United States Patent

Fishburne

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[54] APPARATUS FOR PACKING LOOSE COMPRESSIBLE MATERIAL IN RECTANGULAR CONTAINERS

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Related U.S. Application Data

[63] Continuation of Ser. No. 746,064, July 19, 1968, abandoned.

[52] **U.S. Cl.** ..... **53/124 B,** 53/124 D, 53/124 E, 53/124 CC

[51] **Int. Cl.** **B65b 1/24,** B65b 1/28, B65b 63/02

[58] **Field of Search** 53/24, 124

[56] **References Cited**

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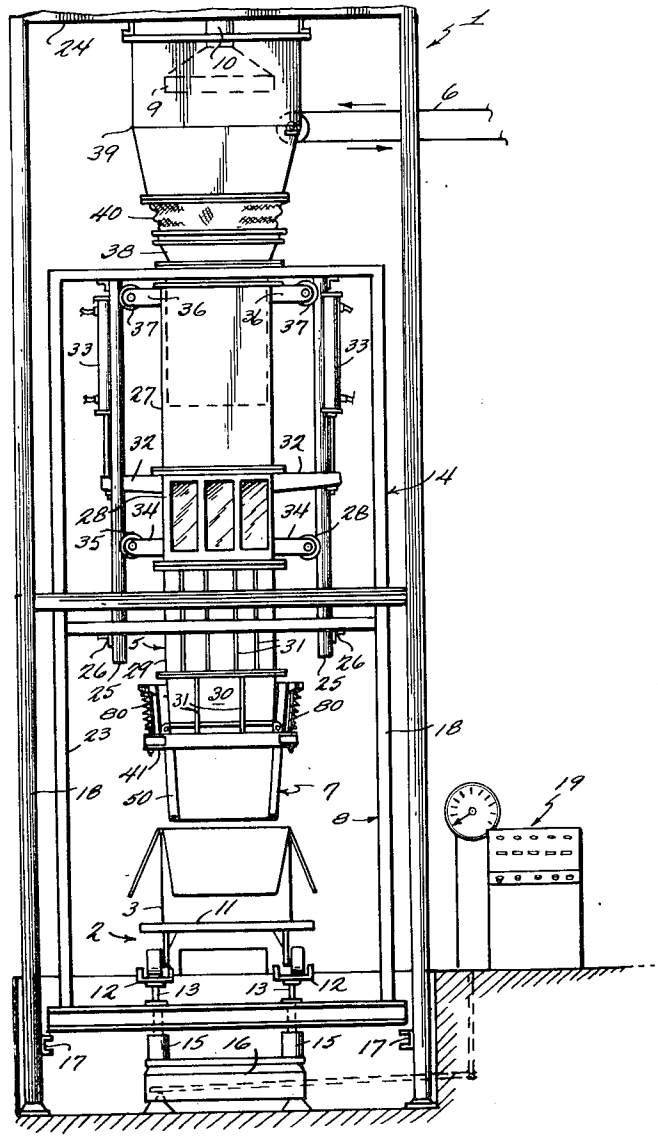
[57] **ABSTRACT**

Apparatus for packing loose, compressible material, such as leaf tobacco, in rectangular containers. The invention is an improvement in apparatus of the type comprising a press with a vertically reciprocatory plunger, means for supporting the rectangular container below the press plunger, and an upright charger which surrounds the path of the press plunger and through which the plunger moves, the charger being movable upwardly and downwardly independently of the press plunger. The invention provides a sleeve mounted on the lower end of the charger and depending therefrom, the sleeve being inserted into the rectangular container as the charger descends, and being extracted from the container by upward movement of the charger, as the press plunger remains in lowered position to keep the compressed material within the containers. The construction of the sleeve is such that it is initially tapered, assuring ease of entry through the open top of the container, without danger of damaging the container. As the compressible material is packed into the sleeve, after the sleeve has been inserted in the container, the sleeve expands to a rectangular form of uniform transverse cross section. The construction of the sleeve, and its relation to the charger and the container, are such as to provide an improved action in minimizing and resisting the forces exerted by compression of the material within the container.

13 Claims, 12 Drawing Figures



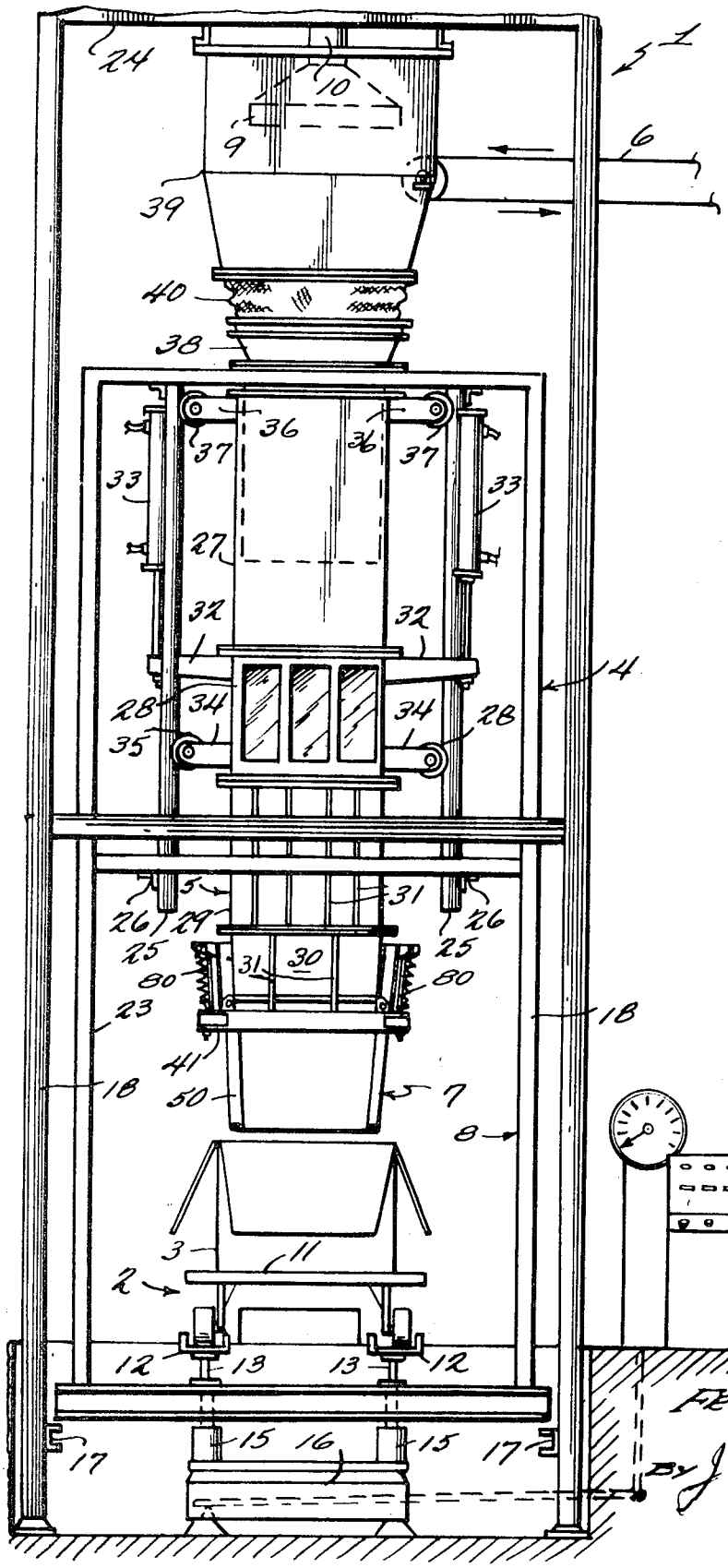


Fig. 1

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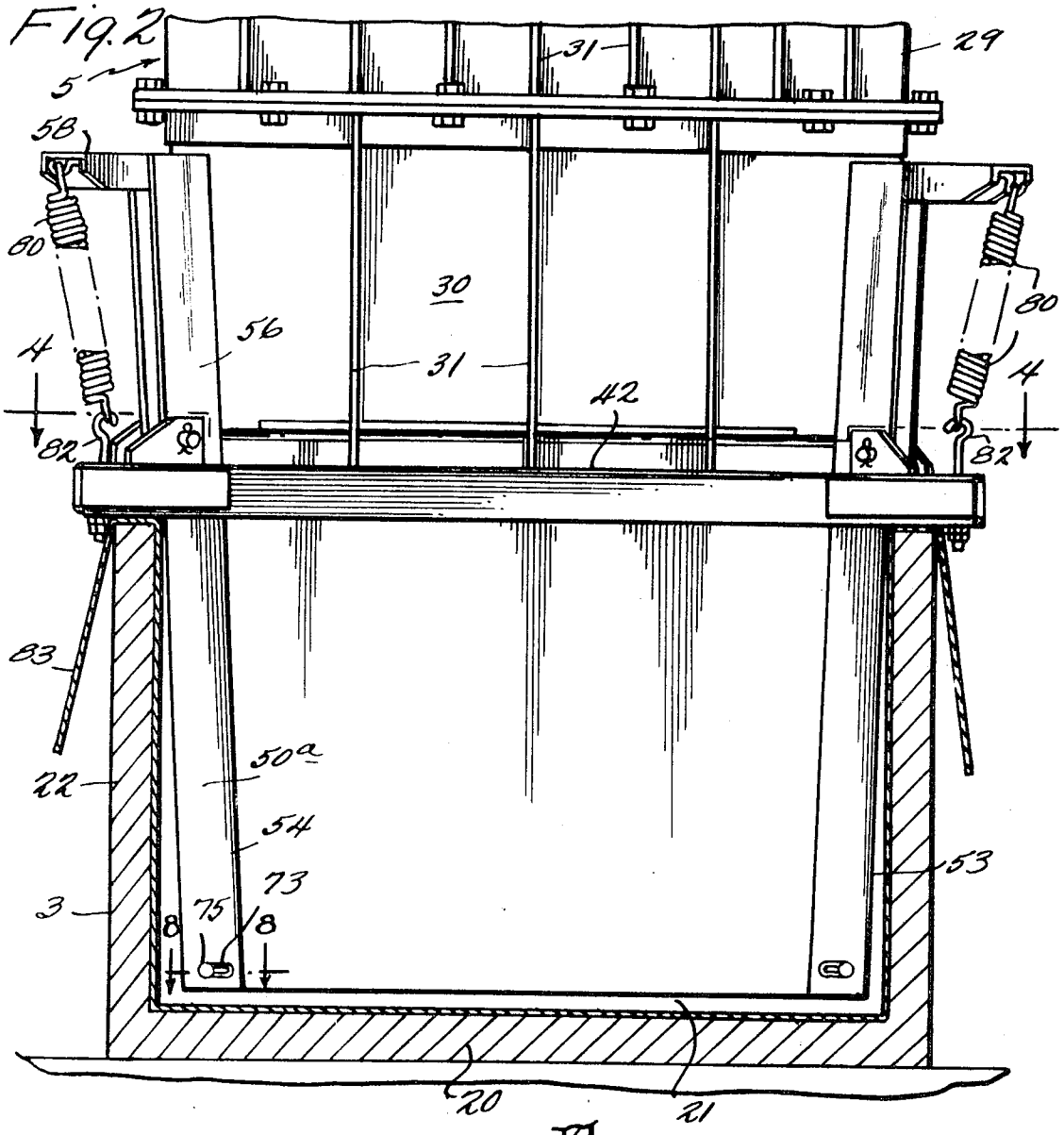
Fig. 2



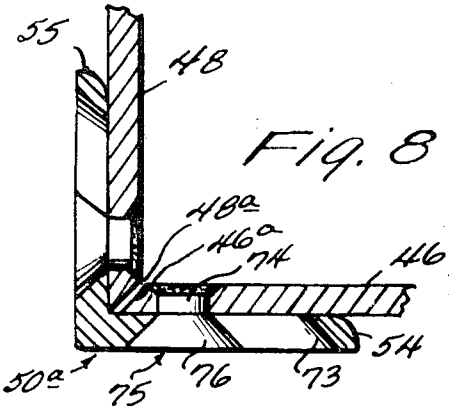


Fig. 8

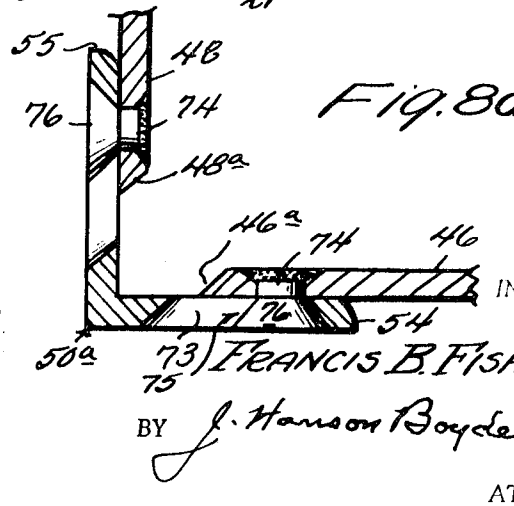


Fig. 8a

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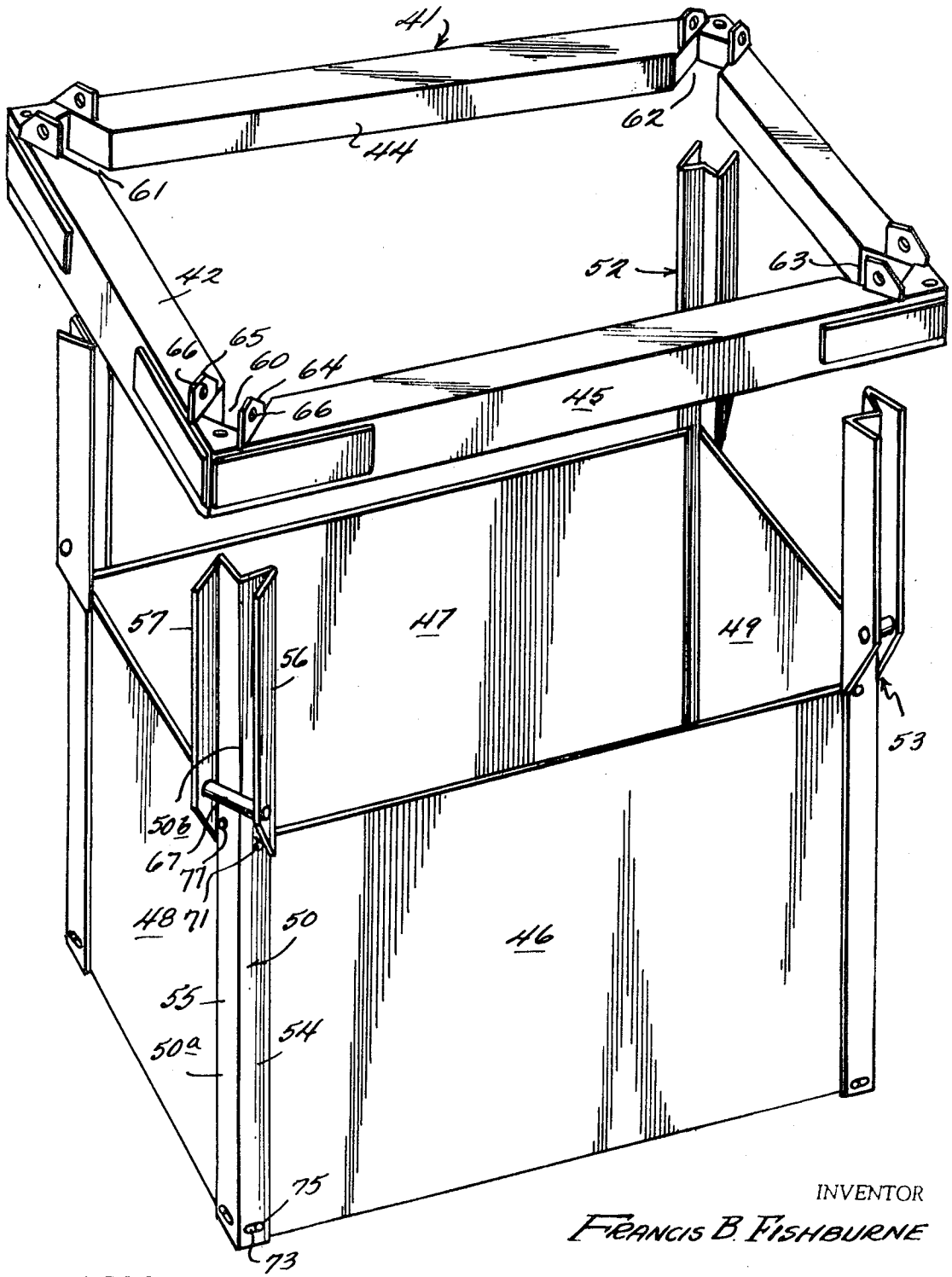

Fig. 3

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FIG. 4

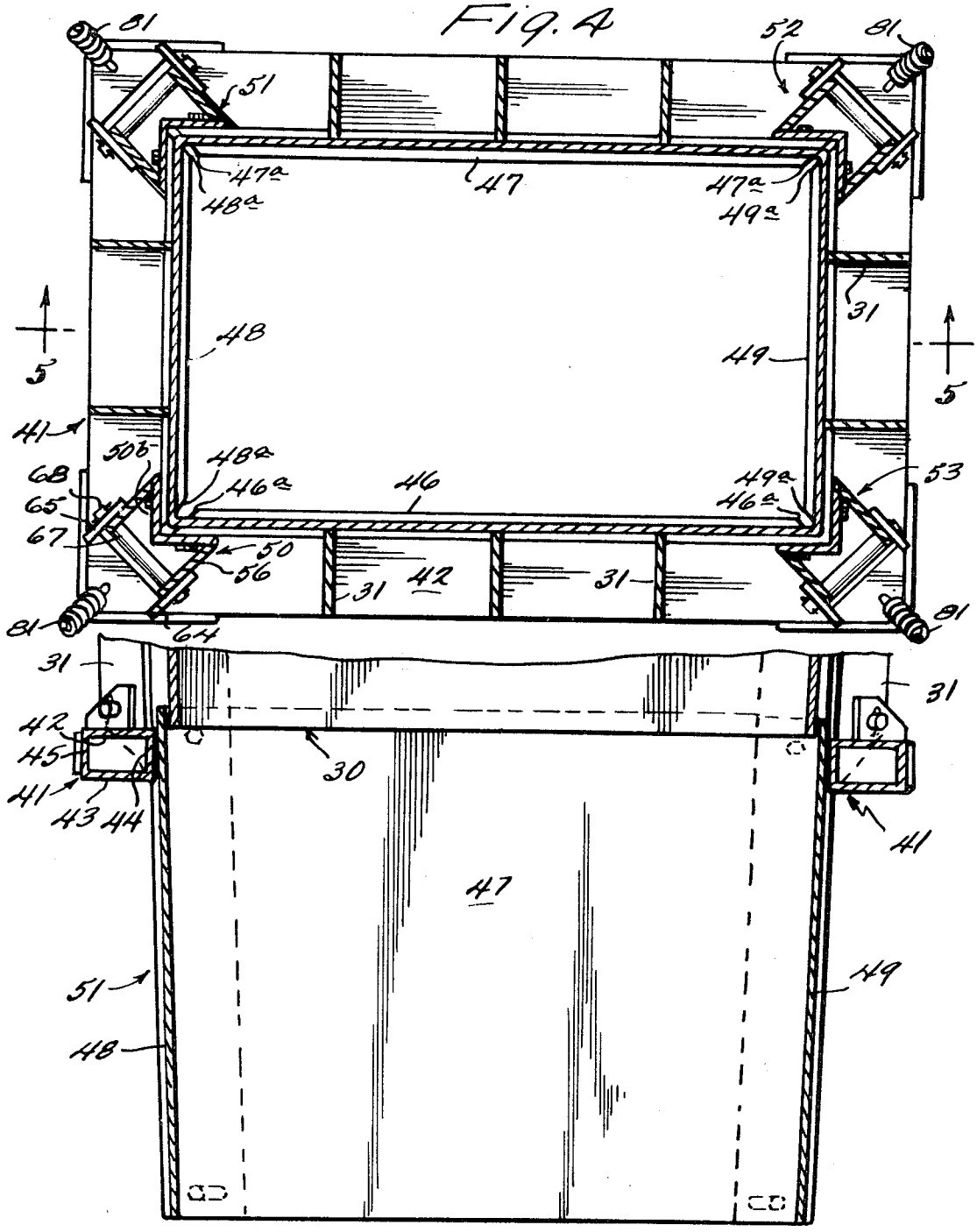

FIG. 5

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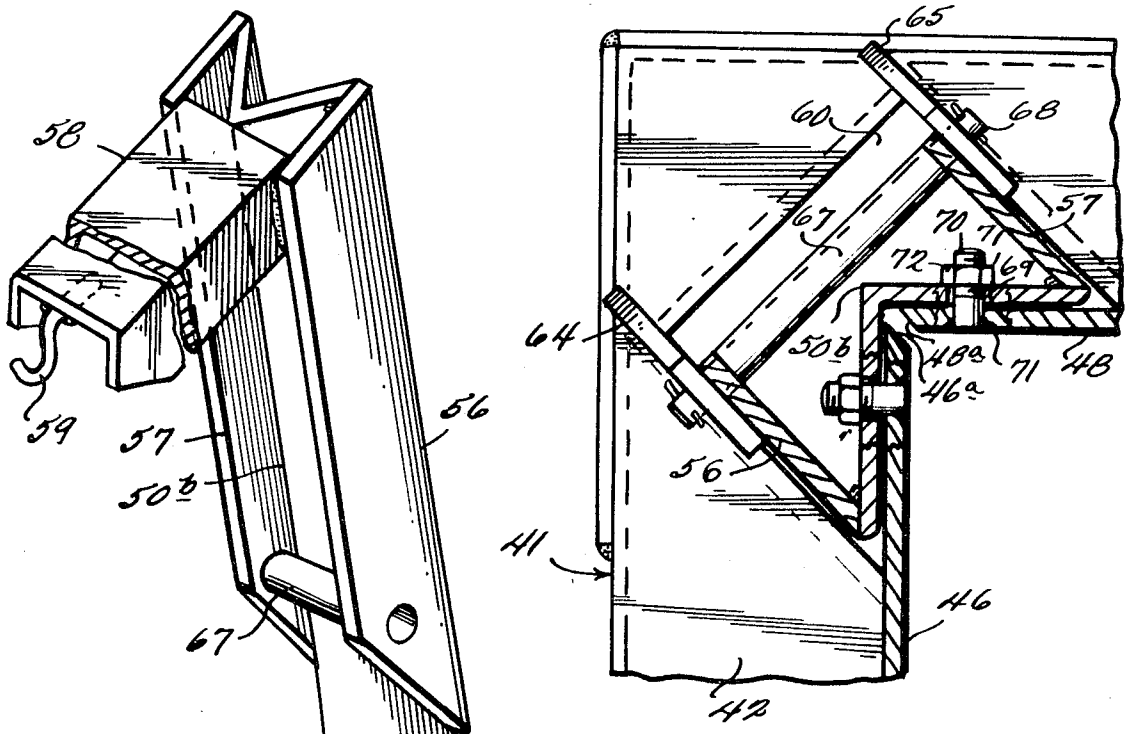

Fig. 7

Fig. 6

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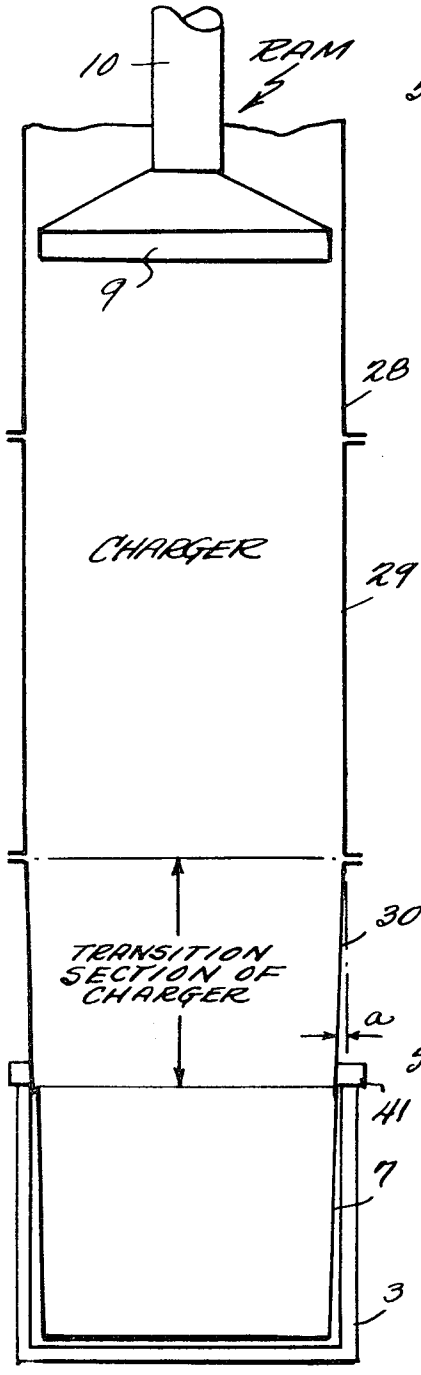
Fig. 9



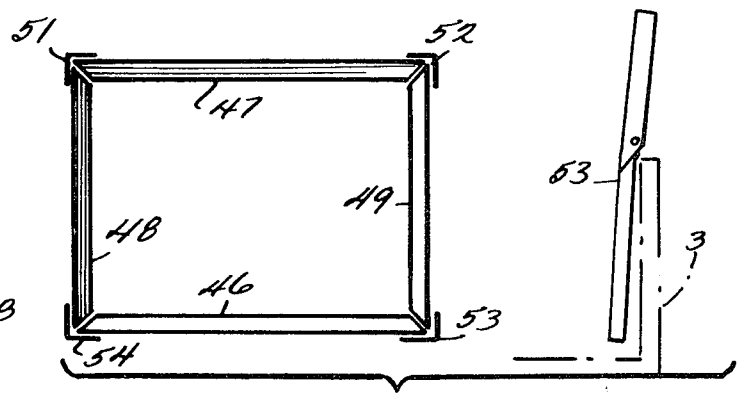


Fig. 10A

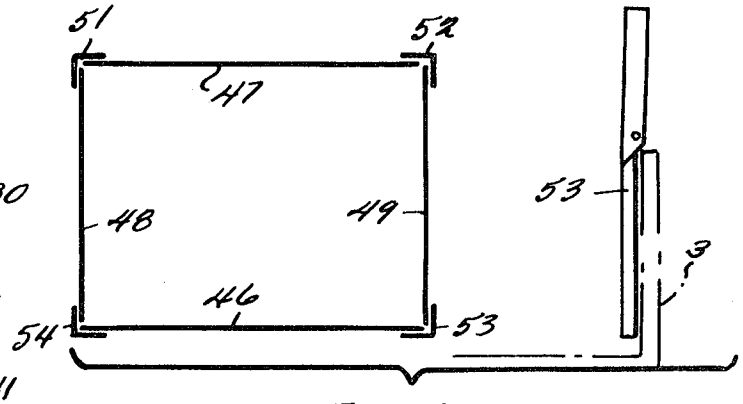


Fig 10B

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APPARATUS FOR PACKING LOOSE COMPRESSIBLE MATERIAL IN RECTANGULAR CONTAINERS

This application is a continuation of Ser. No. 746,064, filed July 19, 1968, now abandoned. This invention relates to apparatus for packing loose compressible material into rectangular containers. Though applicable to other materials, the invention is particularly advantageous for packing leaf tobacco into rectangular shipping cases and will be described with reference to that application.

Historically, leaf or "strip" tobacco usually has been packed in round hogsheads. It has been known to pack such tobacco in rectangular cases particularly in the export trade, but the demand for tobacco packed in rectangular cases has been relatively small until recent times. Recently, this demand has greatly increased as the advantages afforded by the rectangular cases have become more fully recognized and more economically important. The most important of these advantages is the matter of space saving. When shipping hogsheads, much space is always lost because, the hogshead being of round cross-sectional configuration, there is always a considerable amount of dead space between the hogsheads even though they be positioned in mutual contact. Since all surfaces of the rectangular cases are flat, the rectangular cases can be placed in substantially complete face-to-face contact, so that there is no lost space between the cases and more tobacco can accordingly be loaded into a ship or other carrier of given size.

Though the desirability of packing tobacco in rectangular cases now has been fully recognized, substantial problems have been encountered by prior-art workers in attempting to adapt the apparatus used for packing tobacco in hogsheads to the problem of packing the tobacco in rectangular cases. The rectangular cases, while rigid in comparison to a bag or other container of flexible material, are so constructed as to offer substantially no mechanical strength when considered in the context of the relatively large forces resulting from the pressing stroke of the packing apparatus. Since it would be unduly expensive and cumbersome to employ a temporary structure outside of the case to reinforce the same, it has been found necessary to equip the packing apparatus with some sort of sleeve which is insertable into the case and which remains in place until after compression of the tobacco has been completed. Such sleeves have heretofore been of rigid construction, being of rectangular transverse cross section to conform generally to the shape of the shipping case. Use of such sleeves has been unsatisfactory for two reasons, first, because the sleeve is not readily insertable into the shipping case unless the sleeve is made substantially smaller than the case, in which event it is not possible to compress the optimum amount of tobacco into the case. And second, because the sleeves have been incapable of withstanding the large lateral forces exerted by the tobacco as it is compressed to its final condition.

In this latter connection, it must be recognized that the usual pressing apparatus completes the packing operation in a single stroke during which the press plunger travels on the order of 24 feet at an average rate on the order of 1 foot per second. The relatively tall column of initially loose tobacco is compact, there is a tendency for this air to be trapped and compressed, generating great pneumatic pressures which act on the sleeve in addition to the purely mechanical pressures transmitted by the compressed tobacco. The rigid sleeves of the prior art have had the disadvantage of offering no suitable vent passages for escape of the air contained in the mass of tobacco and, for this reason as well as the generally inadequate strength of the sleeves, prior-art rigid sleeves have been subject to bursting during the final stages of the compression of the tobacco.

It is accordingly a general object of the invention to devise an apparatus of the type described, including a charger equipped with a rectangular sleeve which is initially tapered, so as to be readily insertable into the rectangular container, which allows significantly more material to be packed in the container than has been heretofore possible, and which is capable of surviving the relatively large forces resulting from compression of the material in the container.

Another object is to provide such an apparatus embodying an improved charger and sleeve combination, with the sleeve being capable of ready insertion downwardly into the rectangular container without damaging the container, and being effective both to minimize the forces resulting from compression of the packed material and to satisfactorily withstand all of such forces.

In order that the invention may be readily understood, reference is had to the accompanying drawings, forming part of this specification, and in which:

FIG. 1 is a more or less diagrammatic side elevation of the complete apparatus for carrying out the invention;

FIG. 2 is a side elevation on an enlarged scale of the lower portion of the apparatus shown in FIG. 1, the packing case being shown in section;

FIG. 3 is a perspective view of the insertable sleeve and associated parts illustrating the method of assembly;

FIG. 4 is a horizontal transverse section taken substantially on the line 4—4 of FIG. 2;

FIG. 5 is a vertical section substantially on the line 5—5 of FIG. 4, looking in the direction of the arrows;

FIG. 6 is a fragmentary perspective view on an enlarged scale showing part of the mechanism for operating the contractable and expandable insertable sleeve;

FIG. 7 is a fragmentary horizontal section on a still further enlarged scale taken through one of the upper corners of the sleeve and associated parts;

FIG. 8 is a transverse horizontal section on an enlarged scale taken substantially on the line 8—8 of FIG. 2, looking in the direction of the arrows, showing the sleeve contracted;

FIG. 8A is a similar view showing the sleeve expanded;

FIG. 9 is a diagrammatic side elevation showing the relationship between the various parts of the charger and sleeve; and

FIGS. 10A and 10B are diagrammatic views showing in plan and in side elevation the position of the side and end plans of the sleeve when in contracted and expanded position, respectively.

Referring to the drawings in detail, and first to FIG. 1, the illustrated embodiment of the invention compresses a press 1, support means, indicated generally at 2, for supporting the rectangular container 3 to be packed with leaf tobacco or the like, a weighing frame 4, a charging structure indicated generally at 5 and to which the tobacco is supplied by a conveyor 6, and a sleeve indicated generally at 7.

Press 1 includes a main frame 8, a vertically reciprocating press plunger 9 carried by a vertical shaft 10, and conventional power means (not shown) for driving the shaft 9 downwardly, to effect a pressing stroke, and returning the shaft upwardly to return the plunger to its initial position, seen in broken lines in FIG. 1.

The support means 2 comprises a dolly 11 which, during operation of the apparatus, is disposed with its wheels in tracks 12 supported respectively by two horizontal beams 13 which extend across and are secured to the horizontal base members 14 of weighing frame 4. The entire weighing frame is supported by four upright hydraulic power devices 15. The cylinders of power devices 15 are rigidly mounted on a base 16, and the piston rods thereof act upwardly on the combination of beams 13 and members 14 when the power devices are energized. When the power devices are deenergized, the combination of beams 13 and members 14 is allowed to descend a small distance to bring the members 14 into seating engagement with a pair of horizontal support beams 17 which are rigidly mounted on the uprights 13 of the press frame 8. When members 14 engage beams 17, the combination of members 14 and beams 13 is secured against downward movement and, accordingly, the dolly 11 is supported to accept the downward force applied thereto as the press operates to pack the tobacco in container 3. A conventional weighing mechanism 19 responds through suitable lever means to the weight of the

weighing from support means 2, and container 3 when power devices 15 are operated to raise beams 13.

Container 3 is typically a shipping case of elongated rectangular plan and side elevational configuration. Thus, as seen in FIG. 2, the container has a rectangular bottom wall 20, long sidewalls 21, short sidewalls 22, and an open rectangular top, sidewalls 21 being parallel to each other and sidewalls 22 being parallel to each other. Such containers are substantially rigid when considered in comparison to bags, cardboard cartons, and the like. However, the strength of container 3 is normally a minor factor when considered in the context of the large forces involved in the pressing operation. When the container has been packed, a suitable cover (not shown) is applied and the container then bound with wire or strapping.

Weighing frame 4 includes four upright frames members 23 and horizontal top members 24, with the frame being rectangular in side elevation and in top plan elevation. Two vertical track members 25 are secured to and depend from the top structure of weighing frame 4, the two track members being spaced apart across the charging structure and lying in a vertical plane which is parallel with the larger sides of the charging structure and which extends through the center of the charging structure. The lower ends of the track members 25 are secured to horizontal cross braces 26, these cross braces being rigid portions of the weighing frame 4.

Charging structure 5 is in the nature of an upright hollow open-ended assembly comprising an upper portion 27, intermediate portions 28 and 29, and a transition portion 30. All of portions 27–30 are of rectangular transverse cross section conforming generally to the rectangular plan of configuration of container 3. Portions 27–29 are of the same internal transverse dimensions so that the part of the charging structure made up by these portions can be considered as a rectangular structure of uniform transverse internal dimensions. The internal transverse dimensions of this part of the charging structure are significantly greater than the corresponding internal dimensions of container 3.

Transition portion 30 is downwardly and inwardly tapered, as best seen in FIG. 9, where the angle of taper is indicated at *a*. The transverse outer dimensions of the lower end of transition portion 30 are respectively slightly smaller than the transverse inner dimensions of the top of container 3.

All of the portions of charging structure 5 are fabricated from relatively strong metal plates and intermediate portions 28 and 29 are rigidified by exterior vertically extending reinforcing webs 31. At the juncture between larger portions 27 and 28, there are rigidly secured the portion 28 a pair of transversely aligned laterally projecting arms 32. Two rectilinear acting power devices 33 are provided, each mounted on the weighing frame 4, by being secured each to a different one of track members 25, so that the power devices are each located at a different side of the charging structure 5, the two power devices 33 being vertically aligned respectively above the outer end portions of arms 32. Thus, the power devices 33 can be identical, each comprising a hydraulic cylinder fixed to the weighing frame and a piston rod having its outer end fixed to the respective arm 32. Power devices 33 are operative to selectively raise and lower the charging structure 5 independently of weighing frame 4 and press plunger 9. Two transversely aligned lateral outwardly projecting wheel supports 34 are rigidly secured to intermediate portion 28 of the charging structure and are each equipped with a wheel 35 adapted to engage one of the tracks 25. Similarly, two upper wheel supports 36 are secured to the top of charging structure portion 27 and are each equipped with a wheel 37 for engagement of the respective ones of the track 25. Wheel supports 34, 36 are vertically aligned in a common plane which extends through the longitudinal axis of charging structure 5. One power device 33 and its cooperating arm 32 lie in a vertical plane spaced in front of the respective track member 25 (as viewed in FIG. 1), the other power device 33 and arm 32 being disposed behind the respective track member 25 (as viewed in FIG. 1).

Carried by the top structure of weighing frame 4 is a lower funnel 38 including a portion of uniform rectangular transverse cross section extends downwardly within the upper portion 27 of the charging structure, there being a small space between the lower portion of funnel 38 and the walls of upper portion 27 of the charging structure so that the charging structure is free to move relative to funnel 38. The lower portion of funnel 38 is of such length as to be disposed within upper portion 27 of the charging structure for all operative positions of the charging structure. The top of funnel 38 is upwardly and outwardly tapered. An upper funnel 39 is rigidly mounted on press frame 8 in alignment above funnel 38 and includes a side opening in which the delivery end of the infeed conveyor is disposed. The lower end of funnel 39 and the upper end of funnel 38 are interconnected by a flexible sleeve 40 so that vertical movement of lower funnel 39 with weighing frame 4 is allowed.

Press plunger 9 is of rectangular plan configuration corresponding to the configuration of the container 3 and is of such dimensions as to be capable of passing freely through funnels 38 and 39 and all of charging structure 5.

Sleeve 7 is secured to the lower end of transition portion 30 of the charging structure by a rectangular supporting structure indicated generally at 41, this structure being in the nature of a girdle. Girdle 41 comprises rectangular extending top and bottom members 42, 43 rigidly joined by inner wall members 44 and outer wall members 45, members 42–45 being secured together in any suitable fashion, as by welding. The inner wall members 44 of the girdle define a rectangular opening which is only slightly larger than, and conforms to the shape of, the lower end of transition portion 30. Girdle 41 is secured rigidly to transition portion 30 by the reinforcing webs 31 of portion 30, the lower edges of these webs being welded to the upper face of the top wall member 42 of the girdle. As best seen in FIG. 5, girdle 41 lies in a plane which is at right angles to the longitudinal axis of the charging structure, the girdle therefore being at right angles to the axis of movement of press plunger 9. The girdle is located immediately below the lower end of the transition portion of the charging structure.

Sleeve 7 is made up of four flat, rigid, metal plates 46–49, and four corner members 50–53, as will be best understood from FIG. 3. Plates 46 and 47 are identical and correspond generally in shape to the longer sidewalls 21 of the container 3. Plates 48 and 49 are identical and correspond generally in shape to the shorter side walls 22 of container 3. The plan dimensions of plates 46, 47 and 48, 49 are slightly smaller than the corresponding dimensions of the respective sides of container 3. Further, the side edges 46*a* and 47*a* of plates 46 and 47, respectively, slant downwardly and inwardly at a small angle, as will be apparent from FIGS. 2, 5 and 10. Similarly, the side edges 48*a* and 49*a* of plates 48 and 49, respectively, slant downwardly and inwardly at a small angle.

Corner members 50 and 53 are identical and only the member 50 shown in FIG. 6 will therefore be described in detail. Member 50 comprises a body portion 50*a* and an upper extension 50*b* which are formed integrally from right-angle metal stock. Thus, the member 50 includes two flanges 54 and 55 which diverge from each other at right angles. The length of body portion 50 is essentially equal to the height of the plates 46–49, that is, the dimension of those plates taken generally in the direction of the side edges 46*a*–49*a*. While body portion 50*a* and extension 50*b* are each straight throughout their respective lengths, the extension 50*b* projects from body portion 50*a* at a small angle indicated at *b*, FIG. 6. Thus, if the apex of the right-angle cross section of body portion 50*a* be considered as the outer edge of corner member 50, and if the corner member be considered in its upright position, with body portion 50*a* extending upwardly, extension 50*b* then slants upwardly and outwardly away from the body portion at the angle *b*.

Extension 50*b* is provided with two identical rigid metal plates 56 and 57, one long edge of plate 56 being welded to the free edge of flange 54 and the corresponding edge of plate

57 being welded to the free edge of flange 55. Plates 56, 57 are mutually parallel and are disposed with their lengths extending lengthwise of extension 50*b* and their widths extending from the edges of flanges 54, 55 toward the apex of the right-angle transverse cross section of the extension. Thus, the overall configuration of the extension 50*b* can be considered as a W. Bar 58 has one of its ends welded between plates 56, 57, at the upper end of extension 50*b*, bar 58 projecting outwardly at right angles to the length of the extension 50*b*. A hook 59 is welded to the outer end of bar 58.

As best seen in FIG. 3, girdle 41 is provided with four notches 60–63, each notch being located at a different corner of the rectangular opening defined by inner wall members 44 of the girdle. Notches 60–63 are rectangular, and are disposed so that the two parallel sides of each notch extend outwardly at 45° to the respective inner wall members 44 of the girdle, and the remaining side, being at right angles to the two parallel sides of the notch, also extends at 45° to the corresponding two sides of the rectangular opening of the girdle. Corner members 50–53 extend respectively through notches 60–63. As seen in FIG. 7, the two side plates 56, 57 of the extension 50*b* are spaced apart by a distance such that the extension 50*b* can be snugly but freely accommodated between the sides of the notch 60.

Two mounting brackets 64, 65 are welded to top wall member 42 of girdle 41 substantially along the sides of the notch 60, brackets 64 and 65 each having a circular opening 66 and the two openings being mutually aligned along an axis which is parallel to the plane of girdle 41 and which extends at an angle of 45° to the adjacent inner wall members 44 of the girdle. Side plates 56, 57 of extension 50*b* are provided with circular openings which are coaxial, their mutual axis extending at right angles to the sideplates, and a cylindrical bearing sleeve 67 has its end portion disposed in these openings and welded to the respective side plates. A pivot pin 68 extends through the bearing sleeve 67, its end portions projecting respectively through opening 66 in brackets 64–65, cotter pins or like fasteners being provided to hold the pivot pin in place. Accordingly, the combination of sideplates 56, 57, bearing sleeve 67, pivot pin 68, and brackets 64, 65 serves to support the corner member 50 on the girdle 41 for swinging movement about the axis defined by the bearing sleeve and pivot pin, that axis being located outwardly from the corresponding corner of the rectangular opening of the girdle and extending at an angle of 45° to the adjacent inner wall, members 44 having defined the rectangular opening.

An additional pair of mounting plates 64, 65 is welded to top wall member 42 of the girdle at each of notches 61–63, and the corner members 51–53 are mounted on the girdle for swinging movement in precisely the same fashion just described with reference to corner member 50.

Plates 56–59 are supported by the body portions, e.g., portion 50*b*, of the respective corner members 50–53. Such support is accomplished by pin-and-circular opening connections at the upper corner of the plates and by pin-and-arcuate slot connections at the lower corners of the plates. Since these connections are the same for each of the corner members 50–53, only the connections of plates 46 and 48 to the body portion 50*b* of corner member 50 will be described in detail. Considering FIGS. 3 and 7, it will be seen that flange 54 of corner member 50 is provided with a circular opening 69, FIG. 7, through which extends the cylindrical body 70 of threaded fastener 71. The body of fastener 71 extends within a suitable aperture in the corner portion of plate 46 defined by the top edge of the plate and the corresponding side edge 46*a* and is welded rigidly to the plate. The tip of fastener 71 is threaded to accept a nut 72 at the outer face of flange 54. The diameter of opening 69 is slightly larger than that of the body 70 of fastener 71. The effective length of fastener 71 is such that, rather than being held in flush face-to-face engagement, the corner portion of plate 46 and adjacent portion of flange 54 are loosely interconnected. Thus, for example, in a case in which the plates 46–49 and the flanges of the corner members all have a thickness of three-eighth inch and the diameter of the fastener body 70 is three-fourth inch, opening 69 can have a diameter of thirteen-sixteenth inch and the effective length of the fastener 71 can be such as to allow one thirty-seconds inch of play between the corner portion of plate 46 and flange 54 in a direction axially of the fastener body 70. At its lower end, flange 54 is provided with an upwardly curving arcuate slot 73. As seen in FIGS. 8 and 8A, the corner portion of plate 46 defined by the bottom edge of the plate and the corresponding side edge 46*a* is provided with an opening in which the stem 74 of a fastener 75 is securely welded. The fastener 75 has a frustoconical head 76 which is slidably engaged in the arcuate slot 73. In this connection, it will be noted that the walls of slot 73 taper inwardly of the sleeve 7 in conformity with the frustoconical configuration of fastener head 76.

In the same fashion just described, the corner portion of claim 48 defined by the top edge of the plate and the corresponding side edge 48*a* is loosely connected to flange 55 of corner member 50 by a headed fastener 77. And, at the lower end of body portion 50*b*, corner member 50 is provided with an arcuate slot 78, and the lower corner portion of plate 48 defined by the lower edge of the plate and the corresponding side edge 48*a*, is slidably connected to flange 55 by a fastener 79 identical to fastener 75, and having its frustoconical head engaged in slot 78.

Considering that the lower corner portions of plates 46–49 are all slidably connected to the corresponding flanges of the corner members 50–53 in the manner just described with reference to FIGS. 8 and 8A, it will be apparent that the swinging movement provided for corner members 50–53 allows the sleeve 7 to adjust between an initial downwardly and inwardly tapering configuration, in FIGS. 1–3, 5, and 10A, and an expanded configuration, illustrated in 10B. In these two configurations, and all configurations intermediate between them, the side edge portions of the plates 46–49 respectively overlap the inner faces of the corresponding flanges of the corner members 50–53 so that, for practical purposes, the sleeve constitutes a complete lateral enclosure for the tobacco being pressed.

In order to yieldably bias the four corner members toward the proper positions for the initial configuration seen in FIGS. 1–3, 5 and 10A, four tension springs 80 are provided, springs, 80 being connected between hooks 59 and cooperating hooks 81 which are secured to the top wall member 42 of the girdle 41. Referring to FIGS. 2 and 4, it will be noted that each hook 81 is located outwardly of the pivotal axis for the corresponding corner member and is centered with respect to the upwardly projecting extension of the corresponding corner member. The biasing effect of springs 81 urges the corner members to swing about their pivotal axes in such fashion that the dependent body portions of the corner members swing inwardly.

Because of the biasing action of springs 81, the sleeve 7 automatically assumes its downwardly and inwardly tapering initial configuration whenever the charging structure 5 is moved upwardly to extract the sleeve from the container 3 which has just been packed, it being understood that no significant amount of tobacco will be present within the sleeve and charging system at this time. In this connection, it will be noted that the side edges 46*a*–49*a* of the sleeve plates are beveled approximately at 45° as best seen in FIG. 7, to allow the plates to come into closer edge proximity as the sleeve assumes its tapering configuration. Accordingly, when a new empty container 3 is brought into registry below the press and charging structure, and power devices 33 are operated to again lower the charging structure, the sleeve 7 will freely enter the new container 3 via the open top thereof without damaging the container even though precise registry of the container relative to the charging structure and press may not have been accomplished. The vertical dimensions of the body portions 50*b* of the corner members, and of the plates 46–49 are such that, when the charging structure has been lowered to a point so that the girdle 41 is located at the open top of the container, as

seen in FIG. 2, the lower ends of the corner members 50–53, and the lower edges of the plates 46–49, will be adjacent but not in engagement with the bottom of the container 3. With the parts in the relationship shown in FIG. 2, and with tobacco supplied via the charging structure, a single downward stroke of press plunger 9 is effective to compress the mass of material contained by the charging structure and the sleeve into a compact mass to fill container 3. Such compression will cause tobacco within the sleeve 7 to exert a large force laterally outwardly against plates 46–49 and corner members 50–53. Such lateral force, overcoming the biasing action of springs 81, causes the corner members and the plates to wing outwardly into substantial conformity with the sides 21, 22 of container 3. In this connection it will be noted that the small angle *b* between the body portions and the extensions of the corner members allow the body portions of the corner member to come into fully vertical position, against the side walls of container 3, there being no mechanical interference between the extensions of the corner members and the adjacent portion of the charging structure.

In typical installations, the initial mass of loose tobacco retained by the charging structure 5 and sleeve 7 may be, for example 24 feet high, and the single stroke of the press plunger may be accomplished at an average rate of downward travel of one foot per second. The initial mass of loose tobacco in the charging structure will contain a rather large volume of air and, as the press plunger descends, a substantial portion of this air becomes highly compressed, the construction of the charging structure being such that no adequate venting of the air results. Accordingly, as the press plunger proceeds through the latter portion of its stroke, large pneumatic forces, in addition to the forces applied directly via the compressed tobacco, are frequently encountered. However, in the embodiment of the invention described, the spaces between the adjacent side edges 46*a*–49*a* of the sleeve plates, the spaces between the lower edges of the plates and the bottom wall 20 of the container, and the spaces between the outer faces of the plates and the respective side walls of the container (these latter spaces existing because of the press of the flanges of the body portions of the corner members) provide for adequate venting of the air from the mass of tobacco being pressed. Hence, generation of unduly high pneumatic forces is avoided, and the stroke of the press can be accomplished at a higher rate of travel, and thus in a shorter time, than has heretofore been practical.

From FIG. 5, it will be noted that the upper edge portions of plates 46–49 and the upper extensions of corner members 50–53 extend upwardly beyond top wall member 42 of girdle 41 and therefore lie just outside of the respective lower end portions of the sides of transition portion 30 of charging structure 5. It is also to be noted that inner wall members 44 of girdle 41 lie in vertical planes, and that the mounting means for the sleeve plates and corner members are such that, when the corner members 50–53 are swung to move their dependent main body portions, e.g., portion 50*a*, outwardly to vertical position, the outer faces of plates 46–49 are brought into flush engagement with the respective inner wall members 44 of the girdle, and the upper edge portions of plates 46–49 are brought into engagement with the lower end portions of the respective sides of transition portion 30 of charging structure 5. Since corner members 50–53 are respectively wholly within the confines of notches 60–63, the corner members are actually outside of the planes of the inner faces of wall members 44 when the corner member portions 50*a* are vertical, and the corner members therefore do not impede engagement of plates 46–49 with inner wall member 44. Accordingly, a cantaliver action is achieved, by interengagement between plates 46–49, inner wall members 44 of the girdle, and the lower end portion of the sides of charger portion 30, which cantaliver action increases the ability of sleeve 7 to withstand lateral forces resulting from compression of the tobacco. Outward swinging movement of the corner members 50–53 also brings the heads of fasteners 75 into engagement with the outer ends of the respective slots 73.

It will also be noted that the flanges of corner members 50–53, as well as the plates 46–49, are of such thickness that the sleeve constituted by these members has a large structural strength adequate to successively resist the high lateral pressures resulting from the final stages of compression of the tobacco.

The forces which must be withstood by the sleeve 7 are also decreased because of the provision of transition portion 30 in the charging structure. The effect of the downwardly and inwardly tapered transition portion 30 is to accomplish an initial lateral compression of the mass of tobacco before the plunger 9 nears the container 3, so that the amount of lateral compression of the tobacco which has to be accomplished within the sleeve 7 is correspondingly reduced.

While the invention has been shown and described in connection with packing tobacco into shipping cases made of wood or the like, it will be understood that the rectangular containers 3 can be constructed in various fashions of any suitable material and may or may not be equipped with a conventional flexible liner 83. Also, though it is particularly advantageous to have the flanges of the corner members 50–53 of the sleeve 7 disposed outwardly of the plates 46–49, so as to assure an air venting space between each plate 46–49 and the adjacent wall of the container, the plates 46–49 can be disposed on the outside of the corner members, with other provisions for venting of air then being made.

What is claimed is:

1. In an apparatus for packing loose, compressible material into rigid rectangular containers, the apparatus being of the type comprising a press having a vertically reciprocatable plunger, means for supporting a rectangular container in upright position with its top open below the plunger, and upright charging means coaxial with the press plunger and mounted for vertical rectilinear movement relative to the container and the press plunger, at least the lower portion of the charging means having a rectangular transverse cross section, and the press plunger being movable through the charging means to compress the material supplied to the rectangular container via the charging means, the improvement comprising

a support structure secured to the charging means and having a rectangular opening coaxial with the lower end of the charging means;

a sleeve structure carried by said support structure and comprising

four rigid, elongated corner members, each of right-angle transverse cross section,

a pivot means for each of said corner members, each of said pivot means mounting the respective one of said corner members on said support structure for swinging movement about an axis which is adjacent one corner of said rectangular opening and which extends at an angle of at least approximately 45° to the adjacent sides of said opening, the sides of the angle of each of said corner members diverging toward the interior of said opening,

four plates each of a shape corresponding generally to the shape of a different one of the sides of the rectangular container and of a size only slightly smaller than the size of the respective side, and

means connecting the upper edge portions of said plates to said support structure, the upper edge portions of said plates each extending along a different side of said rectangular opening of said support structure, said plates depending from said support structure, with the side edge portions of each of said plates overlapping a flange of the respective ones of said corner members, whereby the combination of said plates and said corner members defines a sleeve of rectangular transverse cross section capable of being inserted downwardly into the rectangular container when the charging means descends,

the dimensions of said plates being such that, when said sleeve is inserted downwardly into the rectangular con-

tainer until said support structure is adjacent the top of said container, the lower edges of said plates will be adjacent the bottom of the container,

outward swinging movement of said plates and corner members allowing said plates to come into face-to-face proximity with the corresponding sides of the rectangular container; and

means yeildably biasing said plates to swing inwardly, whereby said sleeve will be downwardly and inwardly tapered when the charging means descends to cause said sleeve to be inserted into the rectangular container,

introduction of loose material via the charging means into the sleeve, and subsequent action of the press plunger to compress the material, causing said plates and corner members to swing outwardly to conform to the interior of the rectangular container, the combination of said plates and corner member having sufficient strength to accept the large lateral forces resulting from compression of the loose material by the press plunger and to allow said sleeve to be extracted upwardly from the rectangular container as the charging means is raised while the press plunger remains in lowered position to retain the compressed mass of material within the container.

2. Apparatus according to claim **1**, and further comprising

fastener means of the pin-and-slot type interconnecting the lower end portion of each side edge portion of each of said plates and the corresponding flanges of said corner members to maintain said side edge portions respectively in face-to-face sliding engagement with said flanges as said corner members swing outwardly about said axes.

3. Apparatus according to claim **1**, wherein

said corner members are located outside of said plates, and said side edge portions of said plates respectively overlap the inner surfaces of said flanges.

4. Apparatus according to claim **1**, wherein

said means connecting the upper edge portions of said plates to said support structure includes fasteners connecting said upper edge portions to the corresponding flanges of said corner members, whereby said plates are connected to said support structure via said corner members and said pivot means.

5. Apparatus according to claim **4**, wherein

said fasteners are rigidly secured to the upper edge portions of said plates and have body portions which extend through openings in the flanges of said corner members, said openings being significantly larger than said body portions, said fasteners having an effective length such as to allow the upper portions of said plates a small freedom of movement axially of said fasteners.

6. Apparatus according to claim **1**, wherein

said support structure is a rectangular girdle having a notch at each corner of said rectangular opening,

said corner members each extend through a different one of said notches and each include an extension projecting upwardly from said girdle outside of the lower end portion of the charging means, and

said means yieldably biasing said plates to swing inwardly comprises tension springs connected respectively between the upper ends of said extensions and said girdle.

7. Apparatus according to claim **6**, wherein

said extensions each include a portion of right-angle cross section which is integral with the main portion of the corner member, and a pair of flat plates each joined along one edge to the edge of one flange of said portion of right-angle cross section to provide an overall structure of generally W-shaped cross section, and

each of said pivot means comprises a bearing carried by said flat plates of a different one of said extension, bracket means secured to said girdle, and a pivot shaft extending through said bearing.

8. Apparatus according to claim **6**, and further comprising

four arms each secured to the upper end of a different one of said extensions and projecting laterally therefrom generally in the plane of swinging movement of the corner member,

each of said springs being connected between a different one of said arms and said girdle.

9. Apparatus according to claim **1**, wherein

said sleeve is of smaller cross-sectional dimensions than the upper portion of the charging means.

10. Apparatus according to claim **1**, wherein

said support structure is provided with four notches each located outside of a different corner of said rectangular opening and each communicating with said rectangular opening,

the upper edge portions of said plates extend above said support structure and are disposed between the walls of said rectangular opening and the lower end of the charging means, and

the relative positions of said support structure, said corner members, said plates and the lower end of the charging means are such that outward swinging movement of said plates and corner members will being said plates into respective engagement with the walls of said rectangular opening and will concurrently cause the upper edge portions of said plates to engage the outside of the lower end of the charging means, so as to establish a cantilever relationship to restrain said plates against further outward movement,

said corner members being respectively accommodated by said notches.

11. In an apparatus for packing loose, compressible material into rectangular containers, the combination of

a press comprising

a vertically acting press plunger, and

means for supporting a rectangular container in upright position with its top open below said plunger;

charging means comprising

an elongated hollow open-ended charger structure,

means mounting said charger structure in upright position, concentric with the axis of movement of said plunger, for vertical movement upwardly and downwardly independently of said plunger,

said charger structure being operative to receive loose, compressible material supplied to the upper end thereof, when said press plunger is in a raised position, and to confine the loose, compressible material as said plunger descends to compress the same, downward movement of said plunger through said charger structure to compress the loose material also resulting in compression of air entrapped in the mass of loose material; and

sleeve means mounted on the lower end portion of said charger structure and depending therefrom for insertion into the rectangular container, as a result of downward movement of said charger structure, and extraction from the container after the loose material has been introduced via said charging means and compressed by said plunger, as a result of upward movement of said charger structure while said plunger remains in lowered position to maintain the compressed material in place in the container,

said sleeve means comprising

four rigid plates each conforming generally to the shape of a different side of the rectangular container and being slightly smaller than such side,

four rigid corner members each of right angle transverse cross section.

a support structure secured to said charger structure and having a rectangular opening coaxial with said axis of travel of said plunger, the transverse cross-sectional configuration of at least the lower end of said charger structure being rectangular and said opening being aligned therewith, and means mounting said corner members on said support structure for swinging movement about a horizontal axis which is adjacent to a corner of said opening and extended at an angle of at

least approximately 45° relative to the adjacent sides of said opening, the flanges of said corner member diverging toward said opening,

each of said plates being disposed with its said edge portions each overlapping the inner surface of the corresponding flange of one of said corner members,

said corner members and plates depending from said support structure for a distance such that, when said support structure is at the top of the rectangular container, the bottom edges of said plates are adjacent the bottom of the container,

swinging movement of said corner members allowing the sleeve defined by the combination of said plates and corner members to be downwardly and inwardly tapered, when said charger structure descends to cause the sleeve to be inserted into the container, and to adjust into conformity with the configuration of the rectangular container, with said corner members engaging the inner surfaces of the respective sides of the container and said plates respectively spaced from such surfaces substantially by the thickness of the flanges of said corner members,

air under pressure within the mass of material being compressed escaping between the adjacent side edges of said plates and through the space between said plates and the corresponding sides of the rectangular container.

12. The combination defined in claim **11**, wherein

said charger structure includes an upper portion and a transition portion joined to the lower end of said upper portion, the lower end of said upper portion having significantly larger transverse dimensions than does the top of said sleeve, said transition portion tapering downwardly and inwardly with it lower end conforming in size to the top of said sleeve.

13. In an apparatus for packing loose, compressible material into rectangular containers, the combination of

a press comprising

a vertically acting press plunger, and

means for supporting a rectangular container in upright position with its top open below said plunger;

charging means comprising

an elongated hollow open-ended charger structure,

means mounting said charger structure in upright position, concentric with the axis of movement of said plunger, for vertical movement upwardly and downwardly independently of said plunger,

said charger structure including an upper portion, and a transition portion joined to the lower end of said upper portion, said transition portion tapering inwardly and downwardly and having, at its lower end, a rectangular transverse cross section substantially conforming in size and shape to the top of the rectangular container,

the relative dimensions of said plunger and said charger structure being such that said plunger can pass axially completely through said charger structure; and

sleeve means secured to said charger structure and depending from said transition portion for insertion into the rectangular container, as a result of downward movement of said charger structure, and extraction from the container, after the loose material has been introduced via said charging means and compressed within said sleeve means by said press plunger, as a result of upward movement of said charger structure while said press plunger remains in lowered position to maintain the compressed material in place in the container, said sleeve means comprising

a support structure secured to the lower end of said transition portion and defining a rectangular opening at least as large as the transverse internal opening defined by the lower end of said transition portion; and

four plates each conforming generally to the shape of a different one of the sides of the rectangular container and being slightly smaller than that side, said plates being mounted on and depending from said support structure with the upper edge portion of each plate extending along a different side of said opening defined by said support structure,

said plates, when said sleeve is inserted into the container, being so disposed relative to each other and to the container as to provide at least one passage for escape of air from the loose compressible material as the material is compressed through said charger structure and into the space confined by said plates;

said transition portion, by reason of its downwardly and inwardly tapering configuration, providing a preliminary lateral compression of the loose material as the same is forced downwardly through said transition portion by said press plunger.

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