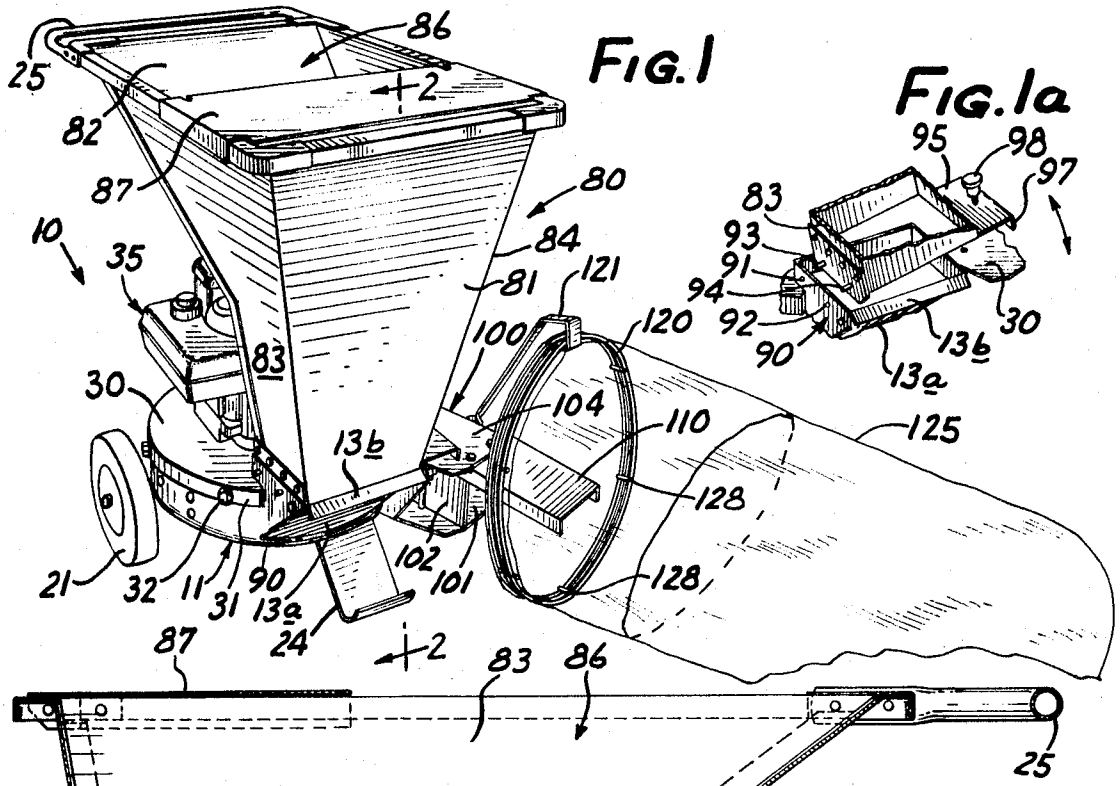
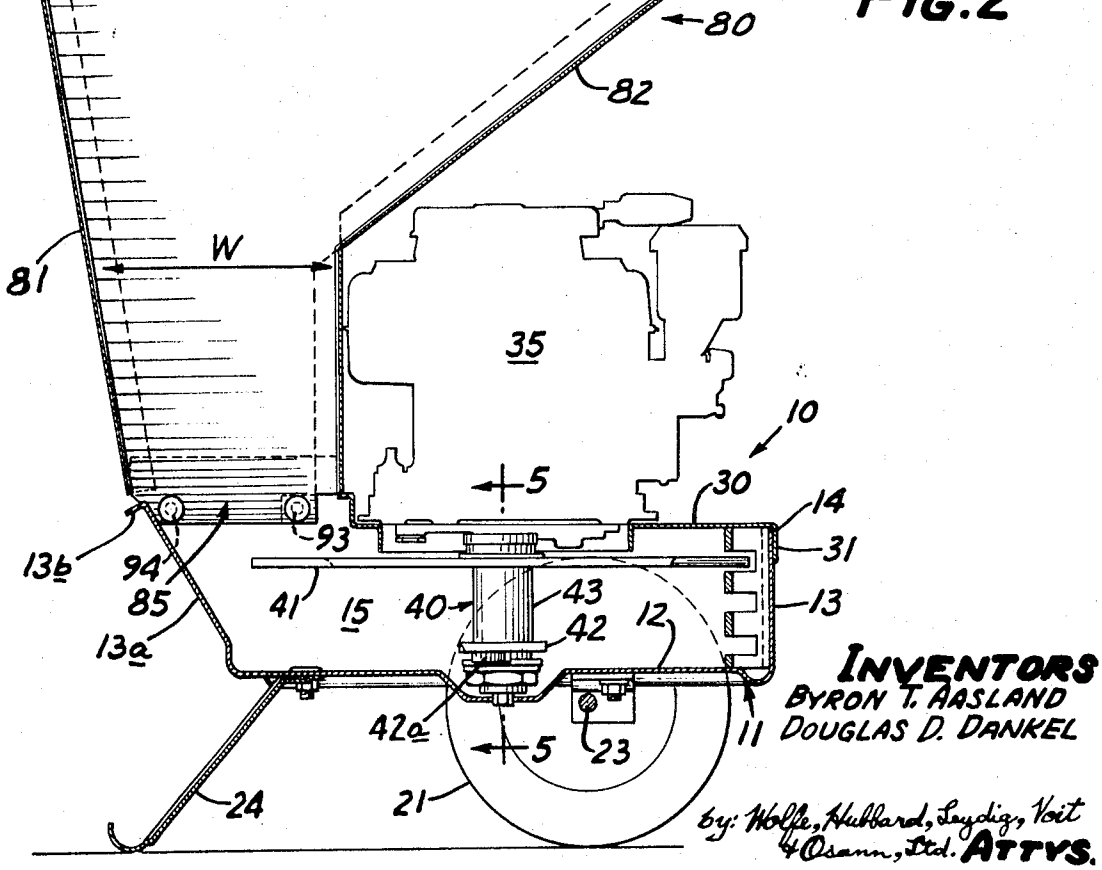


FIG. 1a

FIG. 2



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FIG. 3

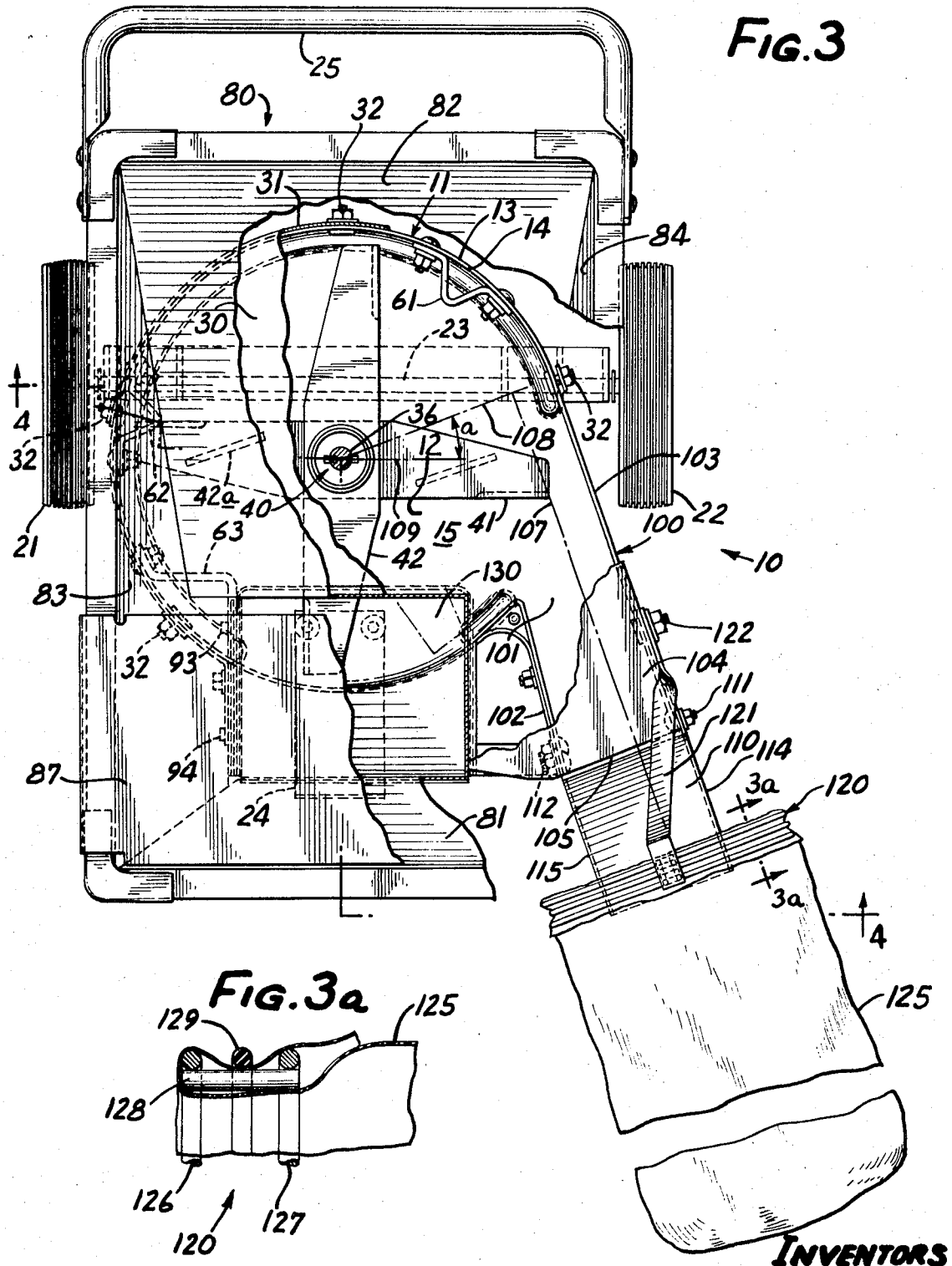


FIG. 3a

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FIG. 4b

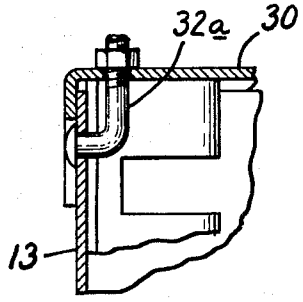


FIG. 4a

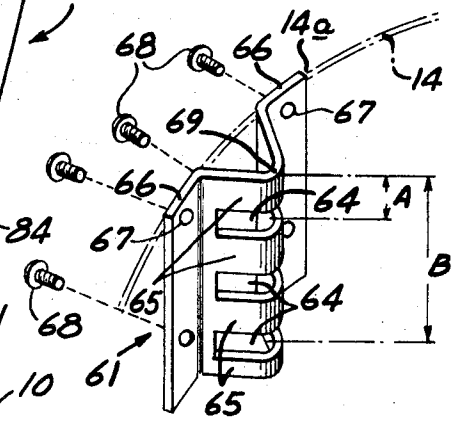


FIG. 4

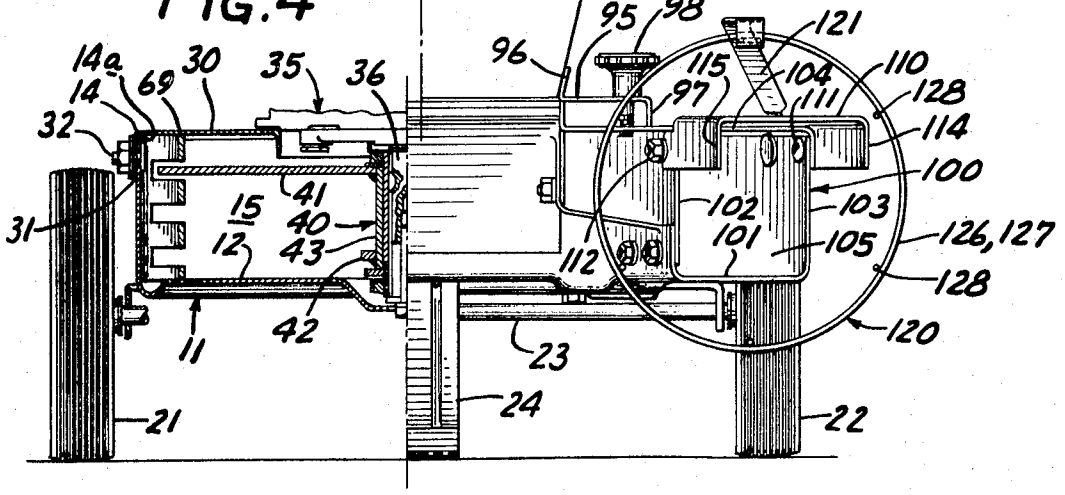
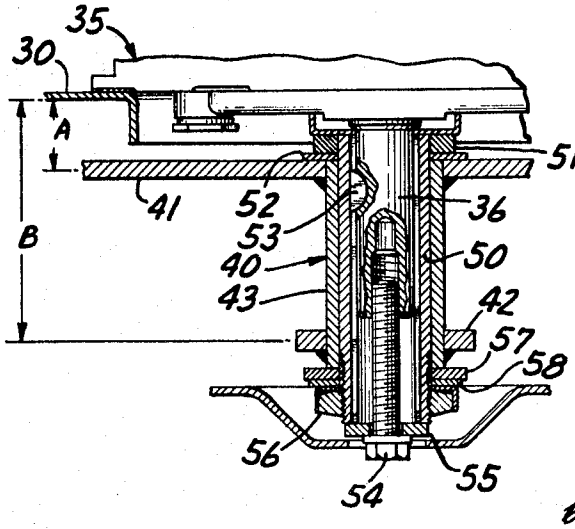


FIG. 5



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SHREDDING AND BAGGING DEVICE FOR YARD USAGE

It is an object of the present invention to provide a shredding and bagging device which utilizes the shredding action of the tip of a blade travelling at high speed through a registering notch in a cooperating breaker and which insures that the blade will always be precisely centered in the notch to avoid interference and possible damage and to insure efficient shredding action. It is a more specific object to provide, in a device of this type, breaker elements which are removable but which enable the condition of register to be preserved in spite of repeated disassembly of the machine and in spite of replacement of the breaker elements.

It is another object of the present invention to provide a shredding and bagging device which is more efficient than prior devices, which resists clogging both at the entry way and at the discharge conduit, which is safe to use and which is intended for discharge directly into an integrally supported plastic or paper bag.

It is a more detailed object to provide a shredding and bagging device which employs a rotor having a plurality of blades mounted in fixed phase position upon a hub, with both the rotor and breaker elements being easily and quickly removable for servicing.

Other objects and advantages of the invention will become apparent upon studying the attached detailed description and upon reference to the drawings in which:

FIG. **1** is a perspective view of a shredding and bagging device constructed in accordance with the invention and with the receiving bag shown in partial section.

FIG. **1***a* is a fragment showing the manner in which the hopper is installed and removed.

FIG. **2** is a vertical section looking along the line **2—2** in FIG. **1**.

FIG. **3** is a plan view of the device shown in FIGS. **1** and **2** with portions broken away to reveal the internal construction.

FIG. **3***a* is a fragmentary section taken through the bag-supporting ring and looking along the line **3***a*—**3***a* in FIG. **3**.

FIG. **4** is a vertical section looking along the line **4—4** in FIG. **3**.

FIG. **4***a* is a perspective view of a typical breaker.

FIG. **4***b* shows a preferred form of the hold-down.

FIG. **5** is a fragmentary section taken through the engine shaft and rotor looking along the line **5—5** in FIG. **2**.

While the invention has been described in connection with a preferred embodiment, it is understood that there is no intention to be limited to the particular embodiment shown but that it is intended, on the contrary, to cover the various alternative and equivalent constructions included within the spirit and scope of the appended claims.

Turning now to the drawings, there is shown a shredding and bagging machine **10** supported on the ground in operating position. The device includes a base member **11** which is of shallow cup-shaped construction having a bottom wall **12** and a generally circular side wall **13** having an upper edge **14** and defining a central space **15**. For spacing the device close to the ground and for permitting it to be moved from one position to another it includes a pair of small ground wheels **21**, **22** mounted upon an axle **23** which is suitably secured to the underside of the base. Spaced from the wheels is a skid **24**. For transport the device is fitted with a suitable handle **25** which permits the device to be rocked about the wheels thereby lifting the skid clear of the ground, following which it may be trundled in the manner of a wheelbarrow.

Superimposed upon the base **11** is a cover plate **30** which is preferably of circular outline, conforming to the shape of the base and having a downwardly turned lip **31** which extends downwardly, as a skirt, about the upper edge **14** of the base. A series of clamping bolts, or studs, **32** clamp the lip to the base. The registering openings in the lip are preferably in the form of vertical slots or oversize holes to accommodate vertical positioning of the cover plate.

Centrally mounted upon the cover plate **30** is an engine **35** of the vertical shaft type having a shaft **36** which projects through the plate **30** and into the space **15** in the base.

Mounted upon the shaft **36** is a rotor **40** having an upper blade **41** and a lower blade **42** formed of flat pieces of steel welded to a hollow cylindrical hub **43**, the blades being preferably oriented at right angles to one another in fixed phase position.

For the purpose of mounting the rotor on the engine shaft the shaft has a sleeve **50** which presents a reference shoulder **51** having an adjacent washer **52**. The sleeve is keyed to the shaft by machining in it a longitudinal groove which registers with a key **53**. The sleeve is held in a "bottomed" condition by a screw **54** which is axially threaded into the shaft and which has a washer **55** which bears against the end of the sleeve. For holding the rotor captive, the sleeve is threaded and fitted with a lock type nut **56**. Interposed between the nut and the end of the rotor hub is a non-rotatable washer **57** having an adjacent spring washer **58** of the belville type. To develop the desired amount of friction between the sleeve **50** and the hub **43**, the nut is turned until the spring washer develops an adequate reactive force, following which the nut is locked in position. As a result, the blade rotor may rotate as a unit with the engine shaft while being capable of momentarily yielding in the event that an obstruction is encountered by the blades.

For the purpose of cooperating with the tips of the blades, that is, for holding the material relatively stationary while it is acted upon by the blades, a plurality of breaker members are provided which are secured at spaced points to the inside wall of the base and which have notches formed therein registering with the tip portions of the blades. In a practical case three breaker members may be used as indicated at **61**, **62** and **63** (FIG. **3**). Taking the breaker member **61** by way of example, shown in detail in FIG. **4***a*, it will be noted that it is in the form of a metal stamping of A-shaped or humped cross section having horizontal notches **64** with intervening lands **65** which obstruct passage of the material. For securing the breaker member to the curved inside wall of the base, the member is provided with flanges **66** which are integral with the feet of the "A" and which have holes **67** for receiving bolts **68**. The notches **64** are dimensioned to permit passage of the blade while allowing a limited clearance on each

side for efficient shearing action. The blades are preferably sharpened along their leading edges and particularly along their tip portions.

The breaker member **62** (FIG. **3**) may be identical with the member **61** previously described while the member **63** is of larger size, projecting radially inward to a greater degree, and having correspondingly deepened notches, for a purpose which will later appear.

In carrying out the present invention the upwardly facing surfaces **69** on each of the breaker members **61–63** are arranged to directly engage land surfaces on the underside of the cover plate so that the breakers together form a reference plane of support for the cover plate, thereby to insure precise registry between the blades and the notches which are intended to receive the tips of the blades. Preferably direct engagement between the breaker members and the underside of the cover plate is achieved by mounting the breaker members so that they project slightly above the upper edge **14** of the base, thereby to establish a clearance gap **14***a* (FIG. **4**) above such upper edge. As was previously pointed out in connection with FIG. **5**, the mounting of the engine upon the cover plate and the provision of a reference shoulder **51** on the engine shaft insures that the blades **41**, **42** are positively and accurately positioned with respect to the cover plate. Since the cover plate seats directly upon the breaker members, accurate maintenance of dimensions A, B of the breaker member (being the distances from the upper edge **69** to the centers of the respective notches which receive the blade tips) assures accurate positioning of the blade tips at the centers of the respective notches. This is to be contrasted with prior constructions in which the cover plate **30** rests upon the upper edge of the base and in which the breaker members are not utilized for reference purposes.

It is one of the features of the present construction that the breaker members are removable and replaceable. It is quite likely that, incident to such replacement, the new breaker member may not be located in precisely the same position as the old. This may be due, for example, to the fact that the mounting holes **67** in the breaker members, and the registering holes in the wall of the base, will normally be slightly oversized to provide free clearance for the mounting bolts **68**. Preferably the breaker elements are three in number since three points define a plane. The precise vertical position of the breaker members with respect to the base is not important. Also while the construction requires the slight gap **14***a* which is somewhat indeterminant, this is not significant since the downwardly bent lip **31** on the cover plate hides the joint.

It will be apparent that the automatic positioning of the blades with respect to the notches is to be contrasted with earlier constructions employing welded breaker members where interference has been encountered between the blades and the breaker members and where such interference has been difficult to correct because of the fact that, when the cover plate is assembled upon the base, the entire assembly is enclosed so that observation of the interfering condition, required for its correction, is not possible.

For the purpose of feeding leaves or other material into the machine a hopper **80** is provided having a front side **81**, a sloping backside **82** and lateral surfaces **83**, **84**, all of which taper to a feeding throat **85**. The widely flaring opening provided by the sloping side surface **82** provides a large access opening **86**. To obstruct direct vertical axis to the throat **85** for safety purposes a partial cover plate **87** is used. Nevertheless, the width of the throat, indicated at W in FIG. **2**, is sufficiently great so that long branches may be progressively fed into the opening **86**, downwardly through the throat **85** and into direct engagement with the rotary blades without any risk to the user.

It is one of the features of the construction that the hopper **80** is registered with a receptacle **90** in the cover plate **30**, but with provision for easy removability to uncover the opening when it is desired to replace the hopper by some other appropriate gathering and feeding arrangement as, for example, the ramp type feeding device which is covered in co-pending application Ser. No. 187,417 filed Oct. 7, 1971. To clamp the hopper into place the receptacle **90** has a pair of openings **91**, **92** along one side which are engaged by registering pins **93**,**94** on side **83** of the hopper. For the purpose of clamping the side **84** of the hopper down after the pins have been inserted, a clamping plate **95** of "Z" configuration is used, one edge **96** of which is welded to the hopper while the other edge **97** projects downwardly for seating on the cover plate. A hand screw **98** penetrating the plate **95** screws into the cover plate. To remove the hopper, the hand screw **98** is unscrewed from the cover plate and the hopper is tipped slightly to permit retraction of the pins **93**, **94**.

As will be noted in FIG. **2**, the throat **85** of the hopper is located radially inwardly, with respect to the blade axis, to the degree permitted by the engine profile so as to feed material as close to the blade axis as possible. To provide, at the same time, a relatively wide throat, the wall **13** of the base **11** is extended outwardly as indicated at **13***a* terminating in a lip **13***b* upon which the hopper seats. The surface **13***a*, which is sloped inwardly, provides an effective extension of the front side **81** of the hopper for efficient feeding of material to the blades. Since the throat or neck of the hopper has only limited taper, it is found that there is little or no tendency toward bridging at the region of feed.

It may be noted at this point that the oversize breaker member **63** is located immediately adjacent the receptacle **90** in the cover plate, presenting a horizontally slotted vertical surface which is generally alined with the edge of the receptacle. This provides an extensive anvil surface registering with the last several inches of blade length and which is particularly useful in the chopping up of large objects, such as long branches, as they are manually fed down through the hopper throat.

Turning next to the problem of ejecting the shredded material, a discharge conduit **100** is provided having a bottom surface **101** and side surfaces **102**, **103** which are integral with the base as well as a cover **104** which is integral with the top plate **30**, the members thus defining a discharge opening **105** of rectangular profile, through which material is ejected along a discharge axis **107** which is perpendicular to a radial line **108**. The latter is at an angle *a* of about 20° from a line **109** perpendicular to the inlet; in other words there is an angle of about 20° between the inlet and discharge.

Moreover, it will be noted that the breaker **61** is angularly spaced well ahead of the edge of the opening by an angle of more than 30° so that material cannot be "hung up" at its point of exit from the base. Next, it will be noted that the conduit **100** has an average length which is substantially greater than the length usually found in devices of this kind, being on the same order of magnitude as the radius of the base. This contributes to safety since it isolates the blades. Moreover, a straight relatively lengthy chute tends to insure well defined straight-line movement of the ejected material for more precise depositing in a bag or other receptacle. Finally, the walls **102, 103** of the conduit **100** are preferably slightly flaring with respect to one another to bring about a freer flow of material at high velocity through the discharge orifice **105**. A degree of flare on the order of 3° to 5° is preferred. All of these features cooperate to provide trouble-free discharge of all of the various types of garden waste, both dry and moist, that may be encountered.

It is one of the features that the discharge chute is physically, as well as angularly, separated from the inlet opening in order that there might be minimum interference with the development of suction at the inlet. Moreover, by locating the chute at some distance from the inlet the bag mounting, to be described, is made more accessible and the bag is located well clear of the ramp disclosed in the copending application referred to above.

It is one of the further features of the construction that a hinged deflector, indicated at **110**, is provided, which is horizontally hinged, by bolts **111,112**, to the conduit to provide an effective extension of the upper surface **104**. While capable of being angled downwardly at a slight angle in order to impart a downward component to any missiles which may be included in the stream of chopped material, the deflector may be positioned substantially horizontally when the machine discharges into an alined bag or other receiver. Preferably, the deflector is of inverted channel shape having downwardly bent side portions **115,114** which form a substantial continuation of the conduit side walls **102, 103**.

In carrying out the invention, means are provided for holding a receiving bag in general alinement with the discharge conduit and axially spaced from the discharge opening **105**. Preferably the bag holding means is in the form of a circular hoop or ring **120** supported upon a bracket **121** which is secured to the conduit by means of a bolt or the like **122**. The bag, indicated at **125**, has a neck which is dimensioned to somewhat exceed the diameter of the hoop **120**. For holding the neck of the bag in place, the hoop defines a peripheral groove with the bag being encircled by an elastic member so as to be held in the groove. Preferably, the hoop is made up of spaced rings **126, 127** of rod stock which are held in spaced relation by short axially extending pieces **128**. The elastic member is indicated at **129**. Preferably, the length of the bracket **121** is such as to permit a slight degree of overlap between the deflector **110** and the mouth of the bag. It is found that the shredded material, exiting from the conduit at high velocity tends to be caught, or deposited, in the bottom of the bag where the material builds up on the form of a compact mass. Very little of the material, even where it is in the form of dried leaves, is found to blow back out of the mouth of the bag, even as the bag gradually reaches its filled condition. The conduit is supported at such height that the weight of the material collected in the bag is borne directly by the ground and very little strain is placed upon the bag itself.

The present shredding and bagging device permits an approximate **10** to **1** compaction of leaves and similar trash, thereby greatly reducing the bulk which must be handled by the home owner and substantially reducing the haul-away charge which is usually charged "per bag" rather than by weight. It is found that a machine constructed as described overcomes the disadvantages which have become associated with prior devices of similar construction, notably the clogging which has sometimes occurred at the entry throat and at the discharge conduit. While the present device has been found to be capable of accepting all types of yard and garden trash without clogging, when disassembly of the cover plate from the base does become necessary it is a simple matter, requiring only the loosening of the peripheral clamping bolts **32** and removal of the hopper. In order to insure that neither of the blades is interfered with by the cooperating breaker elements, a check may be made to see that the blades are in a reference removal condition. Such a condition is achieved, for example, when one of the blades occupies the position **130** (FIG. **3**) easily visible through the feeding throat. Replacement of the cover plate **30** is equally simple, requiring only the restoration of the blade assembly to reference position. With the cover plate seated on the top surfaces of the breakers **61, 63**, precise register of the blades with the notches in the breaker is assured so that the clamping bolts **32** may be tightened. In order to insure that the cover plate is solidly bottomed vertically oriented "J" bolts **32*a***, as shown in FIG. **4*b***, may be substituted for the clamping bolts **32**.

Whenever the breakers become worn to the extent that replacement is necessary, they may be replaced simply by unscrewing the bolts **68** which mount them on the sidewall of the base. No particular care need be used to mount the breakers at precisely the same level as the ones which are removed, since the upper surfaces of the new breakers, taken together, form a new reference surface for seating the cover plate.

Because of the fact that the two blades **41,42** are rigidly welded to the hub **43**, it is impossible for them to get out of phase with one another. Yet in the event that either blade is overloaded by the striking of some obstruction inserted into the hopper throat, momentary relative slippage can take place between the rotor and the engine shaft thus preventing any damage to the engine.

When the rotor must be removed, for example, for resharpening of the blade tips, this is simply accomplished by unscrewing the nut **56** and removing the adjacent washers **57, 58** permitting the blade hub to be slipped clear of the shaft. When the sharpened blade assembly is slipped into place, or when a new blade assembly is substituted, it is automatically positioned with respect to the cover plate by reason of the shoulder **51** on the engine shaft insuring precise register of the blade and the cooperating notches.

In accordance with one of the aspects of the invention fins are secured, as shown at 42*a* in FIG. 3, to the underside of the lower blade 42 inwardly of the breakers and projecting downwardly for a short distance, for example, half an inch. Such fins, it is found, cause the floor to be continuously swept clear to augment the suction at the inlet as well as to provide a more well defined draft in the discharge chute.

The term "engine" as used herein refers to any rotational power source.

What is claimed is:

1. In a shredding and bagging machine for yard usage, the combination comprising a base of shallow cup shape having a bottom wall and a circular sidewall presenting an upper edge, transport means for supporting the base in horizontal position slightly upraised above the ground, a circular cover plate fitted to the base and having a downwardly turned lip about its periphery enclosing the upper edge of the base, an engine mounted on the cover plate and having a drive shaft which extends therethrough into the base, a rotor mounted on the engine shaft and including a diametrically extending blade having tips extending to the region of the sidewall, a plurality of breaker members secured at spaced positions within the sidewall and having horizontal notches formed therein registering with the tip portions of the blade, the breaker members being arranged vertically on the wall and projecting slightly above the upper edge thereof to define a reference surface for seating the cover plate thereby to insure precise registry between the blade and the notches in the breaker members, means for clamping the cover plate in position against the upper ends of the breaker members, means providing an opening in the plate for feeding material therethrough to the region of the blade, and means providing a discharge opening in the sidewall for forcible discharge of the shredded material.

2. In a shredding and bagging machine for yard usage, the combination comprising the base of shallow cup shape having a bottom wall and a circular sidewall presenting an upper edge, transport means for supporting the base in horizontal position slightly upraised above the ground, a circular cover plate fitted to the base and having a downwardly turned lip about its periphery enclosing the upper edge of the base, an engine mounted on the cover plate and having a drive shaft which extends therethrough into the base, a cylindrical sleeve surrounding and keyed to the shaft and providing a reference shoulder at its upper end, a rotor having a hub and a diametrically arranged blade with the hub being snugly telescoped over the sleeve, means including a nut threaded onto the lower end of the sleeve for clamping the hub in position against the shoulder so that the blade occupies a predetermined reference position with respect to the cover plate, a plurality of breaker members secured at spaced positions within the sidewall and having horizontal notches formed therein registering with the tip portions of the blade, the breaker members being arranged vertically on the wall and having supporting surfaces at the upper ends thereof defining a reference surface for the cover plate, land surfaces on the underside of the cover plate for engaging the supporting surfaces on the breaker members and for establishing a gap between the cover plate and the upper edge of the base when the land surfaces are seated, means for clamping the cover plate with respect to the base, means providing an opening in the cover plate for feeding material therethrough to the region of the blade, and means providing a discharge opening in the sidewall of the base for forcible discharge of the shredded material.

3. The combination as claimed in claim 1 in which the clamping means is in the form of a plurality of threaded members for clamping the downwardly turned lip of the cover plate against the sidewall of the base.

4. The combination as claimed in claim 2 in which a frictional element is interposed between the cylindrical sleeve and the hub for normal driving of the hub but for permitting momentary relative slippage of the hub on the sleeve when the blade strikes an obstruction.

5. The combination as claimed in claim 1 in which the tip portions of the blade have sharpened leading edges.

6. In a shredding and bagging machine for yard usage, the combination comprising a base of shallow cup shape having a bottom wall and a circular sidewall presenting an upper edge, transport means for supporting the base in horizontal position slightly upraised above the ground, a cover plate having provision for clamping to the base for enclosing the same, an engine mounted on the cover plate and having a drive shaft which extends therethrough into the base, a rotor having a blade and dimensioned to telescope over the engine shaft, means for holding the rotor on the shaft in a predetermined axial position with respect to the cover plate, the blade having tip portions extending to the region of the sidewall, a plurality of breaker members at spaced positions on the sidewall and having horizontal notches formed therein for registering with the tip portions of the blade, the breaker members having reference surfaces at their upper ends engagable with land surfaces on the cover plate for holding the cover plate in a predetermined position relative to the notches thereby to insure precise registry between the blade and the notches when the cover plate is clamped to the base, means providing an opening in the cover plate for feeding material therethrough to the region of the blade, means including a discharge conduit penetrating the sidewall for generally tangential discharge of the shredded material, and means for supporting the neck of a bag at the discharge end of the conduit for receiving the material discharged therefrom.

7. The combination as claimed in claim 6 in which the conduit is angled outwardly for a true tangential position.

8. The combination as claimed in claim 6 in which the bag supporting means is in the form of a ring having a supporting bracket secured to the conduit for holding the ring in approximate axial alinement with respect to the conduit.

9. The combination as claimed in claim 6 in which the bag supporting means is in the form of a ring having a peripheral groove and in which the neck of the bag is encircled by an elastic member for holding the neck in the groove.

10. The combination as claimed in claim 6 in which the breakers are of "A" cross section having integral

flanges at the feet of the "A" apertured to receive bolts for removable bolting of the breaker members inside the sidewall of the base.

11. The combination as claimed in claim **6** in which a deflector is secured to the discharge end of the conduit in the form of a shallow inverted channel which is horizontally pivoted to the conduit for slight downward angling and which extends to the region of the mouth of the bag to conduct material therein while applying a downward component to missiles ejected from the conduit.

12. The combination as claimed in claim **6** in which the breakers are three in number spaced clear of the conduit.

13. In a shredding and bagging machine for yard usage, the combination comprising a base of shallow cup shape having a bottom wall and a circular sidewall presenting an upper edge, transport means for supporting the base in horizontal position slightly upraised above the ground, a generally circular cover for enclosing the base, an engine mounted on the cover plate and having a drive shaft which extends therethrough into the base, a rotor having a hub with upper and lower vertically spaced blades welded thereto, with the hub being dimensioned to telescope over the engine shaft, means for holding the rotor on the shaft in a predetermined axial position with respect to the cover plate, the blade having tip portions extending to the region of the sidewall, a plurality of breaker members at spaced positions on the sidewall and having horizontal notches formed therein for registering with the tip portions of the blade, means including seating surfaces and clamping bolts for holding the cover plate in a predetermined position relative to the notches thereby to insure precise registry between the blade and the notches when the cover plate is clamped to the base, a hopper having a throat positioned over an opening in the cover plate for feeding material therethrough to the region of the blade, means including a discharge conduit penetrating the sidewall for generally tangential discharge of the shredded material, and means for supporting the neck of a bag at the discharge end of the conduit for receiving the material discharged therefrom.

14. The combination as claimed in claim **13** in which the clamping bolts are in the form of bolts secured in vertical position to the sidewall of the base and penetrating the cover.

15. The combination as claimed in claim **13** in which the lower blade is fitted with generally radially extending fins on the underside spaced inwardly of the breaker members.

* * * * *