Sept. 25, 1962 J. P. MOORHEAD 3,055,506

RACK FOR TELEVISION TUBES

Filed April 20, 1959 3 Sheets-Sheet 1

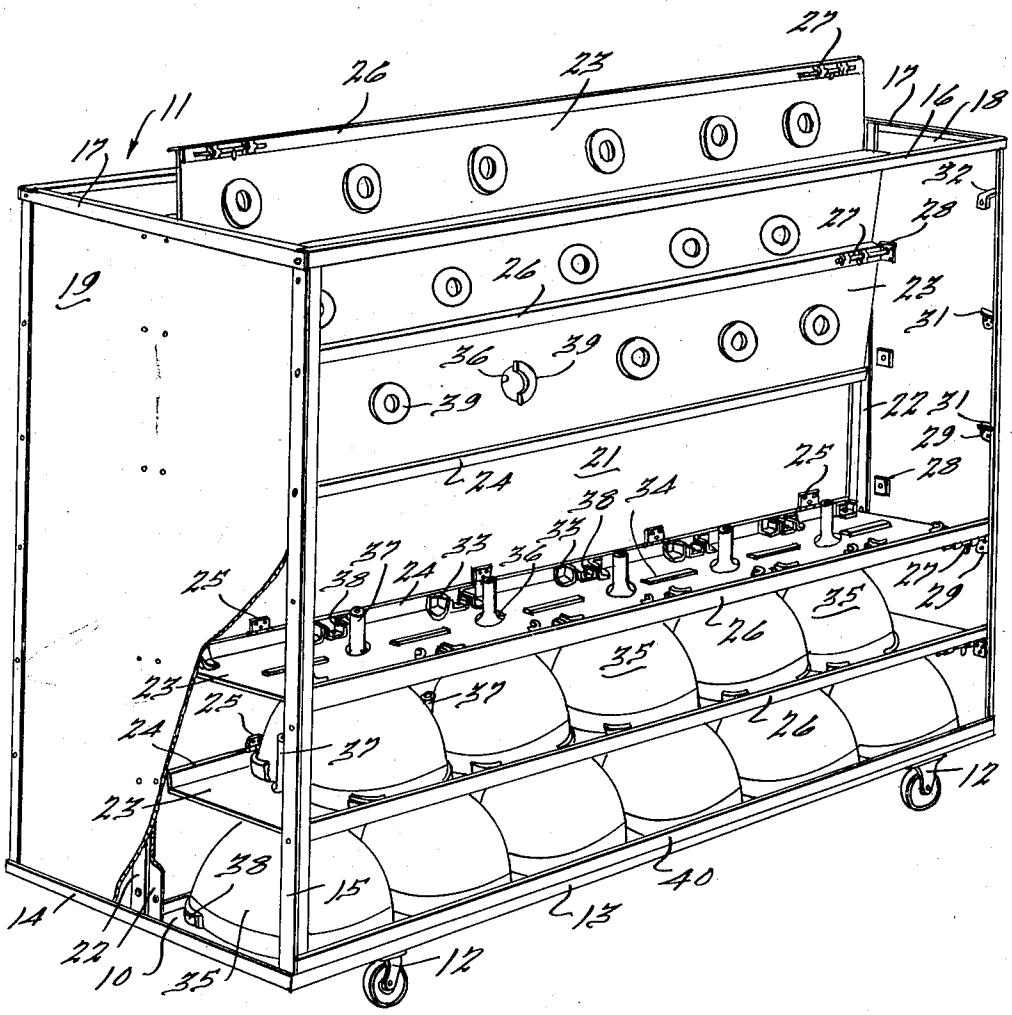


FIG. 1.

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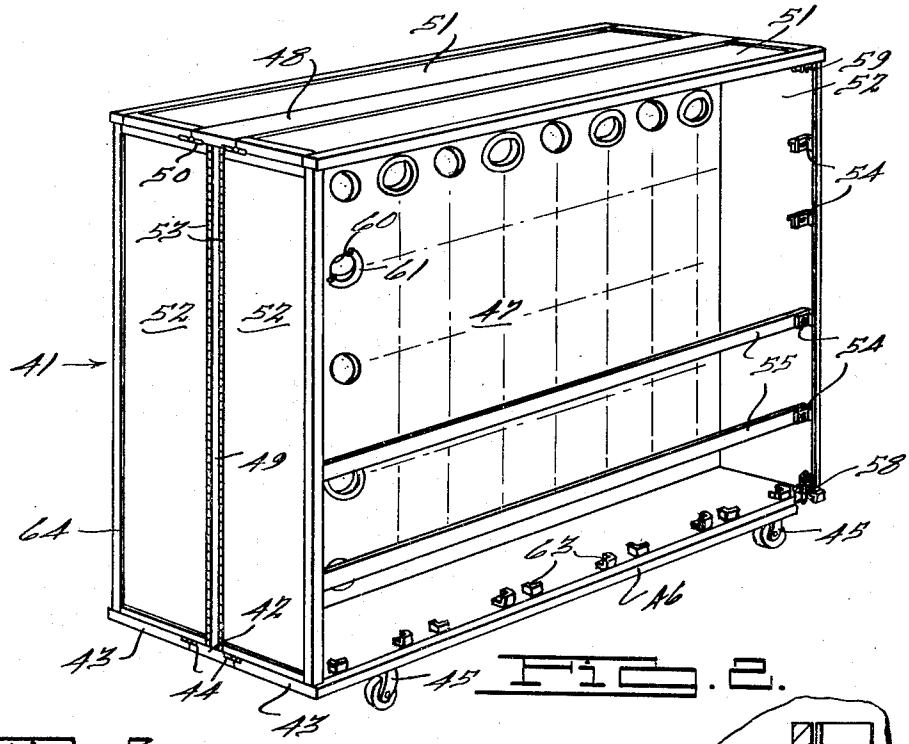


Fig. 2.

Fig. 3.

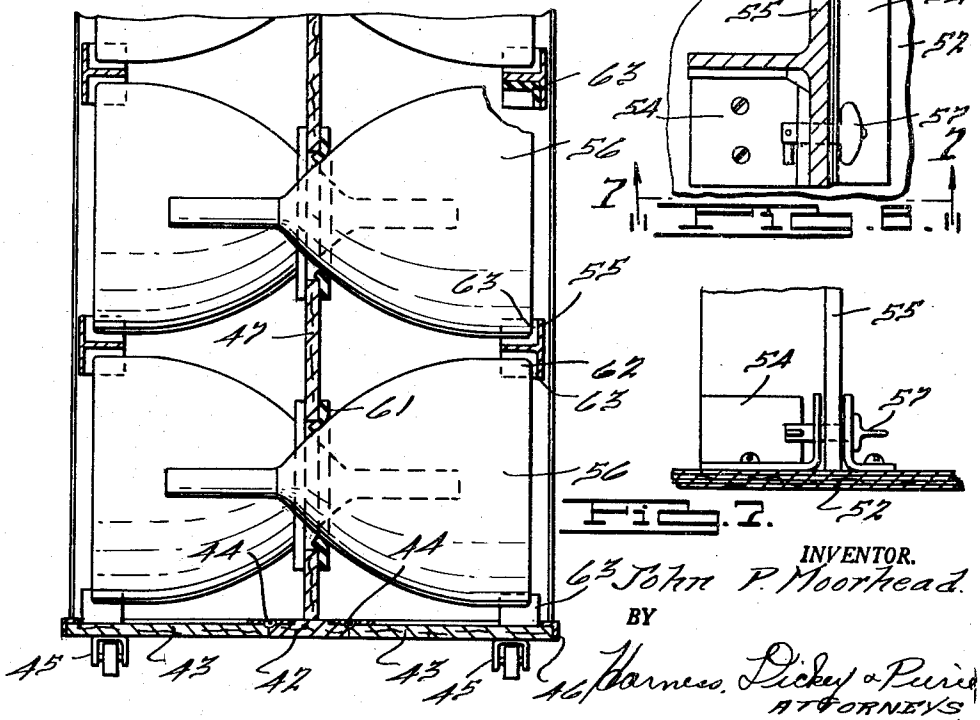


Fig. 4.

Fig. 7.

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Filed April 20, 1959 3 Sheets-Sheet 3

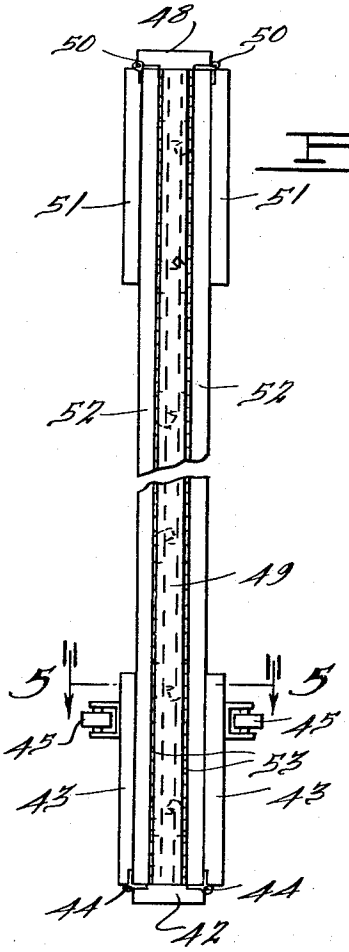


FIG. 4.

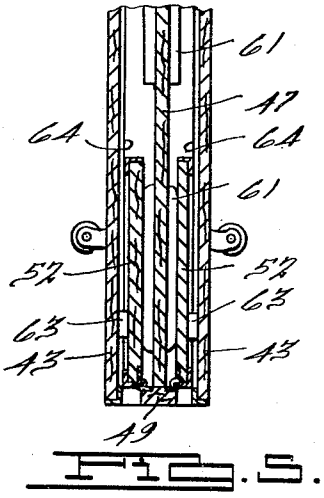


FIG. 5.

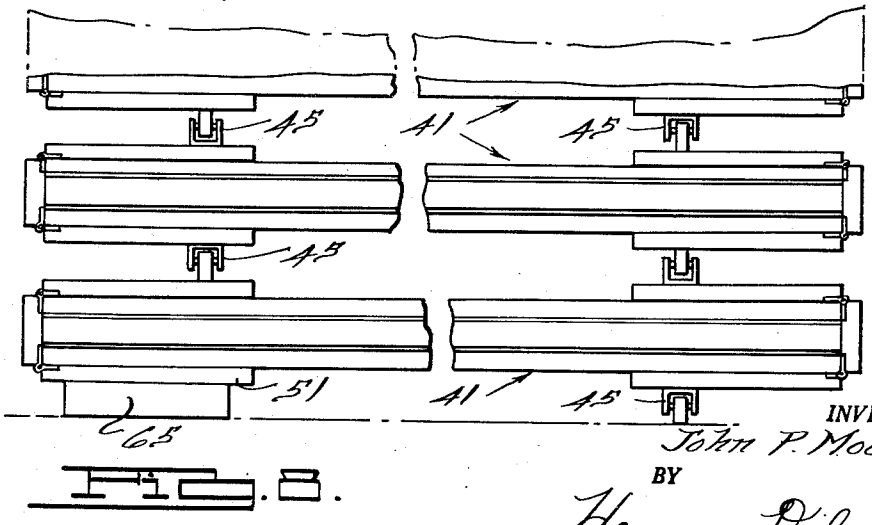


FIG. 8.

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RACK FOR TELEVISION TUBES

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Filed Apr. 20, 1959, Ser. No. 807,427
8 Claims. (Cl. 211—26)

This invention relates to freight carrying apparatus, and more particularly to devices for shipping and storing television picture tubes or similar parts.

In the shipping and handling of television picture tubes, it is necessary that the tubes not only be securely held during transportation but that the shipping means be of economical construction and high mobility. It is also desirable that the shipping means afford easy access so that tubes may be quickly stored or removed with a minimum danger of breakage.

It is an object of the present invention to provide a shipping rack for television picture tubes which is especially adapted to achieve the foregoing results. More particularly, it is an object to provide a shipping rack of this nature which is constructed of economical materials, and at the same time has extreme rigidity so as to protect the tubes from the effects of jarring or rough handling during shipment.

It is another object to provide a shipping rack of this nature in which the tubes are gripped solely by foam rubber or similar parts so that they will not be subject to breakage due to the impact of hard surfaces, and in which this gripping will be effective even with large manufacturing variations in dimension and without danger of tearing or otherwise damaging the foam rubber parts.

It is another object to provide a picture tube shipping rack having the above characteristics, in which easy access is provided for the picture tubes so that they may be quickly and safely handled, and in which the tubes are loaded or unloaded in a progressive manner, maximum usage being made of the total volume of the unit.

It is a further object to provide a shipping rack having the above characteristics, in which damage resulting from the implosion of one picture tube will be localized, preventing a large number of tubes from being broken. In conventional shipping racks used in the past, a single tube blowing up by implosion could cause sympathetic implosion in surrounding tubes, possibly ruining an entire truck load of racks. With the present arrangement, such damage would be localized in the immediate area of the original implosion, thus preventing damage to the entire shipment.

It is also an object, in one form of the invention, to provide a picture tube shipping rack of this nature which is collapsible into a flattened unit when not in use, thus facilitating the storage or shipment of the empty racks, and taking advantage of reduced freight rates prevalent for knocked-down flat objects.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of one embodiment of the shipping rack, showing the construction of the rack with two tiers of picture tubes installed and with the upper shelves folded back, parts being broken away for clarity;

FIGURE 2 is a perspective view of a second form of the invention in which the rack is of a collapsible nature and the picture tubes axes are horizontal, the rack being shown with the picture tubes and some parts removed;

FIGURE 3 is a partial cross-sectional view in elevation

of the rack of FIGURE 2, showing the manner in which picture tubes are supported therein;

FIGURE 4 is a side elevational view of the rack shown in FIGURE 2 in collapsed condition;

FIGURE 5 is a fragmentary cross-sectional view taken along the line 5—5 of FIGURE 4, and showing the overlapping of the panels in the collapsed rack;

FIGURE 6 is a fragmentary side elevational view of a side panel showing the means for securing a picture tube supporting bar thereto;

FIGURE 7 is a cross-sectional view taken along the line 7—7 of FIGURE 6, showing the disposition of the bar between the securing brackets; and

FIGURE 8 is an elevational view showing a suitable manner of stacking the collapsed shipping racks.

Referring to FIGURE 1, the picture tube shipping rack comprises a base **10** and an open-sided housing generally indicated at **11** surmounting the base. Four casters **12** are mounted at the corners of the base, which is flat and is provided with a frame having side members **13** and end members **14**. Housing **11** comprises a frame having uprights **15** secured to the corners of base **10**, upper side members **16** and upper end members **17**. The width of base **10** and the relative dimensions of the frame members are such that television picture tubes in the desired number may be accommodated thereon, as described below. The end walls of the shipping rack comprise a pair of panels **18** and **19** extending between frame members **14**, **15** and **17**; these may be fabricated from plywood or any similar material to provide the required strength and rigidity.

A vertically disposed longitudinally extending central support panel **21** is located on the longitudinal centerline of base **10** and extends between end panels **18** and **19**. Panel **21** is provided with two pairs of angle bars **22** along the edges thereof by means of which the panel is secured to the end panels. The height of panel **21** is such that it extends between frame members **17**, and the panel thus provides a solid partition between the two sides of the rack. Furthermore, panel **21** serves as a strengthening member, providing substantial rigidity for the entire assembly against vertical jarring or vibration.

The means for supporting the picture tubes comprise a plurality of shelves **23** in vertically spaced relation on each side of panel **21** which extend between end panels **18** and **19**. Shelves **23** are each provided with members **24** along the edges adjacent panel **21**, and hinges **25** serve to secure these members to the panel **21**, the vertical spacing of the hinges being determined by the size of the picture tubes. Members **24** are fabricated of angle sections, flanges of the angles extending under shelves **23** to furnish additional strength and resist bending in a vertical direction. Angles **24** are so positioned that each shelf **23** is swingable between a horizontal position projecting from panel **21** and a nearly vertical position lying against the panel **21**. The mounting of hinges **25** on the upwardly extending flanges of angles **24** cause shelves **23** to have a translatory as well as a rotary motion when being swung between their positions, the purpose of this movement being described below.

In FIGURE 1, the lower two shelves **23** on one side of the rack are shown in their horizontal or loading positions, while the upper three shelves are shown in their upper or retracted positions. Uppermost shelf **23**, since it must pass between frame members **17**, is slightly shorter than the shelves below. The outer edges of shelves **23** are provided with members in the form of angles **26** for holding the shelves in their operative and inoperative positions. A pair of sliding bolts **27** are carried by the ends of each angle **26**, movable between a retracted position and a locking position extending from the ends of angle **26**. Apertured plates **28** are provided for bolts **27**, these plates

being secured to the insides of end panels 18 and 19 in such position that when engaged by bolts 27 they will hold the shelves in their upper or folded position. No plates 28 are provided for holding upper shelf 23 in its folded position since in such position this shelf extends above panels 18 and 19. As shown in FIGURE 1, the upper shelf 23 on each side of the rack is swingable slightly beyond its vertical position so that it rests against the upper edge of panel 21, thus eliminating the need for an upper locking means.

The means for holding shelves 23 in their horizontal or operative positions comprise a plurality of brackets 29 secured in vertically spaced relation on end panels 18 and 19. These brackets include shoulders 31 upon which the ends of angles 26 may rest when the shelves are swung downwardly to their horizontal position, with bolts 27 retracted. Bolts 27 may then be extended under shoulders 31 to lock the shelves in place. Apertured brackets 32 are provided for uppermost shelf 23, which as mentioned above is slightly shorter than the shelf below, and the bolts 27 thereof are engageable with the bracket apertures to lock the upper shelf in place.

Means are provided on shelves 23 and base 10 for gripping the picture tubes, and in the embodiment of FIGURE 1 these means comprise foam rubber elements which engage both the face and the neck of each tube. Secured to each shelf 23 and to base 10 are a plurality of substantially cup-shaped foam rubber pieces 33, arranged in groups of four to engage the face of each picture tube at 90° spaced intervals. Each group of four cups 33 comprises two cups adjacent the inner edge and two cups adjacent the outer edge of the shelf (or of base 10), the open portions of these four cups facing a common center. The thickness of cups 33 at their base is preferably sufficient to accommodate both flat and spherical types of tube faces, without danger of the faces contacting the shelves at their center under the severest vertical impact likely in normal handling. For additional protection, supplementary foam rubber strips 34 may be provided on the surface of each shelf 23 in the center of each group of four edge pieces.

The centers for the groups of foam rubber cups 33 are not vertically aligned on the various shelves 23 but are horizontally staggered. Specifically, the centers on base 10 and on the second and fourth shelves above base 10 are such that the outer edges of picture tubes 35 will be adjacent the ends of these supports. The alternate shelves 23 have their centers for the gripping cups halfway between the centers on the shelves above and below. The vertical spacing of shelves 23 is such as to accommodate the hemispherical portions of tubes 35. Apertures 36 are provided in each shelf except base 10 to accommodate the necks 37 of tubes 35 which protrude upwardly from the shelf next below. In order to accommodate necks 37, the cups 33 of adjacent groups are spaced apart a distance slightly greater than the neck diameter. With this arrangement, it will be seen that an extremely compact positioning of the picture tubes is possible with a minimum amount of unused space. Clips 38 may be provided to reinforce cups 33. Annular foam rubber pieces 39 are disposed around the undersides of apertures 36 to engage the juncture between the necks and bodies of tubes 35. Guard rails 40 may be provided at the outer edges of base 10 for additional protection.

In operation of the embodiment of FIGURE 1, assume an initial condition in which the rack is unloaded and all the shelves are in folded position, base 10 being fixed in its flat position. It will be noted that the entire space above base 10 is clear between uprights 15 and frame members 13 and 16. In particular, angles 26 of shelves 23 will be locked in place by bolts 27 and aperture plates 28. Picture tubes 35 may then be placed one at a time, face downward, in each set of cups 33 on base 10, the picture tube face engaging foam rubber strip 34. The spacing of cups 33 is preferably such that the face edges of the picture tube are gently but firmly held against sliding movement. When all the tubes on base 10 are in place, the lowermost shelf 23 is unlatched from its folded position and lowered into its horizontal position. During this movement apertures 36 will pass over necks 37 of the tubes as described in more detail below, washer-shaped foam rubber units 39 engaging the junctures of the necks and bodies of the tubes.

When the lowermost shelf 23 is in operative position bolts 27 will be extended so as to engage shoulders 31 of brackets 29, thus securely locking the shelf in its horizontal position. The second tier of picture tubes 35 is then placed in cups 33 on the lowermost shelf similar to the first tier on base 10. This process continues until all the shelves on one side of the rack have been lowered and filled. Uppermost shelf 23 will not be surmounted by a row of picture tubes but serves to engage the junctures of the necks and bodies of the tubes resting on the shelf next below. After one side of the rack has been thus loaded, the other side will be loaded in a similar manner. To unload the tubes, the steps are reversed, the tubes being removed in tiers from the top downward on each side of the rack, the shelves being latched in retracted position as they are emptied.

Shelves 23 with their apertures 36 are hinged at the top edges of rear angles 24, and are so pivoted as to have an inward as well as downward component of movement during the final phase of their approach to horizontal position. This type of mounting of course also causes apertures 36 to move away from panel 21 during the initial portion of their upward movement from the horizontal position. Since the neck diameters of the tubes are reduced in the area traversed by apertures 36 just above horizontal position, the inner edge of each aperture 36 (that edge closest to panel 21) will clear the tube when the shelves are being lifted, even though the shelves are moving outwardly from the panel 21. This shelf mounting is of significance during the loading operation in that it allows the outer edges of apertures 36 to clear the tops of the tube necks as shelves 23 are lowered. The hinged shelf can thus clear the tubes when being lowered or raised with a hole of small enough diameter to fit snugly the necks or shoulders of the tubes at the points necessary to allow minimum clearance horizontally and vertically between adjacent tubes. Maximum use is therefore made of the cubic content of the rack, and lowering of each shelf causes slight compression of the cups 33 and washer 39, firmly holding the tubes against movement. The compression is preferably sufficient to fit tubes of maximum and minimum manufacturing variations, which may be of considerable magnitude.

It will be noted that as each tier of tubes is loaded or unloaded the space above this tier is clear, thus facilitating easy handling. The shelves are locked in position by latches 27, and the tubes are held against movement in all directions by cups 33 and pieces 39. Since only one side of the rack is loaded and unloaded at a time, the uppermost shelves 23 will not interfere with each other since only one will be swung against panel 21 at a time. The entire rack presents a rigid structure which can be easily wheeled on casters 12. Each tier of picture tubes on each side of the rack is walled in and separated from all other tiers by panel 21 and shelves 23. Thus, should an implosion occur for example on the second tier shown in FIGURE 1, only the tubes on that tier of the rack could possibly be damaged. If a plurality of racks are stored alongside each other, the tubes on the opposing shelf on the adjacent rack might also be damaged, but all other tubes will remain unharmed.

FIGURES 2–8 illustrate a second embodiment of the invention in which the tubes are stored with their axes horizontal and the entire rack is collapsible into a flattened unit. The unit is generally indicated at 41 and comprises a base having a central section 42 and side sections 43 hinged at 44 to the edges thereof, as shown in FIGURE 3. Casters 45 are mounted at the outer edges

of base sections **43**, which are provided with angular metal edge strips **46**. Secured to central base section **42** is a vertical longitudinally disposed central support panel **47** which forms part of the open-sided housing and is surmounted by a top central panel section **48** secured thereto, as shown in FIGURES 2 and 4. Panel **47** is also provided with central end sections **49** at its vertical edges. Hinged at **50** to the opposite edges of panel section **48** are a pair of top side sections **51**.

As seen in FIGURE 4, base side sections **43** and top side sections **51** are adapted to be folded inwardly into parallel relation with panel **47**. The width of central base section **42** and upper central section **48** are such that when in their folded positions sections **43** and **51** are spaced from panel **47**. The vertical edges of central end sections **49** each have a pair of end panel sections **52** secured thereto by hinges **53**. Panels **52** are adapted to be swung between an operative position as shown in FIGURE 2 and a folded position in parallel relation with panel **47** and within folded panels **43** and **51**. In their operative position panels **52** form end walls for the rack housing.

The outer edge portions of panels **52** are provided with sets of spaced brackets **54**, as shown in FIGURES 6 and 7, to accommodate supporting bars **55** of T-shaped cross section. Bars **55** are horizontally supported by panels **53** and are vertically spaced from each other a distance slightly greater than the appropriate face dimension of picture tubes **56** which are to be supported. Pins **57** may be provided, passing through brackets **54** and the lower leg sections of bars **55**, for holding the bars in place. The spacing of bars **55** from panel **47** may be adjusted by providing additional brackets **54** in panels **52** spaced inwardly from brackets **54**. Thus, picture tubes of different sizes may be accommodated. As shown in FIGURE 2, latches **58** are provided at the lower edges of panels **52**, these latches being engageable with apertures in side base sections **43**. Panels **52** are thus lockable in their operative position and in turn engage sections **43** and **51** to hold the latter in their respective operative positions. Top side sections **51** are also provided with latches **59** in the corners thereof engageable with panels **52** as shown in FIGURE 2 to hold sections **51** in their operative positions.

The means for supporting picture tubes **56** are so arranged that the tubes are held in tiers with adjacent tubes in each tier facing in opposite directions. For this purpose, panel **47** is provided with a plurality of apertures **60** having annular foam rubber members **61**. The apertures are so spaced as to receive the picture tubes in each tier facing in alternate directions. The face edges **62** of picture tubes **56** in FIGURE 3 are adapted to be gripped by foam rubber cups **63** secured to sections **43** as well as bars **55**. As shown in FIGURE 2, base sections **43** have secured thereto a proper arrangement of foam rubber cups **63** to engage the lower portions of the tube face edges in the lowermost tier, with the tubes facing outwardly. The lowermost bar **55** on each side of the rack is provided with corresponding cups **63** so that the outer periphery of the tube faces are gripped at spaced points. Remaining bars **55** and the undersides of sections **51** are likewise provided with cups **63**, the cups forming groups of four centering around alternate apertures **60**. The relative dimensions of the foam rubber pieces, namely cups **63** and washer-shaped elements **61**, are so chosen as to provide firm gripping surfaces for the picture tubes. In order to accommodate cups **63** when the unit is folded, angle frames **64** on panels **52** and on sections **43** and **51** are arranged as shown in FIGURE 5, leaving sufficient space for the cups. The width of central end sections **49** is sufficient for end panels **52** to clear washer-shaped elements **61** when the device is folded.

In operation of the shipping rack shown in FIGURES 2–6, starting from an initial condition in which the rack is in its open condition shown in FIGURE 2, all bars **55** on either side of the rack will at first be absent. To load

the rack, the operator starts with the lowest row of apertures **60** and inserts the necks of picture tubes **56** in alternate apertures from one side of the rack. The tubes are inserted so that they engage the washer-shaped foam rubber elements in apertures **60** and the foam rubber cups **63** mounted on section **43**. The lowermost bar **55** is then inserted in its brackets **54**. As indicated above, foam rubber cups **63** on bars **55** and section **43** cooperate with foam rubber washers **61** to hold picture tubes **56** securely in place.

After the bottom tier of tubes has been secured in place, succeeding tiers on the same side of the rack are stored. Picture tubes **56** will be placed in alternate apertures **60** and in staggered relationship vertically. As each tier of tubes is placed in the rack, another bar **55** is inserted in grooves **54** to hold the upper portions of that tier in place, so that the intermediate tiers are held by the foam rubber cups on the upper and lower sides of bars **55** and by foam rubber washers **61**. It will be noted that as each tier is loaded, there is free space above that tier so that the operator has ample room for handling the tubes. A top or capping bar **55** is used for the uppermost tier of tubes, panel **51** not serving to support this tier.

The other side of the rack is then loaded in a similar manner. In loading picture tubes **56** on the second side of the rack, they will be inserted in the alternate apertures **60** not occupied by tubes on the first side. The arrangement is such that sufficient space is left between the tubes on each side of the rack to accommodate the necks of tubes projecting from the other side. In this manner a maximum of space is utilized for loading purposes. In its final loaded condition the shipping rack forms a compact mobile unit which can be easily transported on its casters **45**. The interlocked nature of panels **52** and sections **43** and **51** serve to create a rigid construction which is enhanced by the presence of panel **47**. Moreover, T-shaped bars **55** provide rigidity against vibration of the picture tubes in a vertical direction. Picture tubes **56** have no contact whatsoever with any metal or wooden portions of the structure but are engaged solely by foam rubber or other like material. The entire unit has a flat-sided configuration with no projecting parts, and groups of units may thus be easily stored in a carrier body.

To unload the picture tubes, the top or capping bar **55** on one side will first be removed. The uppermost tier of picture tubes on that side is then removed and the bar **55** supporting that tier of tubes also removed. Succeeding tiers are then unloaded on that side of the rack until the side has been emptied. The second side is then unloaded in the same manner as the first side. Here again, it will be observed that the space above each tier of tubes is clear as the tier is removed, facilitating handling by the unloader.

To collapse the rack after all the tubes **56** and bars **55** have been removed, panels **52** are unlatched from sections **43** and **51** and swung inwardly on hinges **53** until they are flush with panel **47**. It will be noted that, due to the width of sections **49**, the thickness of washers **61** does not interfere with this movement. Base sections **43** and top sections **51** are then swung inwardly over panels **52** as shown in FIGURES 4 and 5.

When in their collapsed condition, a plurality of racks **41** may be stacked as shown in FIGURE 6. In this figure, a block **65** is provided for supporting the upper end of the first rack which is now horizontal. This block engages one of the top sections **51** of the rack and is of sufficient thickness to compensate for casters **45**. The second collapsed rack **41** is placed on top of the first rack with its casters **45** oppositely disposed from those of the first rack so that the second rack will also be horizontal. Succeeding racks may then be stacked in a similar manner.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, varia-

tion and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a shipping rack for television picture tubes of a predetermined size, a base having a central section and two side sections hinged thereto, casters mounted on said side sections, a central panel secured to said central base section and extending upwardly therefrom, a pair of end panels hinged to each end of said central panel at the opposite sides thereof, a top having a central section secured to the upper edge of said central panel and two side sections hinged to said central section, said end panels being swingable between operative positions at right angles to said central panel and folded positions overlying said central panel, said base and top side sections being swingable between operative positions at right angles to said central panel and folded positions overlying said end panels when the latter are in their folded positions, a plurality of bars extending between said end panels when the latter are in their operative positions, means carried by said end panels at the outer edges thereof for detachably holding said bars in vertically spaced relation, a plurality of apertures in said central panel for receiving the necks of television picture tubes therein soft gripping means surrounding said apertures, and gripping members mounted on said base and on said bars adapted to engage the edges of outwardly facing picture tubes the necks of which are received in said apertures, the distances between said bars and between the bars and said central panel being such that picture tubes of said predetermined size are firmly held by said aperture gripping means and said gripping members.

2. The combination according to claim 1, said end panels each being further provided with a second row of detachable holding means for said bars spaced inwardly from said first row, whereby said bars may be mounted closer to said central panel for gripping television tubes smaller than said predetermined size.

3. The combination according to claim 1, said bars being of T-shaped cross section, said gripping members being mounted on the opposite sides of said bars, said detachable holding means comprising brackets on said end panels for retaining the ends of said bars.

4. The combination according to claim 3, said gripping members comprising a plurality of cup-shaped elements, the arrangement of said elements being such as to form groups of four elements around common centers coaxial with said central panel apertures when said bars are in operative position, said groups being centered on alternate apertures on opposite sides of said central panel, whereby picture tubes on each side of said central panel will be spaced to accommodate necks of picture tubes from the other side of said keel panel.

5. The combination according to claim 1, further provided with means carried by said end panels for locking the latter into engagement with said base side sections when said end panels are in operative position, and means for latching said top side sections to said end panels when said panels and sections are in operative position.

6. In a shipping rack for television picture tubes of a predetermined size, a base having a central section and two side sections hinged thereto, a central panel secured to said central base section and extending upwardly therefrom, a pair of end panels hinged to each end of said central panel at the opposite sides thereof, said end panels

being swingable between operative positions at right angles to said central panel and folded positions overlying said central panel, said base sections being swingable between operative positions at right angles to said central panel and folded positions overlying said end panels when the latter are in their folded positions, a plurality of bars extending between said end panels when the latter are in their operative positions, means carried by said end panels at the outer edges thereof for detachably holding said bars in vertically spaced relation, a plurality of apertures in said central panel for receiving the necks of television picture tubes therein, soft gripping means surrounding said apertures, and gripping members mounted on said base and on said bars adapted to engage the edges of outwardly facing picture tubes the necks of which are received in said apertures, the distances between said bars and between the bars and said central panel being such that picture tubes of said predetermined size are firmly held by said aperture gripping means and said gripping members.

7. A shipping rack for television picture tubes or the like comprising a rectangular base, an open sided housing including a central panel and end panels extending upwardly from said base, said central panel being disposed on the longitudinal center-line of said base, said end panels being disposed at right angles to said central panel, means connecting said central panel and said end panels at the junctures thereof, a plurality of vertically spaced shelf panels hinged to each side of said central panel and extending between said end panels and adapted to support tiers of picture tubes thereon, and a plurality of holding means in vertically spaced relation along the outer edges of said end panels adjacent the open sides of said housing for detachably holding said shelf panels in their operative positions, said shelf panels being independently disconnectible from said end panels whereby the open sides of said housing are made accessible for the loading or removal of picture tubes, each of said shelf panels except the uppermost one thereof being provided with a plurality of resilient gripping members engageable with the face edges of television picture tubes, each of said shelf panels except the lowermost one thereof having a plurality of apertures and having additional resilient gripping members at each of said apertures, said apertures being disposed between said first named resilient gripping members for accommodating the necks of picture tubes supported on the next lower shelf panel with said additional gripping members engageable with the junctures of the necks and bodies of said picture tubes.

8. The combination according to claim 7, wherein said shelf panels are hinged to said central panel on axes spaced above the planes of said shelf panels whereby said apertures are moved outwardly relative to said central panel during the initial portion of the upward swinging movement of said shelf panels.

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