Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2520108 A1 2007/03/19

(21) 2 520 108

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 2005/09/19

(41) Mise à la disp. pub./Open to Public Insp.: 2007/03/19

(51) Cl.Int./Int.Cl. *A01F 25/18* (2006.01),
A01D 75/02 (2006.01), *B65G 65/30* (2006.01),
B65H 49/00 (2006.01)

(71) Demandeur/Applicant:
FLEXAHOPPER PLASTICS LTD., CA

(72) Inventeurs/Inventors:
HLADY, TIM, CA;
KENNEDY, ROBERT, CA;
OLIVER, WILLIAM, CA;
SPENCELEY, JAMES W., CA

(74) Agent: GOODWIN MCKAY

(54) Titre : TREMIE
(54) Title: GRAIN HOPPER

"GRAIN HOPPER"

FIELD OF THE INVENTION

The present invention relates generally to hoppers used for transfer of granular materials from one location to another. More particularly, a hopper is configured to accept and auger at a low repose while accommodating an auger safety guard.

BACKGROUND OF THE INVENTION

Standalone augers are known for receiving free-flowing granular materials, such as those pouring from bins and chutes or dumped from end-dump trucks. The hoppers are positioned below the source. Further, a transfer auger is positioned in the hopper to elevate accumulated granular materials to a destination such as bin or other storage location.

Hoppers have a number of competing design issues including structural integrity, accommodation of augers, minimizing of auger angle, minimizing of hopper height while maximizing capacity, stability and minimizing material hang-up.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a hopper according to one embodiment of the invention illustrated with an auger positioned therein and extending at about a 25-30 degree angle therefrom;

Figure 2 is a top view of the hopper of Fig. 1;

Figure 3is a side view of the hopper of Fig. 1;

Figure 4 is a front view of the hopper of Fig. 1;

Figure 5 is an isometric front view of the hopper of Fig. 1;

Figure 6 is a perspective front view of the hopper with the tail or inlet end of the auger positioned therein with the guard in its normal installed configuration;

Figure 7 is an exploded, isometric front view of the hopper of Figure 5 illustrating some of the 3-D profiles constituting the hopper structure;

Figure 8 is a perspective back view of the hopper with the tail or inlet end of the auger positioned therein;

Figure 9 is a perspective back side of the hopper with the tail or inlet end of the auger positioned therein;

Figure 10 is a perspective top view of the hopper with the tail or inlet end of the auger positioned therein;

Figure 11 is a side view of the hopper with the auger positioned therein;

Figure 12 is a top view of the hopper with the auger positioned therein;

Figure 13a is a back view of the hopper with the auger extending from the front;

Figure 13b is a cross-sectional view of the lip of the upper edge of the hopper;

Figure 14 is a perspective front view of the hopper with the auger guard and screw in place;

Figure 15 is a perspective front view of the hopper according to Fig. 14, with the auger tube protruding from the front and with the guard and screw shown removed for illustrating the inlet end; and

Figures 16a and 16b are elevation and top view of a typical arrangement of an auger in a grain hopper and with a truck dumping grain into the hopper.

SUMMARY OF THE INVENTION

As shown in Fig. 1 a hopper rests on a surface such as the ground. The hopper is generally concave with an open top for receiving granular materials such as grain. Grain is an example of a granular free-flowing material typical of the materials used with the hopper. The hopper is adapted to receive an inlet end of a elongate screw conveyor or auger. The auger's inlet end is positioned in the open top of the hopper for enabling conveyance or transport of grain present in the hopper to a discharge end of the auger, typically directed at an elevated destination.

The inlet end of the auger is nestled into the hopper and commencing adjacent a bottom of the hopper for maximal evacuation of grain from the hopper. The auger extends upwardly along a side wall of the hopper and protrudes from the hopper.

As shown in Figs. 2 - 6 the hopper has a composite shape. Referring to Fig. 2 and 6, the hopper is generally conical with side walls diverging upwardly from a base to the open top. The hopper configuration deviates from conical and the known profiles of conventional hoppers. As shown in Fig. 3, from the side, and perpendicular to the longitudinal axis of the auger, the side profile of the hopper illustrates a narrow base profile. The hopper can pivot about the narrow base profile to conform the angle of the hopper side wall to the angle of the auger. The shallower the angle of the auger, the more the hopper will rotate to accommodate the auger. From the front view of Fig. 4, the base has a wide profile to resist tipping.

As shown in Fig. 6, the hopper is a merger of at least two major three-dimensional profiles; a semi-circular profile and a tetrahedron profile. A first profile is a right semi-circular conical back side having a central axis approximately positioned at the tail end of the auger. A second profile is a generally tetrahedron or trigonal pyramid in which the one face or top is upward facing and open and a back face is open to the semi-circular profile. A wide back or stern merges with the semi-circular back side. A bottom apex forms a front side wall which rises to the open top forming a prow. Thus, the second 3-D tetrahedron profile forms a rising triangular trough in which the auger is supported as it protrudes from the hopper. The hopper has a narrow front side wall from which the auger protrudes. Preferably a semi-circular rest is provided at the front side wall for conforming to the auger and supporting the auger on the hopper.

A third trapezoidal or substantially triangular or transition profile or profiles merge the semi-circular and the tetrahedrons and form connecting side

walls of the hopper which extend along a tangent from the semi-circular profile, through the third substantially triangular profile to intersect with the side walls of the triangular trough.

The triangular trough is widened through with a fourth profile or pan for increasing the spacing between the auger inlet end and the hopper. A fifth prism or wedge shape completes the bottom of the hopper structure and which forms the base which is narrow transversely to permit angular rotation of the hopper and which is wide side-to-side to stability the hopper laterally. The wedge intersects upwardly to merges with the semi-circular profile.

As shown in Fig. 6, the auger is a cylindrical tube with a screw extending coaxially within. The screw protrudes from the cylindrical tube at the inlet end. A cage or guard surrounds the inlet end to prevent personnel contact with the screw. As shown in Fig. 2, to accommodate the guard, the front wall or bottom apex of the tetrahedron is widened into the pan which is a substantially semi-circular trough bottom having a nominal radius greater than that of the auger so as to form an annular space therebetween and permit grain to flow i9nto the screw.

The tip of the prow is blunted or formed with the semi-circular rest or collar which is sized to support the cylindrical tube of the auger and maintain the annular space I the pan under the auger inlet.

Best seen in Figs. 13a and 13b, the upper edge of the side walls along the open top has a lip which extends first laterally and outwardly from the side wall and then downwardly. This stiffening lip is forgiving and will yield in the face of forceful deformation from impact and displacement from encroachment of a truck box or other immovable structure thereon such as during unloading.

Circumscribing the girth of the hopper are ribbed projections, preferably of obtuse triangular cross-section, for imparting increased strength to the side walls.

As shown in Figs. 16a and 16b, the semi-circular back side is amenable to easy access by the source, from over 270 degrees or at least three sides of the hopper, such as by the tailgate of the grain truck. The prow enables low auger angles for maximal grain recovery and minimal residuals or loss in the hopper when emptied. The combination of the semi-circular and tetrahedron profiles results in a strong structure with a large volume or capacity.

Figs. 8 – 15 illustrate a variety of view to show the various features and configuration. Figs. 14 and 15 illustrate the inlet end of the auger with and without the guard. The guard and the screw are only shown removed to better illustrate the spatial relationship between the hopper and the auger.

The hopper is stackable or nestable for minimizing shipping volumes with up to 20% more hoppers per shipment. For most applications hopper diameters are about ½ of a maximal transport width enabling two-wide shipping arrangements for even greater shipping economies. The height of the lip of the hopper can be minimized for increasing the number of applications in which the hopper can be used. The wide trough ensures that augers can be used with the original guards in place thereby improving safety. Long augers are currently available and which can be accommodated. Such augers typically have angles of about 25 – 30 degrees.

Application number: numéro de demande: 2520108

Figures: 1 à 5; 7 à 12; 13A; 14 et 15

Pages:

DRW-IP

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th Floor)

Documents reçus avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au 10ième étage)

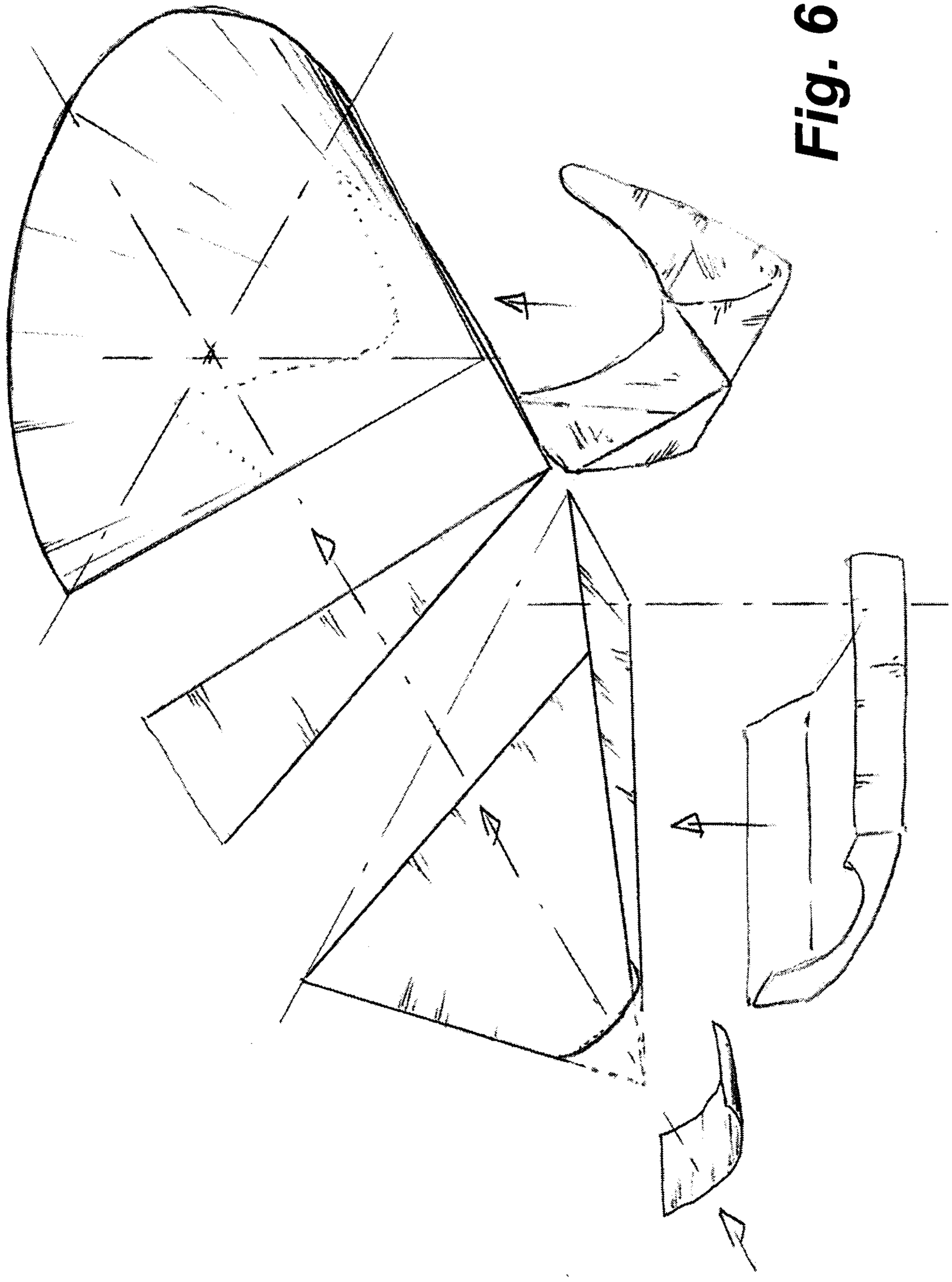


Fig. 6

Fig. 13b

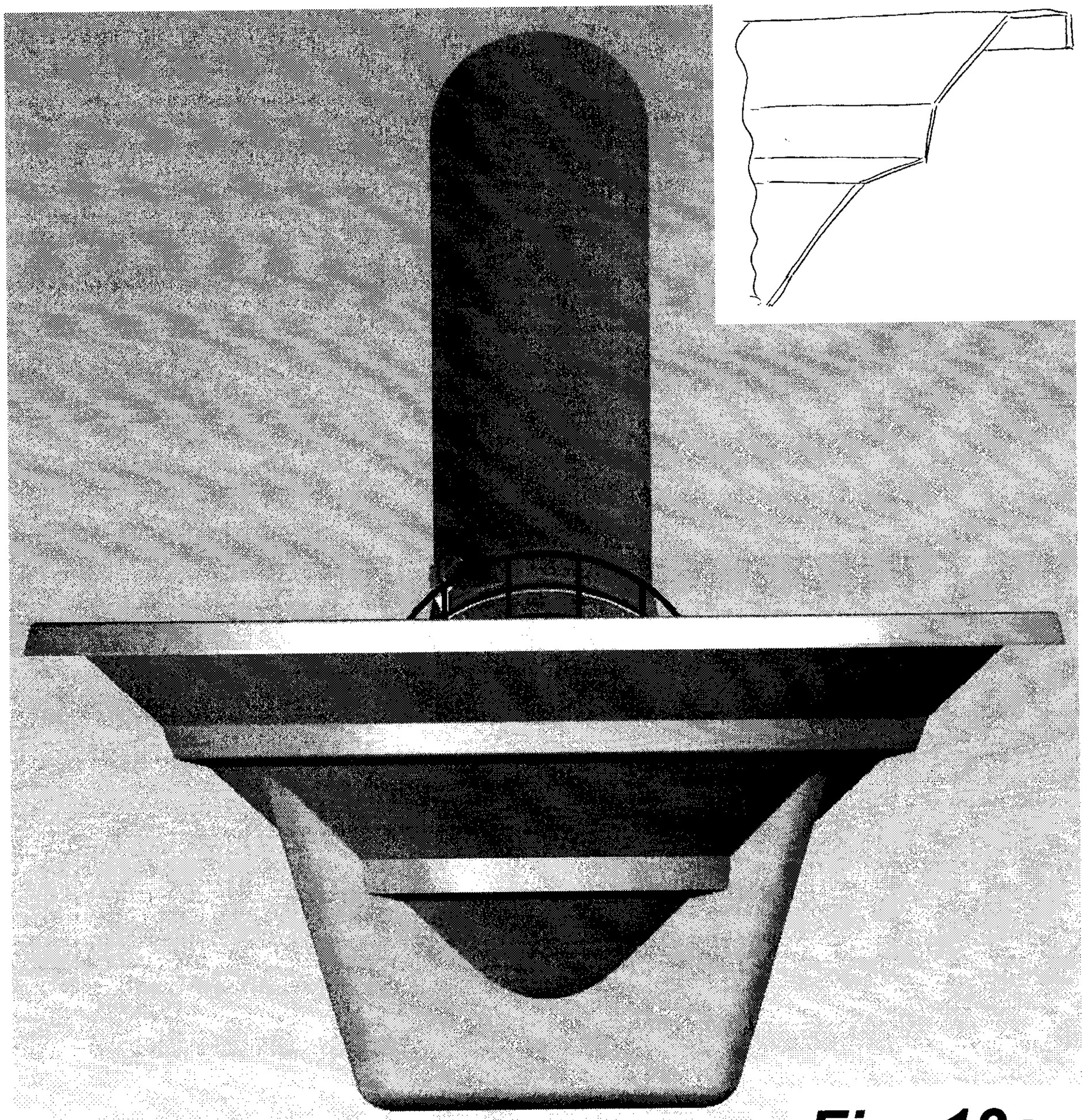
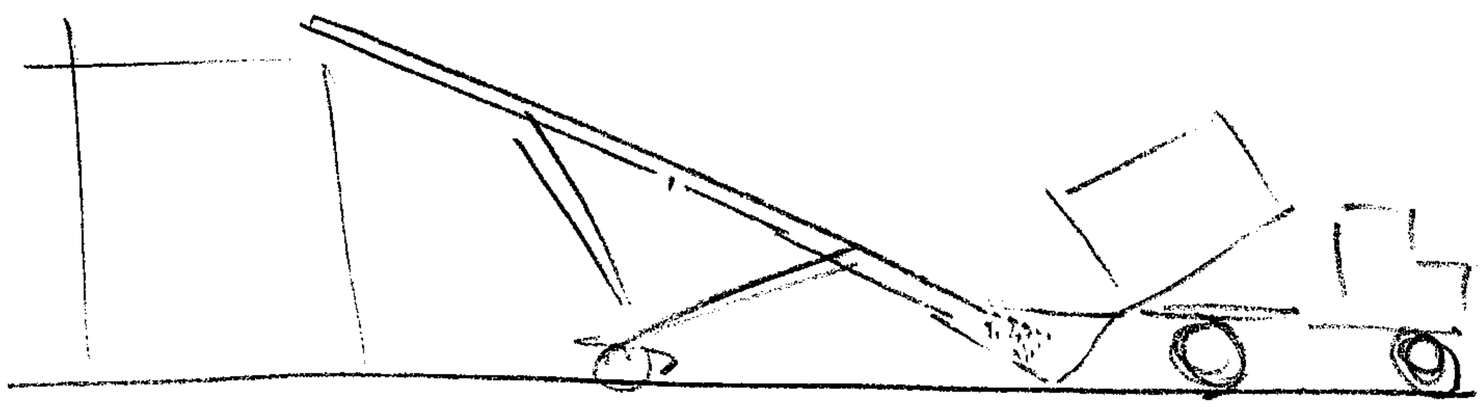


Fig. 13a

Fig. 16a



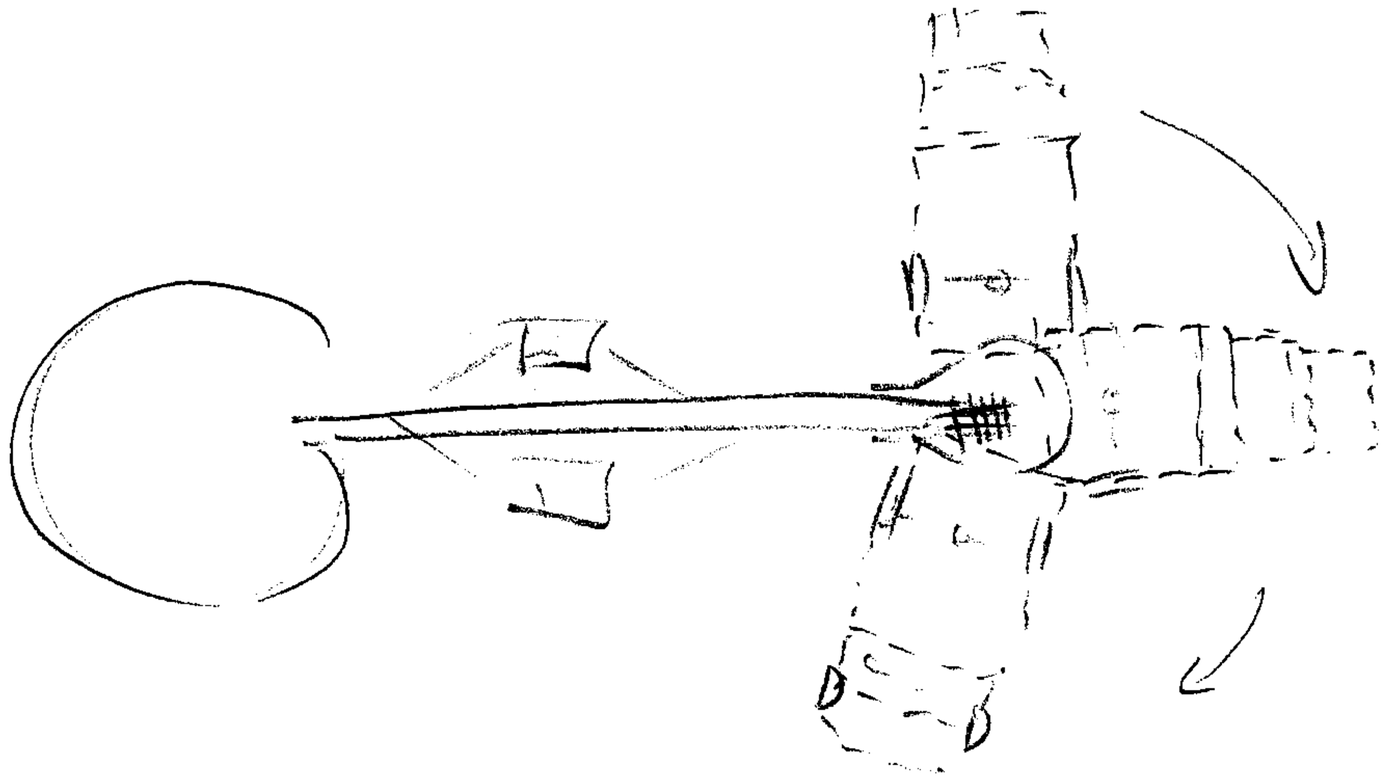


Fig. 16b