June 23, 1953 H. M. DODGE ET AL 2,642,877

FLAILING TYPE BEATER MEANS FOR THRESHING APPARATUS

Filed Nov. 17, 1948 3 Sheets-Sheet 1

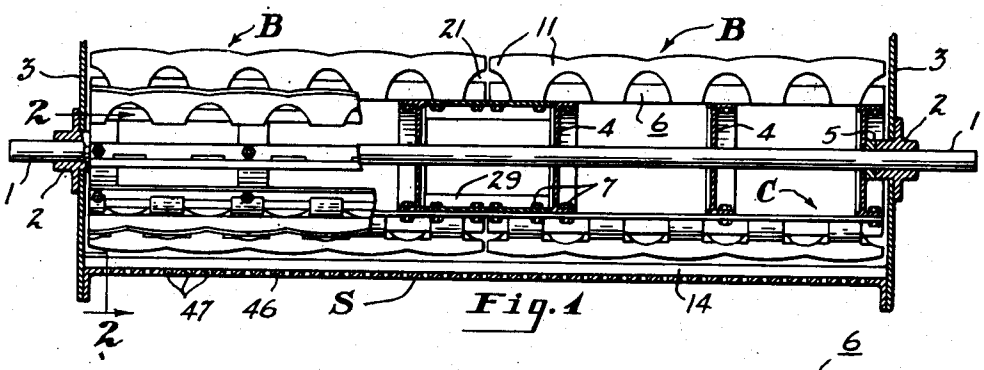


Fig. 1

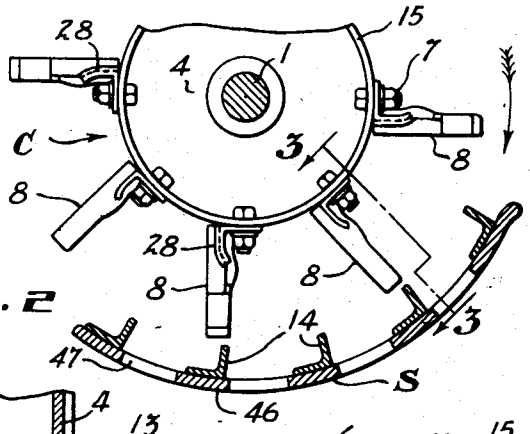


Fig. 2

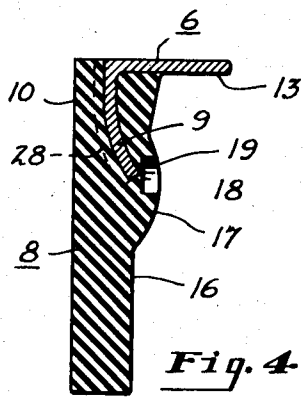


Fig. 4

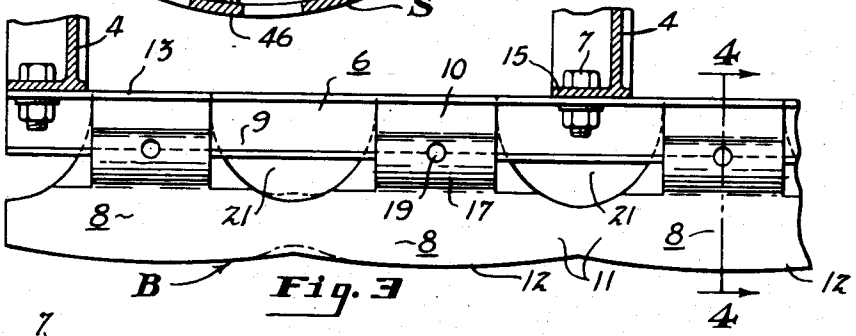


Fig. 3

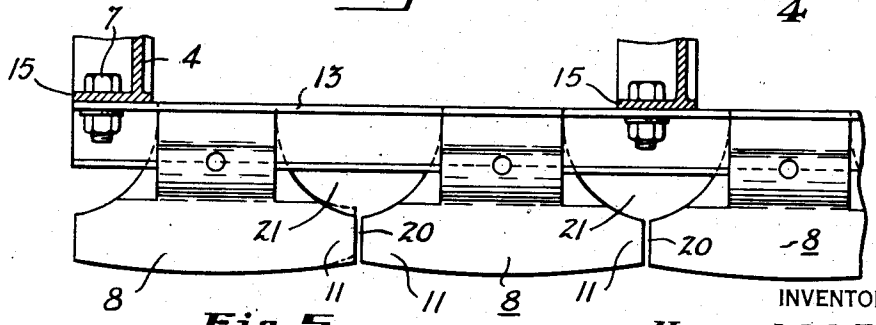


Fig. 5

INVENTOR
Howard M. Dodge
BY Clarence Neff
Evans & McCoy
ATTORNEYS

June 23, 1953 H. M. DODGE ET AL 2,642,877

FLAILING TYPE BEATER MEANS FOR THRESHING APPARATUS

Filed Nov. 17, 1948 3 Sheets-Sheet 2

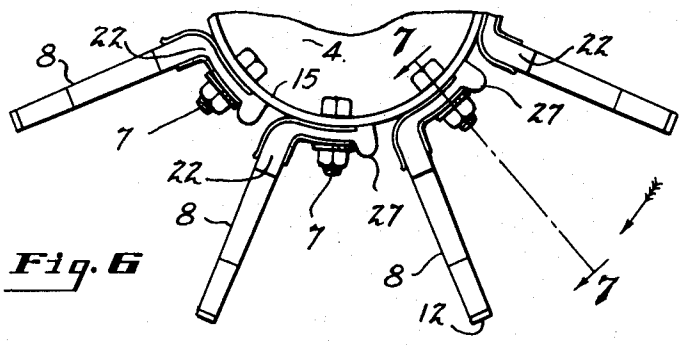


Fig. 6

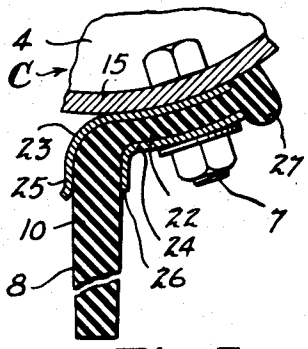


Fig. 8

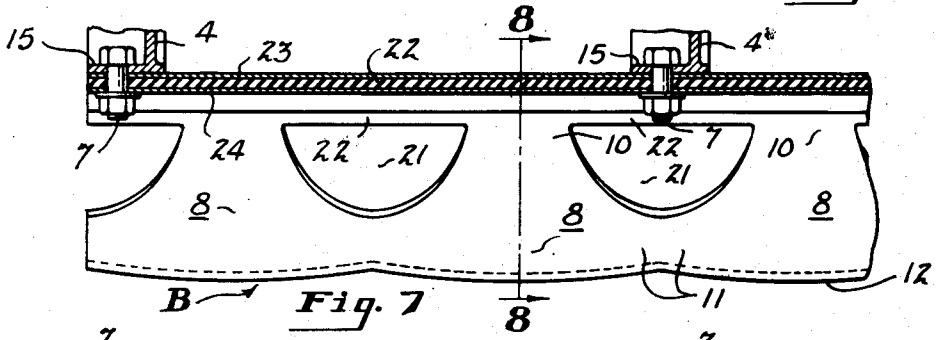


Fig. 7

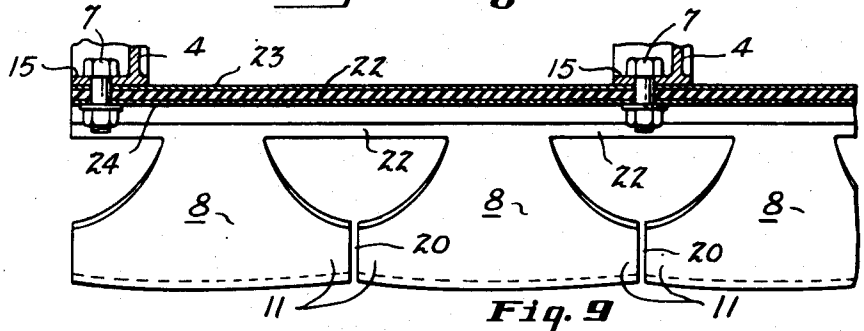


Fig. 9

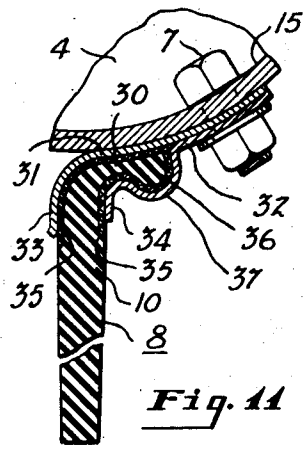


Fig. 11

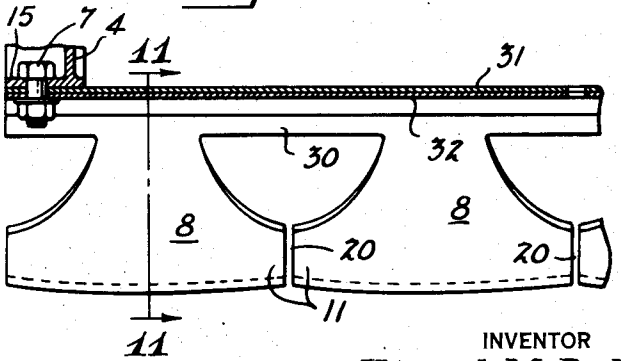


Fig. 10

INVENTOR
Howard M. Dodge
BY Clarence Neff
Evans & McCoy
ATTORNEYS

June 23, 1953 H. M. DODGE ET AL 2,642,877

FLAILING TYPE BEATER MEANS FOR THRESHING APPARATUS

Filed Nov. 17, 1948 3 Sheets-Sheet 3

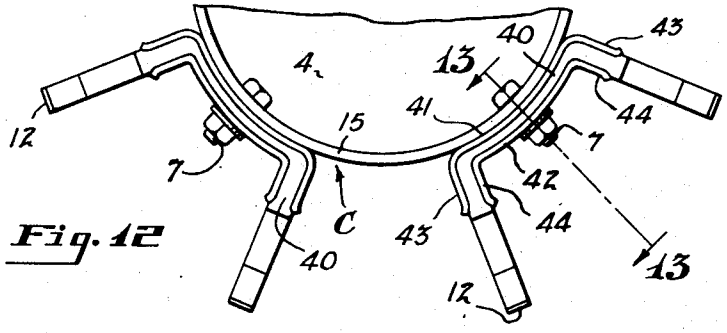


Fig. 12

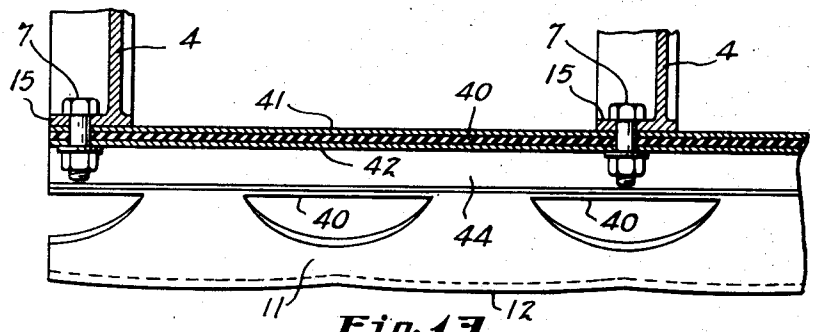


Fig. 13

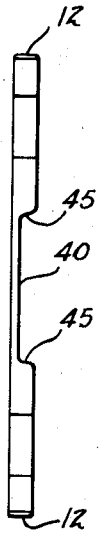


Fig. 14

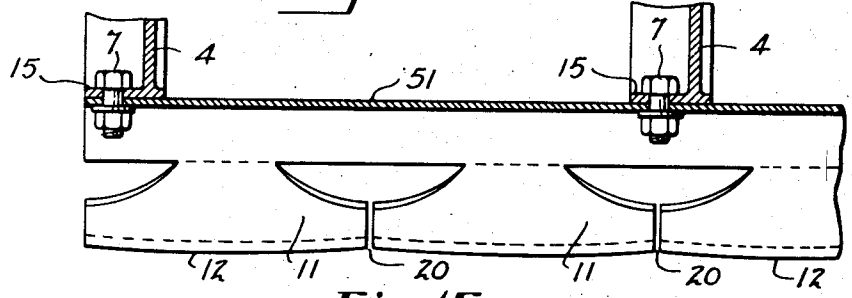


Fig. 16

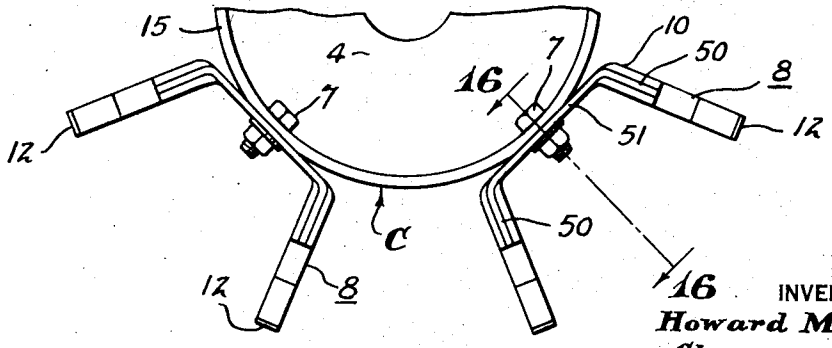


Fig. 15

INVENTOR
Howard M. Dodge
BY Clarence Neff
Evans & McCoy
ATTORNEYS

Patented June 23, 1953 2,642,877

UNITED STATES PATENT OFFICE

2,642,877

FLAILING TYPE BEATER MEANS FOR THRESHING APPARATUS

Howard M. Dodge and Clarence Neff, Wabash, Ind., assignors to The General Tire and Rubber Company, Akron, Ohio, a corporation of Ohio

Application November 17, 1948, Serial No. 60,604

6 Claims. (Cl. 130—27)

1

This invention relates to threshing machines, and more particularly to an improved rotatable cylinder for use in separators of the beater type. The improvements of the present invention are directed to threshers of the type shown in U. S. Patent No. 2,265,380, issued December 9, 1941, to Harold Maginn.

The principal object of the present invention is the general improvement of the threshing action in separators of the rotary beater type, this objective being achieved by utilizing radially extending deformable beater elements that are relatively thin and yield circumferentially. Preferably the beaters are formed to include unsupported elements or portions to yield radially. A soft beating action is thus obtained that minimizes crushing of grain and other crops. By reason of the yielding of the beaters the present thresher tends to reject large bulky articles and prevent them from entering the machine. Yet, by reason of yielding readily both circumferentially and radially, the beaters permit large and bulky articles not rejected to pass through the thresher without objectionable damage to the apparatus.

Another object of the invention is achieved in a novel cylinder construction wherein a plurality of shaft mounted discs or spiders are connected together for rotation in unison by a plurality of rigid bars arranged parallel to and equidistant from the shaft, the bars also serving as supporting elements for carrying yieldable molded rubber beaters, the beaters preferentially being integrally connected in gangs and permanently bonded to the bars as by vulcanization during molding.

Another object of the present invention is to provide an improved cylinder construction which comprises the combination of a rotatable structure or support and a plurality of groups or multiple units of beater elements demountably secured to the support for facile assembly and removal, permitting the thresher to be quickly and easily repaired.

Another object is to provide beater elements of the yieldable type which are arranged in a group or gang along a connecting member, the connecting member preferably being of rigid character to facilitate mounting of the multiple unit or gang beaters on the rotatable support or drum of the thresher.

Another object is to provide, in combination, a rigid thresher cylinder structure or rotatable support, and groups of integral or separate beaters adapted for unit mounting on the cylinder structure. More specifically, the invention seeks to provide individual or separate beaters

2

connected together in groups at or adjacent their bases for attachment in multiple units to a rotatable thresher structure.

Still further objects and advantages of the invention relate to details of construction and arrangements of parts to provide for more economical manufacture of threshers and their component parts and for economical maintenance and repair of worn and broken beaters, as will become apparent from the following detailed descriptions of several embodiments of the invention. This description is made in connection with the accompanying drawings forming a part of the specification. Like parts throughout the several views are indicated by the same letters and numerals of reference. In the drawings:

Figure 1 is a longitudinal sectional view through the cylinder and concave of a thresher showing a preferred construction, the view corresponding to Fig. 2 of the patent referred to, and parts being broken away and removed;

Fig. 2 is a transverse sectional detail, with parts broken away and removed, taken substantially along the line indicated at 2—2 of Fig. 1 and enlarged with respect to that figure;

Fig. 3 is a sectional detail through the cylinder, this view being taken along the line indicated at 3—3 of Fig. 2, with parts broken away and removed and enlarged with respect to that figure;

Fig. 4 is a sectional detail taken substantially along the line indicated at 4—4 of Fig. 3 and enlarged with respect to that figure;

Fig. 5 is a longitudinal sectional detail similar to Fig. 3, showing a modification in which the beaters are divided into separate elements;

Fig. 6 is a fragmentary elevational view showing the lower half of one end of a modified beater cylinder, parts being broken away and removed;

Fig. 7 is a longitudinal sectional detail taken substantially along the line 7—7 of Fig. 6;

Fig. 8 is a sectional detail, with parts broken away and removed, taken substantially along the line 8—8 of Fig. 7;

Fig. 9 is a longitudinal sectional detail similar to Fig. 7, showing a modification similar to that illustrated in Figs. 6 through 8, the beater groups being divided to provide separate beater elements along the working edges of the beaters;

Fig. 10 is a longitudinal sectional detail, with parts broken away and removed, showing a modification in which the rubber beater groups are secured in place by metal clamping elements attached to the rotatable supporting structure or drum and engaging the beater groups along their inner edges;

Fig. 11 is a sectional detail, with parts broken

away and removed, taken substantially along the line indicated at 11—11 of Fig. 10;

Fig. 12 is an elevational view showing the lower half of one end of a modified cylinder assembly in which rubber beaters in groups are arranged in integral pairs, each pair being secured to the rotatable drum or supporting structure by common metal clamping means;

Fig. 13 is a longitudinal sectional detail, with parts broken away and removed, taken substantially along the line indicated at 13—13 of Fig. 12;

Fig. 14 is an end elevational view showing the integrally joined beaters of Figs. 12 and 13 in their unstressed shape in which the beater groups are molded;

Fig. 15 is an elevational view of the lower half of one end of a thresher cylinder showing a modified gang beater construction; and

Fig. 16 is a longitudinal sectional detail, with parts broken away and removed, taken substantially along the lines indicated at 16—16 of Fig. 15.

The separator shown in assembly in Fig. 1 comprises a driven shaft 1 horizontally supported in journals 2 of spaced end plates 3, the latter being parts of the housing of the thresher. A number of circular discs or spiders 4 are spaced along the shaft 1, several of the discs having enlarged hubs 5 which are drivingly secured to the shaft 1. The discs are secured together in groups by rolled steel angle connecting members or bars 6 arranged in parallel relation to one another and spaced circumferentially about the flanged peripheries of the discs. The bars are secured as by bolts 7 which pass through aligned holes in the bars and disc flanges 15. Thus, the spiders and bars comprise a supporting structure or cylinder C which rotates with the shaft 1. The bars 6 are substantially parallel to and equidistantly spaced from the shaft and from one another, although other mounting arrangements can be used.

Secured along each of the bars 6 is a group or gang B of integrally connected beater elements 8 formed of molded rubber, either natural or synthetic, compounded to exhibit physical characteristics substantially like those of the rubber employed in conventional pneumatic vehicle tires. The gang beater elements 8 are simultaneously cured or heat molded in place to one of the flanges of the bars 6. Although the beaters 8 may be individually mounted on or vulcanized to either short or long sections of the attaching bars 6 it is preferable, for reasons of economy and improved operating characteristics, to mold and attach the beaters to the mounting bars in groups or gangs. A multiple pocket vulcanizing mold is used for this purpose, the mold having as many as five or more cavities in side by side aligned relation to form a like number of the beaters 8. The mold is formed with a recess to receive the mounting bar 6 to which the several beaters are simultaneously secured by vulcanization during the single molding operation.

The several mold cavities may be continuous with one another so that during the molding operation the several beaters are integrally connected together through wing portions 11, as shown in Fig. 3. The curved outer edges 12 of the several beaters form a continuous or unbroken undulating edge along the entire length of the group or gang of beaters.

A suitable adhesive agent is employed to insure that the elements bond to the bars during vulcanization. Preferably the bar flanges 9 to which the beaters are bonded or attached are transversely curved away from the direction of rotation of the beaters. This curving of one of the bar flanges toward the other or attaching flange 13 strengthens the beater structure and minimizes tearing and breaking of the individual rubber beaters under severe and repeated bending and deformation encountered in the threshing operation. The convex leading faces of the curved flanges 9 are preferably covered with a protective rubber sheath 28 bonded thereto during molding of the beaters and integral with the rubber of the beaters.

Each beater element is generally of T shape, having a central attaching portion 10 and divergent wing portions 11 which taper toward their tips. The base of the attaching portion 10 is molded to embrace the curved flanges 9 of the bars and the beaters extend radially from the cylindrical supporting structure C to which they are thus attached.

In operation the outer edges 12 of the beater element pass in close proximity to a number of bars 14 forming part of a concave structure S supported beneath the beater cylinder. The concave structure includes a curved body member or plate 46 concentric to the rotational axis of the cylinder. Threshing action occurs through the striking of the grain by the beaters 8 and against the bars 14 and through the cooperative action of the beaters and the concave bars.

The beater cylinder is rotated by a suitable power source, not shown, to turn in a clockwise direction, as viewed in Fig. 2 and as indicated by the arrow in that figure. A number of spaced openings 47 are provided in the concave plate to release threshed grain to drop between the beater bars 14 from the interior of the concave structure.

Each of the beaters is considerably greater (several times greater) in radial height than in circumferential thickness, preferably having a height as much as about five times its thickness. The laterally unsupported or "free bending" height radially outward or beyond the edge of the curved flange of the bar is less than the total height, being preferably at least about three times the thickness of the working portions of the beater. The working portions referred to are the wing portions 11 and the body portions located between the wing portions. The axial length of each beater along the cylinder is also several times greater than the beater thickness. This construction results in pronounced circumferential yielding or bending of the beaters during the threshing operation. Some twisting also occurs, particularly in those beaters having wing tips separated from adjacent beaters, as later described. The bending and twisting tends to localize in those attaching portions 10 of the beaters adjacent the mounting bars 6 by reason of the radially tapered configuration and cross section of each beater. The width of each beater increases toward its outer or beating edge 12.

Each beater is desirably formed on its rear face with a raised or thickened portion 17 which provides a locally increased section in the body of the beater adjacent the edge 18 of the curved bar flange 9. This increased section distributes the bending in the stem portion of the beater element and provides an increased rubber section about the edge 18 of the bar flange 9 to resist any tendency of the rubber to fail or become separated from the metal. In the molding or beater

forming operation the bar 6 may be supported in the mold as by spaced pins which engage the edge 18 of the curved flange 9. Such support pins form localized cavities 19 in the increased rubber section 17.

In a thresher having the wing portions of adjacent beaters integrally connected, the beaters provide mutual support for one another in resisting both radial and circumferential deflection or deformation. Along the length of such a gang of integrally connected beaters the resistance to radial deflection varies, being greatest in line with the attaching portions 10 of the beater elements and being least along the line of attachment between adjacent beaters. The deformable and resilient beaters are shown in their static or unstressed condition by the full lines of the drawings. During rotation under dynamic conditions, however, the centrifugal force acting on the beater bars causes the wing portions 11 to move or bend radially outward so that the outer edges 12 become substantially straight. Thus, the several beaters of each gang cooperatively present a substantially straight beating edge extending the full length of the cylinder.

Should a hard or non-yielding object enter between the concave structure S and the rotating cylinder, the resilient beaters are adapted to yield and prevent damage to the thresher. The shape of the beaters and the extreme deformability of the wing portions 11 permits relatively large objects, such as stones and pieces of wood, to pass harmlessly through the thresher. Since the wing portions 11 of the beater are radially unsupported, radial deflection or yielding thereof occurs under relatively light loads. Broken lines in Figs. 3 and 5 illustrate positions of the beater wing portions 11 when subjected to radial loads.

A thresher cylinder of any desired length may be built up using cylinder sections mounting the beater gangs of the present invention. In Fig. 1 a group of the beater gangs is mounted on each of two cylinder sections supported on the shaft 1 in end to end relation. The individual beater supporting bars 6 of the two cylinder structures are aligned with one another, abutted, and connected by bolted tie bars 29. A longer shaft may be employed and additional groups of beater gangs may be added on other cylinder sections to obtain any desired beater length. Should one or more of the beaters 8 become worn or damaged, the bar 6 mounting such beater may be readily removed from the cylinder assembly and replaced by a new beater gang unit.

In building up the thresher cylinders of the present invention, the beater gangs are arranged on the supporting disks 4 so that the individual beater elements 8 are offset axially with respect to one another around the circumference of the cylinder. Thus, a more uniform beating action occurs along the length of the cylinder, the relatively soft and yieldable wing portions 11 of the beater being followed by a relatively stiffer central portion of a succeeding beater. As shown in Fig. 1, the cylinder employs eight rows of beaters equally spaced circumferentially. The beater elements of adjacent rows are axially spaced a distance corresponding to half the width of the beater element, although other spacings or axial offsets may be employed.

The gang beater units or assemblies each comprises an elongated integral rubber structure which, when mounted as part of a thresher cylinder, is of greater radial height than circumferential thickness. Between the yieldable wing portions 11 of the beaters and the relatively stiff or rigid attaching bars 6 are openings or spaces 21, preferably semi-circular in form, located at equally spaced intervals along the length of each gang beater.

As an alternative arrangement the wings 11 of adjacent beaters may be separated or severed from one another as by radial knife cuts or slots 20, Fig. 5. The slots may be molded in place or formed by cutting after removal of the gang beaters from the mold. Preferably this through cutting or slitting of the rubber along lines between the wing portions of adjacent beater elements is performed, as by a hot knife or a rotating water lubricated circular cutter, shortly after the molding operation in which the multiple beater gangs are each formed as an integral unit. For example, the severing is desirably done while the rubber retains sufficient of the molding heat to be perceptible by manual contact.

The inherent tendency of the molded rubber to shrink more than the metal support bar upon cooling after removal from the mold, or, differently stated, the difference in the coefficients of thermal expansion of the rubber of the beaters and the steel of the support bar, the rubber coefficient being greater, is thus utilized to provide, without removal of any substantial amount of the rubber material, the spaces 21 between the confronting ends of the adjacent beaters, the individual beaters being held in predetermined positions along the length of the rigid metal support bar 6 and the overall length of the beater gang being predetermined and accurately controlled by the bar.

In the thresher of Fig. 5, wherein the wings of the individual beaters 8 are not connected to the wings of adjacent beaters, the wings 11 are cantilever structures and readily yield when subjected to radial loads.

For example, one of the beater wings 11 may be deflected radially inward to substantially the position indicated by the broken lines of Fig. 5 when driven against a non-yielding object, such as a rock or a stone, or even against a branch or heavy weed stock. The full lines of Fig. 5 show the beater elements in their unstressed condition, it being understood that during operation centrifugal force causes the wings of the beater elements to bend outwardly so that the working edges of the beater elements become substantially straight.

In Figs. 6 through 8 is illustrated a modification in which the beaters 8 of each gang are formed at spaced intervals along a rubber base strip 22. The base strip is continuous throughout the length of the gang and is integrally connected to the attaching portions 10 of the beaters. The base strip 22 includes a portion, preferably angularly disposed with respect to the plane of the beaters, which serves as an attaching flange received between clamping plates 23 and 24 of rolled or stamped sheet metal. The bolts 7 extend through aligned openings in the plates 23 and 24, the beater flanges 22, and the flanges 15 of the spiders 4.

The beaters 8 may be molded with the attaching flange strip 22 angularly disposed, as shown, or the beaters and strip may be molded flat and bent to the desired angle in assembly. Lateral flanges 25 and 26 on the clamping plates 23 and 24 respectively are spaced to receive between them the attaching base strip 22. These plate flanges are shaped to hold the beaters in the desired

radial positions relative to the cylinder structure C.

A number or gang of the beaters are integrally formed in end to end relation in a single molding operation. The attaching plates 23 and 24, as well as the rubber base strip 22, are continuous throughout the length of the gang beater and serve as elements of the cylinder structure to connect the spiders 4. Along the edge of the base strip 22 is formed an integral enlargement or bead 27 which serves to locate the strip with respect to the clamping plates 23 and 24 and also to resist shifting of the strip under the strong centrifugal forces developed during rotation of the cylinder in threashing. The base strip 22, although preferably one piece for each beater gang, as shown, may alternatively comprise short lengths each integral with the attaching portion 10 of one of the beaters.

The several beater elements of the gang may be integrally connected through the ends of their wing portions 11 as illustrated in Fig. 7, or the wing portions may be severed or separated by the slots 20, as shown in Fig. 9. These slots may be formed during the molding operation or subsequently by slitting with a knife or other cutter.

Figs. 10 and 11 illustrate a modification in which an attaching flange 30, preferably integrally formed along the attaching portions 10 of the several beater elements of the gang, is clamped between rolled or stamped metal plates 31 and 32 bolted to the flanges 15 of the rotatable discs 4. The attaching flange 30 may be molded in the angularly disposed position, relative to the beaters, as illustrated, or the beaters and attaching flange may be molded flat with the flange substantially in the plane of the beaters. When the attaching flange 30 is molded in the plane of the beater it is bent to the angular position illustrated in Fig. 11 in assembly and angularly disposed flanges 33 and 34 on the plates 31 and 32, respectively, hold the beaters in the desired radial positions on the cylinder structure. A protective covering of rubberized fabric material, indicated at 35, may be wrapped about and bonded to the attaching flange 30 to protect the rubber against chafing between the clamping plates 31 and 32. A bead or enlargement 36 is formed along the edge of each of the rubber attaching flanges 30 and is received in a matching longitudinally extending pocket formed by an intermediate channel portion 37 of the plate 32. The interlocking connection so provided resists withdrawal of the rubber attaching flange from between the clamping plates. The longitudinally extending attaching flange is wholly embraced by the clamping plates 31 and 32, and is held solely by the clamping action, there being no piercing of the rubber parts by the bolts 7 or in the case of the preceding and succeeding embodiments.

The beaters of the gang of Figs. 10 and 11 are integrally connected to one another in the molding operation through the continuous attaching flange 30. Thus the axial spacing of the beaters along the cylinder is predetermined in this modification as in the embodiments of the invention illustrated in the other figures. The beaters may be integrally joined at the ends of their wing portions 11 or, as illustrated, the wing portions may be severed or separated by the slots 20.

Figs. 12 through 14 illustrate another modified arrangement wherein gangs of beaters are connected in pairs through their bases 10 by integral attaching members or webs 40 clamped to the cylinder structure C by inner and outer plates 41 and 42 respectively. The plates are fastened to the cylindrical flanges 15 of the discs or rotatable members 4 by the bolts 7 and the plates have angularly disposed flange portions 43 and 44 which embrace radially disposed portions of the connecting webs 40 to hold the beaters in the desired radial positions relative to the cylinder structure. The gang beater pairs, for reasons of economy, are preferably molded flat or in a common plane, as shown in Fig. 14, and bent to the desired radial positions in assembly. The attaching plates 41 and 42 extend the full length of the beater gangs and serve to hold the beaters in the radial positions desired. The outer or working portions of the beater elements, adjacent the edges 12, are free to bend circumferentially of the cylinder during threshing. The connecting webs 40 have central portions of reduced section providing locating corners 45 for centering the attaching plates 41 and 42, thereby facilitating assembly.

The several beaters of each gang integrally connected through their bases 10 and wing portions 11, are also integrally connected through the web 40 to the beaters of the companion gang. If desired, slots may be formed between the wings 11 of some or all of the beaters, corresponding to the slots 20 previously mentioned.

Figs. 15 and 16 illustrate still another modified arrangement wherein the beater gangs are arranged in companion pairs. Each beater is bonded as by vulcanization to one of two angularly disposed flange portions 50 of an attaching plate 51 secured by the bolts 7 to the circular flanges or rims 15 of the discs 4. The flange portions 50 of the attaching plate are embedded in the base portions 10 of the beaters and the rubber of the beater portions 10 may be continuous or integral with a protective rubber covering on the flanges 50. This rubber covering, bonded to the metal of the flanges, extends throughout the length of the gang, serving as an integral connection between the several beaters.

As many as four or more of the companion pairs of gang beaters are spaced equally about the circumference of the cylinder supporting structure C. The attaching plates 51 serve not only as supports for the companion pairs of gang beaters but also as elements of the cylinder structure C. If desired, however, the attaching plates 51 may be short axial length, each carrying only a single pair of divergent beaters for attachment to a suitable cylinder structure. The wing portions 11 of adjacent beaters are separated by the slots 20 although, if desired, the slots may be omitted so that the beater wings are integrally connected along the length of the gang.

The beaters of the present thresher, as exemplified in the several embodiments illustrated, exhibit soft threshing characteristics by reason of their relatively thin section in a circumferential direction in combination with their relatively great radial height. In each instance, the beaters have a laterally or circumferentially unsupported radial height at least about three times their thickness. Thus the beaters yield or bend back readily upon impact against their working faces adjacent the edges 12, the yielding being opposite the direction of rotation. This bending of the beaters under impact presents convex faces to articles, especially heavy and bulky articles such as rocks, wooden blocks and earth clods, seeking to enter the threshing zone. Such articles are acted upon by the bent beaters so as to be rejected and largely prevented from

entering the threshing zone. Yet smaller and lighter articles, such as grain and the like, are drawn into the thresher by the fan or blower action of the moving beaters acting as vanes and are moved through the thresher between the rotary cylinder and the concave S and subjected to the desired soft flailing or threshing action of the beaters.

In accordance with the patent statutes the principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiments shown in the drawings and described above are given merely for purposse of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What we claim is:

1. A gang beater assembly for use in a thresher having a rotatable cylinder structure, said beater assembly comprising an elongated rigid bar adapted to be secured rigidly to the cylinder structure of the thresher for rotation with such structure and for facile removal and replacement, an elongated rubber beater member disposed in spaced generally parallel relation to the rigid bar and generally coextensive in length therewith, and a plurality of rubber stems formed integrally with the rubber beater member and spaced along the length of the latter said stems each extending between the rubber beater member and the rigid bar and each being secured to the rigid bar for supporting the beater member in said spaced parallel relation whereby upon securing the rigid bar to the cylinder structure of a thresher the rubber stems extend from the rigid bar generally radially outwardly with respect to the rotational axis of the cylinder and the rubber beater member is supported on the rigid bar at points spaced along the length of the beater member wholly by the integral rubber stems and in radially outwardly spaced relation to the rigid bar for deflection circumferentially of the cylinder structure by bending of the rubber stems.

2. The gang beater assembly of claim 1 characterized in that the portions of said rubber beater member intermediate the integral stems are each greater in depth radially of said axis and cylinder structure than in thickness circumferentially of said axis and cylinder structure.

3. The gang beater assembly of claim 1 characterized in that each of the rubber stems is greater in thickness circumferentially of said cylinder structure than the rubber beater member.

4. The bang beater assembly of claim 1 characterized in that the portions of said rubber beater member intermediate the integral stems are each greater in depth radially of said axis and cylinder structure than in thickness circumferentially of said axis and cylinder structure, and in that each of the rubber stems is greater in thickness circumferentially of said cylinder structure than the rubber beater member.

5. The gang beater assembly of claim 1 characterized in that the rigid bar is of metal formed with a longitudinally extending flange and in that the rubber stems are individually attached to the said flange.

6. The gang beater assembly of claim 1 characterized in that the rigid bar is of metal of substantially L section providing a pair of angularly disposed flanges extending longitudinally of the bar, one flange of the pair being formed to receive elements for securing the bar to the cylinder structure and the rubber stems each being secured to the other flange of the pair.

HOWARD M. DODGE.
CLARENCE NEFF.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
547,813	Snyder	Oct. 15, 1895
2,265,380	Maginn	Dec. 9, 1941
2,308,367	Johnson	Jan. 12, 1943
2,320,944	Maginn	June 1, 1943
2,320,945	Maginn	June 1, 1943
2,321,019	Dray	June 8, 1943
2,327,113	Krotz	Aug. 17, 1943
2,327,901	Johnson	Aug. 24, 1943
2,329,346	Goff	Sept. 14, 1943
2,336,693	Maginn	Dec. 14, 1943
2,361,633	Jones	Oct. 31, 1944