April 29, 1969 J. J. HARDING 3,440,789

CEILING SYSTEM

Filed Aug. 8, 1966 Sheet 1 of 3

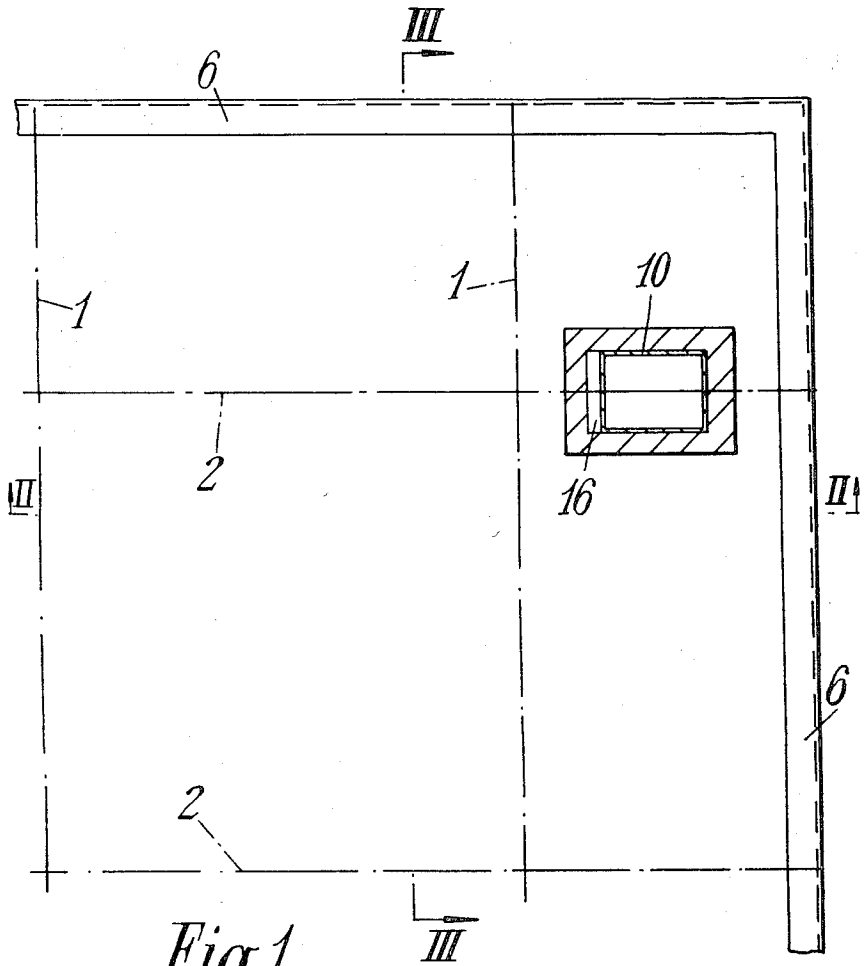
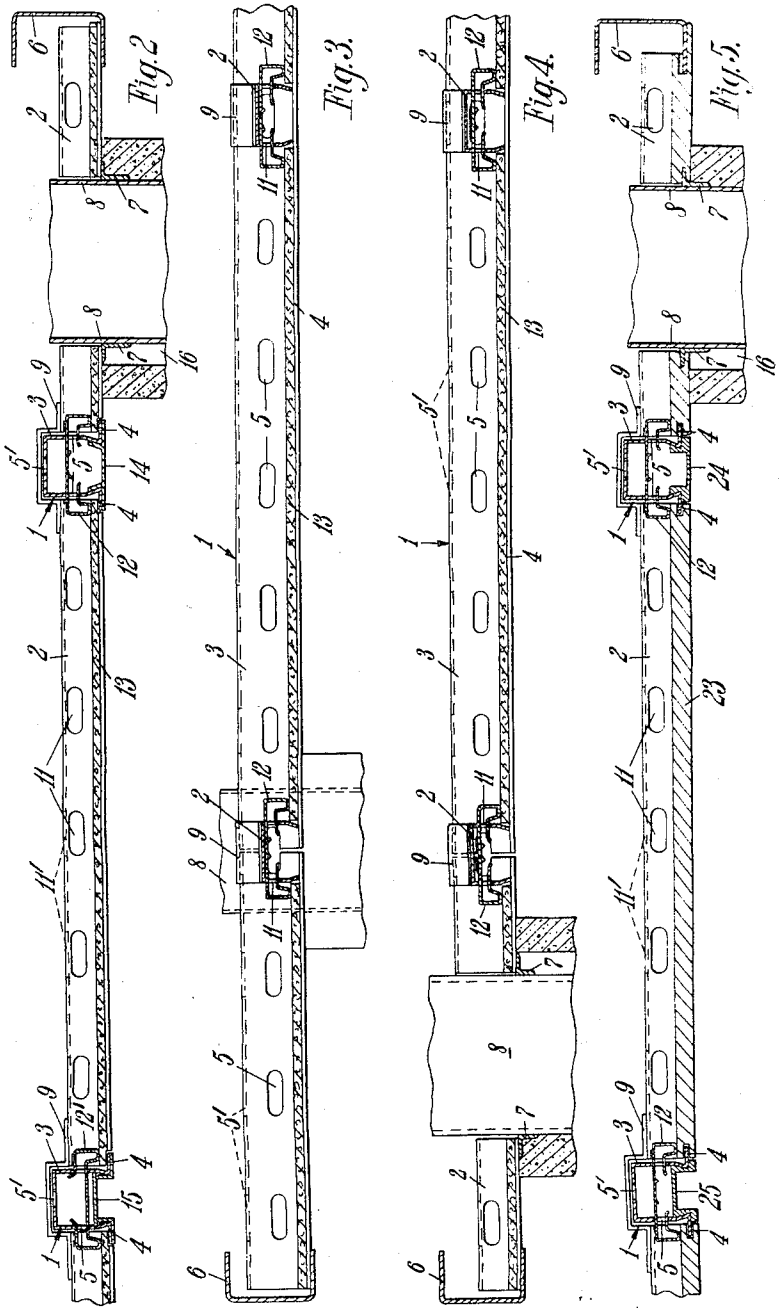



Fig. 1.

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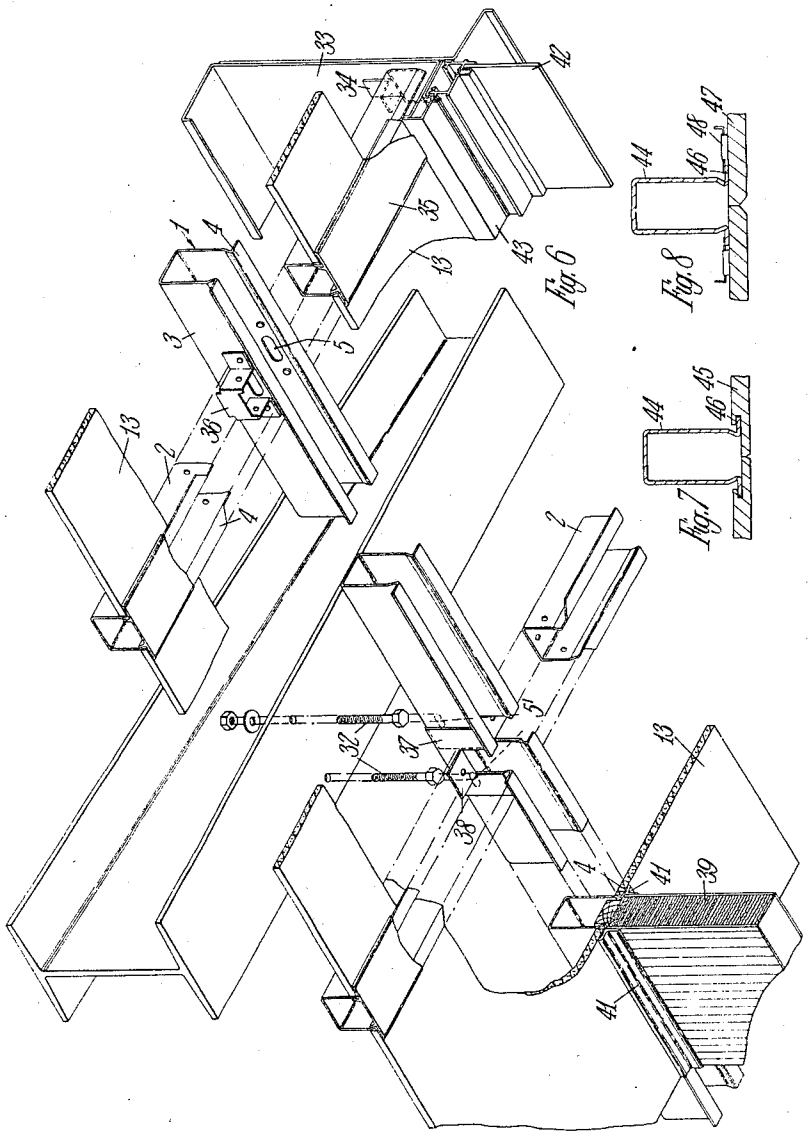



Fig. 6




Fig. 8




Fig. 7

United States Patent Office 3,440,789
Patented Apr. 29, 1969



3,440,789

# CEILING SYSTEM

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Filed Aug. 8, 1966, Ser. No. 571,020
Claims priority, application Great Britain, Aug. 13, 1965, 34,830/65
Int. Cl. E04b 5/52
U.S. Cl. 52—475 5 Claims

## ABSTRACT OF THE DISCLOSURE

A ceiling system for a building and particularly for a suspended ceiling in which downturned channel sections are provided with lower outer lips for supporting ceiling panels. The bottoms of the side walls thereof are bent inwardly for supporting further panels closing the undersides of the channel section.

This invention relates to a ceiling system for a building and particularly, but not exclusively, to a suspended ceiling system. Normally, suspended ceiling systems provide a ceiling which has insulation qualities, decorative qualities, sound adsorption qualities, fire protective qualities, or a combination of these qualities, and is suspended from the floor or roof above using straps or hangers. The ceiling is usually supported on either T-section, bulb T-section or I-section bearers, and uses either an exposed or secret method of fixing.

This invention consists in a ceiling system comprising at least two parallel spaced channel sections, each channel section having projections along its side walls adjacent to the mouth of the channel and projecting outwards from the side walls away from the channel, the channel facing downwards, and ceiling panels, such as ceiling lining board, being supported on the upper side of the projections; the panels can be decorative, insulating, acoustic or fire protective, or a combination of these.

For convenience, the channel sections are referred to herein as "Top Hat" sections, due to the resemblance of the simplest embodiment to a "Top Hat," though more complex embodiments may not resemble a "Top Hat" very closely.

In addition to supporting the ceiling, the system of the invention can provide a flush, concealed trunking system for carrying the electric wiring, water (e.g. small bore systems), communication systems and other services within the "Top Hat" sections, a means of supporting lighting units and other ceiling fixtures, and a top fixing for internal partitioning—all these can be provided simultaneously anywhere on a grid (such as a 3-ft. grid). In addition, the system can be provide a wide degree of flexibility in layout forb oth the lighting, wiring, other services and internal partitioning.

The first-mentioned "Top Hat" sections may be interconnected by at least two further parallel, spaced "Top Hat" sections at right angles to the first-mentioned "Top Hat" sections.

The first-mentioned "Top Hat" sections should be the main sections capable of spanning between the principal roof truss members or floor beams, or other principal supports on the floor above or roof, or in the case of a non-suspended ceiling, between principal supports extending from below. The "Top Hat" sections can be spaced at equal intervals, say at 3 feet centres, and the further "Top Hat" sections may be smaller or identical in cross-sections, and may be spaced at the same intervals as the main sections, for instance, again at 3 feet centres, giving a square grid.



However, it is not necessary that the "Top Hat" sections be spaced at equal intervals, and even if the sections are spaced at equal intervals, the further "Top Hat" sections can be spaced at different intervals.

The "Top Hat" sections can be connected, using slotted holes, to the principal structural members of the building a clearance at the joints being given to enable expansion due to heat in the event of fire to be accommodated without the "Top Hat" sections buckling. Thus the connection to the main structural members may be effected through a bolt with packing pieces to allow for the levelling of the system and an insert, for instance made of a suitable synthetic plastics material such as polyacetate or of a suitable alloy such as Wood's metal, which upon the application of heat, melts and enables the "Top Hat" section to slide smoothly across the structural supporting member; such packing pieces may also be used at the junctions between the "Top Hat" sections themselves. However, in spite of these possibilities of accommodating expansion, it is found that when the steels commonly employed for structural purposes are heated, the steel sags before its expansion becomes critical, so that very little accommodation may be required for expansion.

The projections are preferably continuous along the length or at least a substantial part of the length of the side walls of the section, being in the form of outwardly-projecting lips bent outwards from the channel section. For closing the bottom (open) side of the "Top Hat" section, members may be provided on each side of the channel, at or adjacent the mouth of the channel, which are closer together than the side walls of the channel at a level above the mouth of the channel—thus the members can be constituted by the side walls and the side walls can have their lowermost portions, e.g. about the bottom quarter or less, bent inwards, say at an angle of about 20° to the remainder of the side walls. This can provide inclined ledges upon which a closure panel can rest or be supported; thus the "Top Hat" section can be closed on the underside using a plastics material extrusion, which can be flush with the ceiling system to provide a level or nearly level continuation of the ceiling panels. If it is desirable to conceal the projection on the "Top Hat" section, the ceiling panels can have rebated or grooved edges so that the bottom plane of the panels is below the level of the bottoms of the "Top Hat" sections, with the closure panels referred to above providing a level continuation across the "Top Hat" sections—as another possibility, the ceiling panels themselves can continue across beneath the sections; it is found that such a level ceiling can increase the fire resistance. Alternatively, the closure panels can provide a channel recess giving a top push fit for an internal partition system whether the ceiling panels are grooved or rebated, or not. By using hollow mullions in the partitions, any services can remain concealed when dropped from a feeder line above the ceiling. The inclined ledges may also carry other items, such as special spring clips for a lighting unit (which could be fluorescent tube or pendant type); in this manner, the lighting units may be positioned anywhere on a grid (e.g. a three-foot grid) without drilling or such special provision.

The side walls of the "Top Hat" sections may be apertured (e.g. with punched holes preferably at equal intervals, for instance at 6-inch centres) to enable spring clips to be used to retain the ceiling panels on the outward projections of the "Top Hat" sections, and the apertures can also be used to provide access across the ceiling grid between the channels in the inter-connecting "Top Hat" sections, and the channels in the main "Top Hat" sections. The spring clips can be shaped as to have no sharp edges within the channel sections and to act as

supports for wiring and other services inside the "Top Hat" channel sections.

The invention will be further described, by way of example, with reference to the accompanying drawings, of which:

FIGURE 1 is a schematic plan showing the corner of a ceiling system in accordance with this invention;

FIGURE 2 is a section on a larger scale, along the line II—II of FIGURE 1;

FIGURE 3 is a section, on a larger scale, along the line III—III of FIGURE 1;

FIGURE 4 is a section similar to that of FIGURE 3, but taken at a position (not shown in FIGURE 1) where there is a gable stanchion;

FIGURE 5 is a section similar to that of FIGURE 2, but showing a slightly modified system;

FIGURE 6 is an isometric view, partly in section, partly broken away, and partly "exploded," of a modified ceiling system in accordance with this invention; and

FIGURES 7 and 8 are vertical sections showing a modified "Top Hat" section and modified ceiling panels.

In FIGURE 1, the main "Top Hat" sections **1** are shown running at right-angles to the noggin "Top Hat" sections **2**, forming a square grid. All the sections **1, 2** are cold-rolled in steel.

A cross section of two main sections **1** is shown in FIGURE 2; as can be seen, the side walls **3** have their lowermost portions bent inwards, but are provided with outward lips **4** along their lower edges. As shown in FIGURE 3, the main sections **1** have punched, slotted holes **5** at equal intervals, say at 6-inch centres, along their sides and punched, slotted holes **5'** at the same intervals along their tops and the main sections **1** rest either on cold rolled channel ceiling supports **6** provided on the walls of the building or on angle plates **7** provided on stanchions **8**.

The noggin sections **2** are about two-thirds the size of the main sections **1**, but have a similar cross section; this is not apparent from FIGURE 3, for the lips and bottom portions of the side walls are cut away at the end portion of the noggin section **2**, so that the noggin section **2** can rest on the lips **4** of the main sections **1** with all the lips, both on the main section **1** and noggin sections **2**, at the same level; the noggin sections **2** are secured to the main sections **1** by small "Top Hat" fixing clips **9**. Some of the noggin sections **2** will have an end resting on a ceiling support fix or on an angle plate **7**, as shown in FIGURE 2 where the stanchion **8** is provided with angle plate **7**. The noggin sections **2** have punched, slotted holes **11** again at equal intervals, and preferably at 6-inch centres, along their sides and punched, slotted holes **11'** at the same intervals along their tops.

Services, such as electric wiring, can be carried in the channels of the sections **1, 2**, and it will be noted that the channels of the noggin sections **2** communicate with the channels of the main sections **1** through the holes **5**. The services can be supported by clips **12** or **12'** inserted through the holes **5, 11** which also serve to hold fire-resistant (e.g. Asbestolux) ceiling panels **13** in position on the lips **4**; the clips **12** are inserted in pairs, one clip of each pair being inserted from each side closely adjacent to the other clip, whilst the clips **12'** are in the form of single clips.

The underside of the sections **1, 2** are closed by synthetic plastics material extrusions **14, 15**, the extrusion **14** being used to continue the ceiling between adjacent panels **13**, and the extrusion **15** being used to provide a top push fit for an internal partition (not shown).

As indicated in FIGURES 1 and 2, a space **16** can be left adjacent a stanchion **8**, or even up the centre of a partition, for concealing services dropped from a feeder line in the channel of sections **1, 2**.

In FIGURE 5, the main and noggin sections **1, 2** are generally similar to those shown in FIGURES 2–4. However, the ceiling panels **23** have slotted edges so that their undersides are below the lips **4**. The ceiling panels **23** may be rigid, and the rigid panels can be slid in position along the lips **4** after the main sections **1** have been mounted in position but before the noggin sections **2** have been mounted in position; the last panel can be held in position by special clips inserted from inside the respective sections. To provide a flush ceiling, the underside of the right-hand main section **1** is closed by an extrusion **24** whose underside is level with the underside of the panels **23**, whilst the underside of the left-hand main section **1** is closed by an extrusion **25** which provides a top push fit for an internal partition (not shown).



The ceiling systems of FIGURES 1–5 gave a half-hour fire rating (British Standard 476, "Fire Tests of Building Materials and Structures," part I, 1953) when tested.

In FIGURE 6, the ceiling system is generally similar to that shown in FIGURES 1–4, and the same reference numerals are used for corresponding parts. The main section **1** is fixed to an I-section beam **31** by bolts **32** passing up through punched, slotted holes **5'** in the top of the main section **1**, but other types of hanger may be used, if desired. The noggin sections **2** are attached to the wall plates **33** by angle plates **34**.

As in FIGURES 1–4, the lips **4** of the sections **1, 2** carry ceiling panels **13**, and, if desired, spring clips can be inserted through holes in the side walls **3** of the sections **1, 2** as in FIGURES 1–4, extra holes being punched for this purpose during the manufacture of the sections **1, 2**. The undersides of the sections **1, 2** are closed by synthetic plastics material extrusions **35** which have upwardly-projecting lips clipping into the inside of the sections **1, 2**, and which completely conceal the sidewards-projecting lips **4** on the sections **1, 2**.

In distinction to the arrangement of FIGURES 1–5, the main sections **1** and noggin sections **2** are positively secured together using fixing brackets **36** which are bolted to the side walls **3** of the main section **1** and to the ends of the side walls **3** of the noggin sections **2**. A special fixing bracket **37** is used where the main section **1** is bolted to the beam **31**, this bracket **37** embracing the top part of the section **1**, and being secured to the section **1** by the bolts **32**. The bracket **37** has a projecting piece **38** on each side, which is bolted to the respective noggin sections **2**.

The incorporation of a partition **39** is shown, this partition having a wooden soffit **40** which is received in the mouth of the main section **1**, and the lips **4** of the main section **1** being concealed by profiled plastics material extrusions **41**.

The outside wall of the building is concealed by vertical panels **42**, and the wall plate **33** and the edges of the sealing panels **13** are concealed by a cornice structure **43** formed of profiled strips of any suitable material.

The ceiling system of FIGURE 6 can ensure that the lips **4** or suspension platforms for the ceiling panels **13** are dimensionally correct.

The ceiling system of FIGURE 6 gave a one-hour fire rating when tested.

The "Top Hat" sections **44** of the FIGURES 7 and 8 have a slightly greater ratio of height to width than those of FIGURES 1–6. In FIGURE 7, the ceiling panels **45** extend across under the section **44**, being notched so as to be supported on the lips **46** of the sections **44**. In FIGURE 8, the ceiling panels **47** again extend across under the section **44**, but are held in position by secret fixings **48** cooperating with the lips **46**.

I claim:

**1**. A ceiling system comprising at least two parallel spaced channel sections having their channels facing downwardly, each of said channel sections having a single side wall on each side of the channel with at least a portion of the side walls lying in general parallel planes, the lower portions of the side walls being bent at an angle of about 20° to the remainder of said side walls whereby

the lower portions approach closer together than the generally parallel portions to provide sloping support surfaces within and on each side of the channel, the bottoms of the side walls being directed outwardly to define support surfaces and on each side of the channel, ceiling panels supported on said last named support surfaces, and closure panels fitted into the underside of the sections resting on the sloping support surfaces for providing a continuation across the channel sections.

2. The ceiling system as claimed in claim 1, wherein apertures are defined at intervals in said side walls, spring clips inserted in said apertures and retaining said ceiling panels on said outside support surfaces and a service provided in said channel with said spring clips serving as supports for said service.

3. The ceiling system as claimed in claim 1 including partition means arranged below the ceiling system and extending upwardly so that the upper portion thereof is received at the mouth of a channel section.

4. A ceiling system comprising at least two generally parallel spaced channel sections, each channel section having side walls defining a channel therebetween, a downwardly-facing mouth and projections extending continuously along at least a substantial part of the length of said side walls adjacent to said mouth and being in the form of outwardly-projecting lips bent outwards from said channel section, ceiling panels supported on the upper sides of said lips, at least two further generally parallel spaced channel sections extending generally at right angles to said first named channel sections for connecting said first-named channel sections, each further channel section having side walls defining a channel therebetween, a downwardly-facing mouth and projections along said side walls adjacent to said mouth and projecting outwards from said side walls away from said channel, ceiling panels supported on the upper sides of said projections of said further panels, said first-named channel sections being of larger section than said further channel sections, all of said first-named and further channel sections being spaced at equal intervals whereby said channel sections form a square grid, said side walls of said channel sections having apertures where the channel sections meet for providing access across the ceiling system along said channel sections, and said ceiling panels having rebated or grooved edges so that the bottom plane of the panels is below the level of the bottoms of the channel sections, with said panels providing a continuation across the channel sections.

5. A ceiling system comprising at least two generally parallel spaced channel sections, each channel section having side walls defining a channel therebetween, a downwardly facing mouth and projections extending continuously along at least a substantial part of the length of said side walls adjacent to said mouth and being in the form of outwardly projecting lips bent outwards from said channel section, at least a portion of the side walls lying in generally parallel planes, the lower portions of the side walls being angled inwardly to constitute an obtuse angle substantially greater than 90° with the generally parallel portions of the side walls without an abrupt shoulder therebetween whereby the lower portions approach closer together than the generally parallel portions to provide sloping support surfaces within and on each side of the channel, ceiling panels supported on the upper sides of said lips, at least two further generally parallel spaced channel sections extending generally at right angles to said first named channel sections for connecting said first named channel sections, each further channel section having side walls defining a channel therebetween, a downwardly facing mouth and projections along said side walls adjacent to said mouth and projecting outwards from said side walls away from said channel, at least a portion of the side walls lying in generally parallel planes, the lower portions of the side walls being angled inwardly to constitute an obtuse angle substantially greater than 90° with the generally parallel portions of the side walls without an abrupt shoulder therebetween whereby the lower portions approach closer together than the generally parallel portions to provide sloping support surfaces within and on each side of the channel, ceiling panels supported on the upper sides of said projections of said further panels, said side walls of said channel sections having apertures where the channel sections meet for providing access across the ceiling system along said channel sections, said ceiling panels having rebated or grooved edges so that the bottom plane of the panels is below the level of the bottoms of the channel sections, and closure panels closing the undersides of said channel sections and supported on said sloping support surfaces providing a continuation across the channel sections.

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KENNETH DOWNEY, *Primary Examiner.*

U.S. Cl. X.R.

52—461; 98—40